



## Individual and Environmental Factors Determining Sedentary Lifestyle of the Polish Population

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### Abstract

**Background:** The aim of the current investigation was to evaluate the sedentary lifestyle of the Polish population and its link with prolonged sitting in light of individual and environmental factors.

**Methods:** The sample consisted of 1505 Polish people between 18 and 64 years old. The Computer-Assisted Telephone Interview (CATI) survey was conducted with the Polish version of International Physical Activity Questionnaire (IPAQ-LF) and the survey of the determinants of a sport activity among the Polish population. The relationships between the time spent sitting and the individual and environmental factors among Polish citizens were investigated through log-linear analysis.

**Results:** The total time Polish people spent sitting was  $2812.4 \pm 1593.9$  min/week. During the weekend, men ( $\text{Chi}^2 = 45.0$ ;  $P = 0.04$ ) spent significantly more time sitting than women ( $251.1 \pm 170.1$  min/week,  $230.9 \pm 155.0$  min/week, respectively). Despite the relatively high proportion of people declaring participation in the Sport for All initiative (67.8%), only 9.6% of Polish people undertake a physical activity on a daily basis. The odds ratios above the median ( $>2545$  min/week) are higher (OR=1.33; 95% CI=1.03–1.72) for those who are not physically active (54.5% vs. 45.5%). There was no relationship between prolonged sitting time and the environmental factors.

**Conclusion:** It is necessary to increase consistent efforts to create an environment that would successfully promote an active lifestyle among Polish citizens in their place of residence and prevent sedentary behaviours within this population. The recommendations for physical activity should include the guidelines intervening in the time people spend sitting.

**Keywords:** Sedentary behaviours, Population, Determinants, Poland

## Introduction

Physical activity, or rather the lack of it, has become a significant risk factor for chronic diseases in modern society. The consequences of hypokinesia are widespread across highly developed (1–3) and developing countries (those with average and low income) (4, 5). While confronting this phenomenon, public health campaigns around the globe put forward the increase of physical activity among inactive people as their primary goal (6) ('inactive' meaning those who do not undertake vigorous or moderate physical activity, also known

as 'sedentary society') (7). However, the sedentary lifestyle is not the exact opposite of the physically active lifestyle (2, 8, 9). Although both the lack of physical activity and prolonged sitting are serious risk factors for chronic diseases, their consequences are not dependent on each other (3, 10–12). Scientists have proven that the physiological effects of sedentary behaviours are often more harmful (13) than insufficient amounts of physical activity itself (14, 15). It appears that activities requiring low energy expenditure such as sitting

down, watching TV, reading, working in front of a computer, computer games, lying down or napping, or driving a car (1.0–1.5 MET)(16,17) may have a stronger relationship with the risk of metabolic syndrome than the lack of any physical activity at all(14,18,19). Watching TV, in particular, is linked with obesity(20, 21), cardiovascular disease(22, 23) or type II diabetes(20). On the other hand, the sedentary lifestyle is not necessarily a synonym for lack of physical activity(24), as shown by individuals who meet or exceed the recommended amount of physical activity, even though they spend a long time on sitting(16). In this case, the consequences of a prolonged sitting might be independent of the protective effects of regular physical activity. There are individuals who do not meet the WHO recommendations, even though they do not spend a long time sitting. Instead, those people are involved in household chores (2–3 MET).

Regardless of the relationships described above, prolonged sitting is a key problem facing public health(13). It appears that adults employed on a full-time basis spend the majority of their working hours sitting(25). The rapid increase in the use of a car as the main means of transport leads to congestion on the roads and, in consequence, extends travel time (especially during the peak hours)(26). Spending leisure time on watching TV also seems to be a major problem (20, 27). First, it requires lower energy expenditure than any other sedentary behaviour (for example, driving a car, writing or reading)(28, 29). Second, watching TV is becoming a more popular activity among people. Scientists report that in a typical American household, the TV is switched on for longer than 8hrs per day(27), with the average above 2hrs per day(25). The sitting/lying down time median in other investigated countries is 5h per day (from ≤3h per day in Portugal, Brazil and Columbia, up to ≥6h per day in Taiwan, Norway, Hong Kong and Saudi Arabia)(4).

The above data indicate that attention should be turned towards understanding the mechanisms underpinning sedentary behaviours. Further exploration of these behaviours should change the direction of health research (7, 30). Qualitative and quan-

titative data collection is extremely important in this particular case, as it would contribute to our understanding of this constantly growing problem. Furthermore, it would also help in the development of successful intervention programmes.

The aim of the current investigation was to evaluate the sedentary behaviours among the Polish population, with a particular focus on the relationship between these behaviours and the possibility of compensating their effects with various forms of leisure-time physical activities. The relationships between sitting time and individual factors of Polish citizens (age, gender, level of education) and environmental factors (the accessibility of the sports classes and venues, the ratings of these classes and the ratings of the local authorities' work in the realm of sport and recreation) are analysed in the current work.

## **Materials and Methods**

The survey was conducted between 10 October 2012 and 14 November 2012 via Computer-Assisted Telephone Interviews (CATI). The interviews were administered by qualified and supervised surveyors who delivered the questions in a way that was equally easy to comprehend for all respondents. The research tools in the current investigation were the Polish long version of International Physical Activity Questionnaire (IPAQ) and the bespoke survey on the determinants of sport activity among the Polish population. The survey included questions about the frequency, duration, place and the type of Sport for all activities. The subjects were also asked about the accessibility of the sports facilities and classes. Additionally, the participants were asked to rate the attractiveness of these classes and to provide ratings of the work done by local authorities within sport and recreation.

The IPAQ provided the information on physical activity in specific domains (such as occupational, commuting, domestic chores, sports and leisure) as well as the duration of sitting time during the weekdays and weekends (31). The respondents were asked about the duration of sitting at work, at home, while studying and in their leisure time in

the last 7 days prior to the survey. This included the time they spent sitting by the desk, sitting when visiting friends, while reading, watching TV or lying down (sleep was not included). The sitting time during the weekdays and weekends is in minutes per day. The time of sitting in/on the vehicles (i.e., in a car, on a bus or on a motorcycle) was also specified in minutes per day. The total and average sitting times (during the weekdays and weekends) were calculated according to the formulae below.

Total sitting time min/week = sitting time in minutes during weekdays x 5 days + sitting time in minutes during weekend x 2 days

Average sitting time min/day = sitting time in minutes during weekdays x 5 days + sitting time in minutes during weekend x 2 days / 7

The total weekly duration of sitting was obtained by adding the time spent on commuting/transportation per week.

For the purpose of the current study, only information on physical activity undertaken in leisure time (in the last week prior to the start of the survey) was used. After performing a standardised calculation of the durations and the frequencies of declared physical activities (vigorous, moderate activities and walking)(31), and with the WHO recommendations on the amount of physical activity needed to maintain a good health taken into account, the respondents were divided into two groups: those who follow the recommendations (n=874) and those who do not (n=630). Furthermore, those who declared undertaking  $\geq 150$  minutes of moderate physical activity or  $\geq 75$  minutes of vigorous physical activity per week (or the equivalent combination of moderate and vigorous physical activity) were classified as physically active. The investigated sample consisted of 1,505 Polish citizens (age range 18–64 years old). They were selected through the stratified-quota sampling method, with the demographic variables such as age, gender, education and the place of residence as strata. The quotas were established proportionally, based on the data that were made accessible to the researchers by the Central Statistical Office. Furthermore, in order to increase the representativeness of the sample, a data-weighting

procedure was used for the variables listed above. The quotas were proportionally assessed based on the data provided by the Central Statistical Office (data sources: National Census of Population and Local Data Bank). The characteristics of the respondents are shown in Table 1.

**Table 1:** The characteristics of the Polish population

Factors	n=1,505	
Gender	n	%
Men	740	49.2
Women	765	50.8
Age (yr)		
18–24	252	16.7
25–29	200	13.3
30–39	322	21.4
40–49	295	19.6
50–59	293	19.5
60–64	143	9.5
Education		
Primary	376	25.0
Secondary	854	56.7
Higher	275	18.3

### Statistical Analysis

Statistical analysis was run on IBM® SPSS® Statistics version 21. The descriptive statistical analysis provided detailed characteristics of the dependent variables by using the mean ( $\bar{x}$ ), median (me) and standard deviation (SD). The Kolmogorov-Smirnov test was used for assessing whether the data are distributed normally (the sitting time during the weekdays and weekends, the sitting time in the vehicles and the total sitting time were taken into account). Given that the assumption of normality in the collected data was violated ( $P < 0.05$ ), further statistical analyses required use of Chi<sup>2</sup> and non-parametric tests such as U Mann-Whitney, Kruskal Wallis and Wilcoxon. The significant differences between dependent and independent variables (individual: age, gender, education, participation in Sport for All; environmental: the number of and the state of free and paid sports facilities, the costs and attractiveness of the classes offered by paid public sports and leisure centres, local authorities' input in promoting physical activity) were examined ( $P < 0.05$ ). The relationships between the time

spent on sitting and the individual and environmental factors among Polish citizens were investigated through log-linear analysis. The respondents were divided into two groups: those who spent more than 2545min per day on sitting and those who spent less than 2545min per day on sitting (the median of the duration of sitting was the cut-off point). There were two analyses run separately: one taking into consideration the individual factors and one for the environmental factors. The strength of the relationship between these variables and the time Polish citizens spend on sitting was expressed through the odds ratios (OR) (with 95% confidence intervals).

## Results

The total sitting time of Polish citizens (during the weekdays, weekends and when commuting) averages 9.4±5.1h/day (46.9±26.5h/week). It appears that there is no difference in the average sitting time during weekdays and weekends (4.0±2.8h/day; 242.9±169.1h/weekend 4.0±2.7h/day; 240.8±162.9h/week, respectively). The average time spent sitting in a vehicle was 78.4±111.0min/day (Table 2). The significant relationships were not found when the socio-demographic factors were taken into account, with one exception: gender. The results showed that men (251.1±170-

min/week) spend significantly more time on sitting during weekends (Chi<sup>2</sup>=45.0; *p*=0.04) than women (230.9±155 min/week).

Engaging in any type of physical activity of a continued duration of 10 minutes in leisure time was declared by 67.8% of the Polish population (Table 3). It appears that participation in Sport for All depends on gender (Chi<sup>2</sup>=11.7; *P*<0.001), age (Chi<sup>2</sup>=58.7; *P*<0.001) and education (Chi<sup>2</sup>=28.7; *P*<0.001). Men (48.0%), young adults (aged 18–24: 61.1%; aged 25–29: 52.5%) and those educated to a degree level (56.7%) participated in Sport for All more often than the remaining groups of respondents. Women (60.8%), those in the 50–59 and 60–64 age groups (34.5% and 31.5%, respectively) and respondents with primary education (64.1%) more often declared lack of engagement in physical activities. The most popular sports are cycling (21.2%), swimming (13.4%) and running (12.2%). Cycling as a main type of physical activity is declared mostly by the respondents who are in the age range of 50–59 (44.7%) and over 60 years old (42.6%). Younger adults (18–24 years old), on the other hand, choose swimming and running more often (26.9% and 35.2%, respectively). Overall, both men and women tend to choose cycling as their favourite type of sport (31.1% and 42.9%, respectively).

**Table 2:** Average (±SD) sitting time (in min/day) and the total sitting time (in min/week) of the Polish population during weekdays, weekends, spent in mechanical vehicles (when commuting) depending on the socio-demographic factors

Factors	Sitting			
	Weekday (min/day)	Weekend (min/day)	In a vehicle (min/day)	Total (min/week)
<b>Gender</b>				
Men	248.3±171.2	251.1±170.1*	74.5±102.0	2876.8±1609.9
Women	237.8±167.0	230.9±155.0	82.1±119.0	2750.1±1576.9
<b>Age (yr)</b>				
18–24	247.3±167.9	249.0±155.5	91.7±130.8	2951.7±1704.2
25–29	233.8±167.2	248.5±165.6	66.3±93.3	2760.9±1548.6
30–39	253.8±172.2	252.3±168.9	77.2±119.9	2914.4±1690.7
40–49	252.4±173.5	238.9±171.8	77.7±88.2	2841.0±1569.5
50–59	236.6±163.6	235.7±155.4	73.6±117.4	2714.6±1449.2
60–64	217.1±167.6	204.2±150.7	85.4±102.6	2550.3±1541.9
<b>Education</b>				
Primary	228.7±153.3	239.9±145.5	81.2±124.6	2734.8±1498.2
Secondary	248.9±176.5	240.1±168.5	77.5±111.5	2840.5±1618.8
Higher	243.9±165.6	244.2±168.2	77.2±87.8	2831.3±1644.8
Total	242.9±169.1	240.8±162.9	78.4±111.0	2812.4±1593.9

Significant differences (*P*<0.05) – \*men vs. women

**Table 3:** The frequency and duration time of sport activities in which Polish citizens (n=1,505) participated in their leisure time

Participation in sport activities		Men		Women		Total	
		n=740	%	n=765	%	n	%
<b>Frequency</b>	None	216	29.2	269	35.2*	485	32.2
	Sporadically	169	22.8	196	25.6	365	24.3
	1–2 days per week	169	22.8*	132	17.3	301	20.0
	3–4 days per week	125	16.9*	84	11.0	209	13.9
	Everyday	61	8.2	84	11.0	145	9.6
<b>Duration</b>	<30 min/day	99	18.9	175	35.3*	274	26.9
	30–59 min/day	188	35.9	188	37.9	276	36.9
	≥60 min/day	237	45.2*	133	26.8	370	36.3
<b>Type</b>	Not organised (performed at home, open space, etc.)	334	63.7	322	65.1	656	64.4
	Organised	85	16.2	170	34.3*	126	12.4
<b>Place</b>	Private gym/fitness club	31	5.9	33	6.7	22	2.2
	Free public facilities	102	19.5*	62	12.5	74	7.3
	Paid public facilities	104	19.8*	30	6.1	48	4.7
	At school, university	143	27.3	124	25.1	79	7.8
	Others	34	6.5	30	6.1	14	1.4

Significant differences ( $P<0.05$ ) – \*men *vs.* women

Despite a relatively high proportion of respondents declaring participation in Sport for All, only 9.6% of Polish citizens' exercise on a daily basis (Table 3). As many as 13.9% of the respondents engage in a physical activity 3–4 times per week and 24.3% exercise sporadically (a few times per month or year). The results show that more men than women exercised 1–2 times ( $\text{Chi}^2=7.3$ ;  $P<0.05$ ) and 3–4 times ( $\text{Chi}^2=11.0$ ;  $P<0.05$ ) per week. The proportion of men who did sports 1–2 times per week was 22.8%, whereas this proportion for women was 17.3%. The same pattern was shown for the group of people declaring engaging in a physical activity 3–4 times per week (16.9% of men and 11.0% of women). Interestingly, women declared lack of any physical activity more often than men did (35.2% *vs.* 29.2%;  $\text{Chi}^2=6.2$ ;  $P<0.05$ ). Furthermore, women who were physically active reported shorter durations of their exercises than men: they worked out for less than 30min/day more often than men did (35.3% and 18.9%, respectively;  $\text{Chi}^2=69.1$ ;  $P<0.05$ ). However, when the durations of more than 60min/day were considered, Polish women's trainings were less frequent than those of men (26.8% and 45.2%, respectively;  $\text{Chi}^2=42.4$ ;  $P<0.05$ ).

It appears that women participated in organised classes more often than men did (34.3%, 16.2%, respectively;  $\text{Chi}^2=42.8$ ;  $P<0.05$ ), whereas men reported using public sports facilities, free (19.5% and 19.8%;  $\text{Chi}^2=8.7$ ;  $P<0.05$ ) and paid ( $\text{Chi}^2=43.1$ ;  $P<0.05$ ), more than women (12.5% and 6.1%).

The proportion of people who met WHO health recommendations, based on the type of activity (vigorous, moderate and walking) undertaken in leisure time, was 58.1% (in which the proportion of men was 57.7% and of women 58.5%). Despite the lack of significant differences when age, gender and education were taken into account, there was a relatively high proportion of physically active people in the 40–49 age group (62.7%).

On the other hand, the analysis of individual and environmental factors showed that the only factor that determines the duration of sitting of more than 2545 min/week is participation in Sport for All (see Table 4), where the value of 2545min/week is a median of the total sitting time declared by the respondents. According to the results, the odds ratios of sitting above the median is higher (OR=1.33 [1.03–1.72]) among those who do not engage in any form of physical activity in their leisure time (54.5% *vs.* 45.5%).

The remaining factors, such as the accessibility of sports facilities, the attractiveness of the classes and facilities and the activities of the local authorities within the area of sport and recreation, do not play an important role in the

longer durations of sitting (see Table 5.). It appears that the sitting time of the Polish population is not dependent on the WHO health recommendations being met (58.1%) or not (41.9%).

**Table 4:** Individual factors determining the sitting time, odds ratios (OR) and the 95% confidence intervals of those sitting below and above 2545min/week

Factors	Sitting ≤2545 min/week		Sitting >2545 min/week		P	OR	95% CI
	n	%	n	%			
<b>Participation in Sport for All</b>					0.031		
Yes*	343	52.5	310	47.5		1	-
No**	166	45.5	199	54.5		1.33	1.03–1.72
<b>Meeting the WHO recommendations</b>					NS		
Yes	449	49.4	423	50.6		1	-
No	311	51.5	319	48.5		1.09	0.89–1.34

\* 1–2 days per week, 3–4 days per week, everyday; \*\* 1–2 times per month, a few times per year, not at all

**Table 5:** Environmental factors determining the sitting time, odds ratios (OR) and the 95% confidence intervals of those sitting below and above 2545min/week

Factors	Sitting ≤2545 min/week		Sitting >2545 min/week		P	OR	95% CI
	n	%	n	%			
<b>Number of free sports facilities</b>					NS		
High	197	53.7	170	46.3		1	-
Low/None	301	48.0	326	52.0		1.26	0.10–1.62
<b>State of free sports facilities</b>					NS		
Good	385	50.6	376	49.4		1	-
Poor	60	43.2	79	56.8		1.35	0.94–1.94
<b>Number of paid sports facilities</b>					NS		
High	192	50.4	189	49.6		1	-
Low/None	298	49.5	304	50.5		1.04	0.80–1.34
<b>State of paid sports facilities</b>					NS		
Good	393	49.1	407	50.9		1	-
Poor	28	53.8	24	46.2		0.83	0.47–1.45
<b>Classes cost in paid public sports facilities</b>					NS		
High	167	48.3	179	51.7		1	-
Low	47	51.1	45	48.9		0.89	0.56–1.42
<b>Attractiveness of classes in paid public sports facilities</b>					NS		
Very attractive	209	50.6	204	49.4		1	-
Not attractive	24	57.1	18	42.9		0.77	0.40–1.46
<b>Local authorities' actions promoting physical activity</b>					NS		
Yes	238	49.4	244	50.6		1	-
No	184	48.9	192	51.1		1.02	0.78–1.33

\*Significant differences ( $P < 0.05$ ) between those declaring sitting time below and above 2545 min/week; Odds ratios (OR) were computed with reference to those sitting for longer than 2545 min/week.

## Discussion

The current investigation conducted on a representative sample of the Polish population shows that the duration of sitting (regardless of participation in any kind of physical activity) is a very important risk factor for chronic diseases. It appears that the time spent sitting has increased in comparison with the data from 2009 (from 343min/day to 401.8min/day) (32). At the moment, Polish citizens spend  $2812.4 \pm 159.3$  min/week sitting, which is very close to the numbers reported in the developed countries. For instance, British citizens sit  $53.8 \pm 23.0$  h/week (roughly 3228min/week), the Dutch  $60.0 \pm 21.0$  h/week (roughly 3602min/week) and the Americans from  $53.0 \pm 19.8$  to  $56.0 \pm 23.5$  h/week, depending on the data sources (roughly 3361–3860 min/week) (33). The Polish population's results are higher than those of countries such as Czech Republic (2295.5 min/week) (34), Portugal ( $2307 \pm 1107$  min/week) (35) and Belgium ( $2191 \pm 1057$  min/week) (35). The median sitting time of Polish citizens is 2545 min/week, which is higher than in Norway, where, depending on the level of education, men are more likely to spend their time sitting than women (35–44h/week and 32–40h/week, respectively; these values in minutes per week would be 2100–2640 for men and 1920–2400 for women) (36). The Spanish also spend less time sitting than Polish people:  $373.1 \pm 184.6$  min/day (roughly 2612min/week) (37). However, it should be pointed out that the cited data were compared with the total time the Polish population devoted to sitting (during weekdays and weekends), including the time spent in vehicles when commuting (the total without commuting time is  $2418.8 \pm 1430.3$  min/week), whereas the investigations conducted in the Czech Republic considered only the weekdays and the Spanish research excluded the time spent sitting in mechanical vehicles (when commuting). Furthermore, some of the authors (35, 36) did not specify what was included in the sitting time. Additionally, it needs to be noted that in the research to date, there is a lack of sufficient evidence that the questions in the surveys were used appropri-

ately (the MET thresholds have not been established). This, in turn, suggests that the sitting-time indicator relies solely on the respondents' declarations, which creates problems when comparing the data across different populations and does not seem to be a reliable measure of the total sitting time of any investigated population.

Regardless of the methodological differences, it is clear that the duration of sitting among the Polish population has increased and their physical activity level is insufficient (only 9.6% of respondents exercise every day and 13.9% exercise 3–4 times per week). These numbers are alarming and concerning, given that, according to some researchers, prolonged sitting significantly decreases the time people spend on exercising (39). Furthermore, as mentioned in the introduction, spending leisure time on sitting might decrease the possibility of meeting the WHO health recommendations (2). Additionally, it may correlate with metabolic diseases (40–43), obesity (40) and high blood pressure (39) among those who are not physically active.

The current findings suggest that Polish citizens who are not physically active are 1.33 [1.03–1.72] times more exposed to sitting durations longer than 2545min/week (>6h). They also direct our attention towards the risks that are associated with such behaviours. It is worrying that within the investigated sample, the authors did not find a relationship between the sitting durations and their healthy behaviours (implementation of the recommended amount of physical activity). This suggests that Polish citizens do not link the need to spend their leisure time actively with preventing a sedentary lifestyle. Interestingly, they declare participation in Sport for All (70%), but they do not see the need to exercise on a regular basis. This may be a result of old habits or a lack of awareness of healthy lifestyle behaviours. Meanwhile, Chu and Moy (39) argue that even those who meet these recommendations but sit more than 9.3h per day are in the 3.82 times greater risk of developing metabolic syndrome. It is therefore expected that this problem may also appear among the most active Polish citizens (those in the 40–49 age group) in the future. At the moment, the majority of the respondents in this particular

age group (62.7%) meet WHO recommendations, but their sitting time is longer than for those in other age groups ( $252.4 \pm 173.5$  min/day).

Despite the fact that sedentary behaviours form an independent risk factor for modern diseases, it seems appropriate to ask whether the duration of sitting among the Polish population is linked with the opportunities (or the lack of thereof) of undertaking leisure physical activity in their place of residence. Unfortunately, the database in the explored topic is rather limited and provides mostly information promoting healthy lifestyle choices (44, 45). The majority of research focuses on the relationship between the undertaken physical activity and urbanisation (46, 47) or pollution (48) (particularly in the context of the means of transportation choice) (49). The research to date also provides analysis of the relationship between environmental factors (i.e., access to the sports facilities) and leisure physical activity (50, 51). However, the data provided mainly concern the citizens of wealthy countries (52–54).

In general, the health behaviours among people are the results of their individual characteristics (such as income, age or education) and the environmental factors (such as the local authorities' activities, sport and recreation infrastructure, physical activity initiatives, or the use of land) (55–57). The results of the current study confirm that men (48.0%), young adults (aged 18–24: 61.1%; aged 25–29: 52.5%) and those educated to a degree level (56.7%) participate in the Sport for All initiative more often than the remaining subjects. These variables appear to be significant factors supporting the healthy behaviours of the respondents (58, 59). However, many reports indicate that people are more likely to undertake a physical activity if they have the support of their social groups (60) and the governmental plans (61). The marketing strategies (62), access to equipment (58, 63), financing public sport facilities (45), promoting active ways of spending leisure time (64), safety, and support of decision-makers on development and implementation of sport initiatives (65) strongly influence the development of attitudes and behaviours of those who live in environments that do not actively promote physical

activity and present many barriers in accessing sport facilities. This seems to be an issue for the people living in poor areas: they have to overcome more obstacles when making healthy choices (63, 66–68). This suggests that an increase in accessibility of free sports facilities and better focus on the safety of public places may encourage those of poorer backgrounds to increase their physical activity (69). It appears that people are more active when they have access to sport facilities, both free and paid (70). In rural Missouri, for instance, making the hiking trails more accessible created an opportunity to promote physical activity among the groups of people who were at greatest risk of becoming physically inactive, especially among women and those with a lower socio-economic status (60). The closeness of golf courses has increased physical activity among older people (71). However, providing free facilities does not itself lead to an increase in physical activity, as shown in the current study (72). Despite the fact that 8.4% of the Polish population take advantage of free sports facilities, there is no relationship between these activities and the time of sitting. This yields the effective initiatives that would raise the awareness of the problem and the consequences of the sedentary lifestyle. The plan for educating people about the ways to fight the sedentary behaviours is also needed. Unfortunately, the results of the current work suggest that a more intense campaign promoting a healthy lifestyle is needed in Poland. As revealed by the analysis, the environmental factors (with the exclusion of one case of participation in the Sport for All initiative) did not correlate with the sitting time among the Polish population. The results showed that there was no relationship between the duration of sitting longer than 6 hrs per day and the recommended by WHO amount of physical activity, the number and state of free and paid sports facilities, the cost and attractiveness of classes, and the engagement of local authorities in the area of sport and recreation. This may indicate that local interventions are not effective, Polish citizens prefer passive recreation and a lack of awareness in this matter. It should be underlined that there is a link between lack of physical activity and the risk of prolonged sitting



(OR=1.33[1.03–1.72]). Moreover, the recent NATPOL reports reveal that the level of physical activity among the Polish population is (at best) moderate (73). Additionally, the upcoming changes in the age structure within the population and a desperately low fitness level of Polish youth may increase the proportion of inactive people.

## Conclusion

With all the above in mind, the authors present the following conclusions:

1. The immediate cooperation with the Ministry of Health concerning the increase of Polish citizens' awareness of the risks brought by sedentary lifestyle is necessary.
2. It is necessary to intensify the consistent efforts aiming at the development of the environments promoting an active lifestyle among the Polish population at their place of residence. The focus of these efforts is also directed towards prevention of the sedentary lifestyle; these efforts should include planning more effective strategies aiming to engage more local communities in active recreation, partnerships development and the exchange of experiences and information about the obstacles people have overcome.
3. The suggestion that future recommendations for the amount of physical activity include guidelines intervening in the time people spend on sitting seems well justified.
4. Further investigation of the environmental factors with the widest scope possible is advised.

## Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc) have been completely observed by the authors.

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