Comparative Leisure Physical Activity: A Comparison Between Polish and European Population

Authors' contribution:

- A) conception and design of the study
- B) acquisition of data
- C) analysis and interpretation of data
- D) manuscript preparation
- E) obtaining funding

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ABSTRACT

Introduction and objective: In Poland, there are only a few studies that refer to the whole society's participation in sport and recreation and that are based on the international questionnaire thus allowing for comparative analysis with other European reports. The aim of the study was to determine the association between leisure physical activity and socio-demographic variables.

Methods: A survey based on CAPI was carried out in Poland from October to November 2012. A random sample of Polish adults (N=1,633) was interviewed using the IPAQ-long form. The data were analyzed using standard statistical procedures.

Results: More than 21% of Polish subjects did not undertake any physical activity in their leisure time. Of those who were physically active, over 70% engaged in vigorous physical activity; only one in four respondents performed moderate physical activity or walking. The average leisure physical activity of the Poles was $1,916.9 \pm 2,621$ MET-min/week. A comparison of the current results and European research findings demonstrated that the median physical activity for the Polish population (MET-min/week) was similar to the median values for Czech subjects and Norwegian males and nearly three times higher than Croats.

Conclusions: Insufficient participation in the conscious process of caring for one's health is a common occurrence among adults living in the EU. In order to encourage the Polish population's participation in physical activities, it is necessary to raise their awareness of the need of well-balanced, regular exercise. Furthermore, this study suggests that caution is warranted before using the CAPI technique to provide the IPAQ-long form survey.

KEYWORDS

physical activity, leisure, comparative study, Poland, European population

Introduction

Research institutions around the world are increasingly engaged in a cross-sectional research on physical activity (European Commission, 2004, 2010; *Physical Activity...*, 1996; Sidney et al., 1991) and Poland is no exception (Biernat, 2011; Drygas et al., 2005; *Polish population...*, 2003; Piątkowska, 2012). However, the majority of investigations and analyses conducted by research bodies in Poland (such as academic institutions, the Central Statistical Office, or the Public Opinion Research Centre) have either

evaluated the frequency and duration of a physical activity by using varied, often non-comparable, methods or have defined an active life style differently. The key aspects of these analyses were the type of activity undertaken in leisure time, the percentage of participation in various activities, the duration of a particular activity, and the frequency of occurrence of a specific activity in a set behavior of a group or an individual (Toczek-Werner & Sołtysik, 1997). The data were often collected and analyzed as they existed at the time of assessment by using small samples that varied in terms of participants' age, gender, and employment status.

As an answer to the social need for a detailed verification of the existing research findings, there was a call for a broader, more representative set of results. This issue was addressed by raising the idea and the current concept of leisure physical activities diagnosis by means of a Polish version of the Last 7 Days Physical Activity Recall (L7DPAR), which was officially approved by an international IPAQ committee (Biernat et al., 2007; Gajewski & Biernat, 2010). This analysis, along with the socio-demographic factors gender, age, education, occupation, income, and the size of the place of residence, would allow for creating a complex profile of the investigated population, which in turn would become a valuable reflection of the lifestyle(s) of the Polish population. It is expected that the current investigation will add to the understanding of the differences and similarities between Polish citizens' leisure physical activity and that of other European citizens (both measured with the same tools).

Material and methods

The surveys were carried out between 10 October 2012 and 14 November 2012¹ via Computer-Assisted Telephone Interviews (CATI). Qualified and supervised surveyors conducted the interviews. They delivered the questions in a way that was equally easy for all respondents to comprehend. Leisure physical activity was estimated by the Polish long version of International Physical Activity Questionnaire (IPAQ) (Biernat, 2013).

The sample consisted of 2,004 Polish people aged 15 years or older. They were selected through the stratified-quota sampling method. The demographic variables of age, sex, education, and place of residence were stratified. The quotas, which were established proportionally, were based on the data made accessible to the researchers by Poland's Central Statistical Office. Furthermore, in order to increase the representativeness of the sample, a data weighting procedure of the variables listed above was used. The quotas were proportionally assessed based on the data provided by the Central Statistical Office.

The analysis excluded 234 participants who were over the age of 69 years, as the IPAQ methodology recommends using the questionnaires for the population in the age range of 15-69 years. Of the remaining sample (n=1,770), 132 subjects who reported physical activity exceeding 16 hours per day were excluded from the analysis (*Guidelines...*, 2005). The characteristics of the respondents can be found in Table 1.

Data analysis was accomplished using statistical software IBM SPSS 21.0. Descriptive statistics was used to present the basic data in the study including the mean, median (me), extreme values (max, min), and standard deviation (SD). Inferential statistics was applied in order to reveal statistically significant differences between groups. It included the *t*-test and the chi-squared test. The significance level was $p=0.05$.

Results

The data analysis shows that over 21% of Polish subjects did not undertake any physical activity (PA) in their leisure time (see Table 2). The lowest physical activity was observed for subjects with secondary education (23.3%); farmers, gardeners, foresters and fishermen (30%); and those with average gross income (per capita in household) of 2,000-2,999 zł per month (26.6%).

¹ Data collection excluded All Saints' Day (a national holiday in Poland) due to the increased physical activity frequently caused by visits to cemeteries.

Table 1. Socio-demographic characteristics of Polish respondents aged 15-69 years

Variables	N=1,633	
Sex	n	%
Male	801	49.1
Female	832	50.9
Age		
15-19 years	88	5.4
20-24 years	206	12.6
25-29 years	200	12.2
30-39 years	322	19.7
40-49 years	295	18.1
50-59 years	293	17.9
60-69 years	229	14.0
Education		
Primary	431	26.4
Secondary	911	55.8
Higher	291	17.8
Place of residence		
Village	451	27.6
City up to 20,000 inhabitants	222	13.6
City with 21,000-50,000 inhabitants	343	21.0
City with 51,000-100,000 inhabitants	245	15.0
City with 101,000-200,000 inhabitants	125	7.7
City with 201,000-500,000 inhabitants	122	7.5
City over 500,000 inhabitants	125	7.7
Average monthly gross income (per capita in household)*		
<1,000 zł	185	11.3
1,000-1,999 zł	437	26.8
2,000- 2,999 zł	363	22.2
3,000-3,999 zł	219	13.4
4,000-4,999 zł	107	6.6
5,000-5,999 zł	57	3.5
≥6,000 zł	81	5.0

* The percentages for average monthly gross income (per capita in household) do not total 100% due to possible data deficiencies and lack of responses.

Source: own study.

Of those who were physically active, over 70% engaged in a vigorous physical activity (leading to a highly increased heart rate and breathing). Only one in four respondents performed a moderate physical activity (24.4%) or walking (25.5%). In general, vigorous physical activity, which was declared more often than moderate physical activity or walking, underlay the leisure physical activity amongst Polish males (69.8%) and females (70.7%).

Interestingly, this mostly affected respondents having a primary education (70.9%), those employed by the armed forces (75%), and those who were unemployed (73.2%). However, it should be mentioned that the differences in this respect were not statistically significant when gender, age, place of residence, gross income, and occupation were taken into consideration.

Walking (whether related to work, involved with shopping, part of getting to work, or leisure walking) was declared by subjects aged 25-39 years (27.6%). In contrast, subjects aged 15-24 years rarely declared walking as their leisure physical activity (22.8%). There were industrial laborers and craftsmen on the one side of the spectrum, of which only 18.5% chose to walk in their leisure time. On the other side were CEOs, administration managers and officials (33.3%), employees of the armed forces (33.3%), and professional athletes (33.3%). They declared this particular activity more often. However, these differences were not statistically significant. Interestingly, the results show that Polish respondents with primary education declared taking up walking as their physical activity more often than those with higher or secondary education (31.5%, 28.1%, and 21.8%, respectively). These differences were found to be significant ($\chi^2=15.7$, $p<0.001$).

Table 2. The fraction of Polish population aged 15-69 years (n=1633) declaring participation in leisure physical activity

Variables	Leisure PA			No PA
	Vigorous PA	Moderate PA	Walking	
Sex				
Male	69.8	26.4	25.2	21.7
Female	70.7	22.4	25.7	21.2
Age				
15-24 years	71.7	24.5	22.8	22.2
25-39 years	68.9	25.1	27.6	23.2
40-54 years	72.3	25.2	23.1	18.2
55-69 years	68.7	22.4	27.3	22.1
Education				
Primary	70.9	27.2	31.5 ^b	20.1
Secondary	70.6	23.1	21.8	22.3
Higher	68.2	24.1	28.1	20.6
Place of residence				
Village	70.8	23.3	24.2	21.4
City up to 20,000 inhabitants	68.9	25.0	23.6	23.9
City with 21,000-50,000 inhabitants	71.7	23.6	23.7	20.8
City with 51,000-100,000 inhabitants	68.7	26.6	24.7	21.6
City with 101,000-200,000 inhabitants	72.0	25.6	35.2	17.6
City with 201,000-500,000 inhabitants	66.9	23.0	23.1	24.2
City over 500,000 inhabitants	71.0	24.8	32.3	20.3
Occupation				
CEOs, officials, and administrative managers	71.7	28.3	33.3	18.3
Professionals and freelancers	71.3	26.3	30.9	17.7
Technicians and other middle-level staff	66.2	23.0	26.9	28.8
Office clerks	69.7	27.4	23.7	19.7
Personal care and sales assistants	71.3	24.0	26.8	20.7
Farmers, gardeners, foresters, and fishermen	60.0	14.3	24.2	30.0
Industrial workers and craftsmen	72.2	24.2	18.5	21.6
Heavy equipment operators and fitters	71.1	28.1	27.3	19.0
Support staff (seasonal farmers, cleaners, security guards)	67.6	21.1	25.0	25.2
Armed forces employees	75.0	30.2	33.3	16.7
Professional athletes	50.0	33.3	33.3	16.7
Unemployed	73.2	22.7	22.4	20.6
Average monthly gross income (per capita in household)				
<1,000 zł	67.9	20.5	23.5	23.1
1,000-1,999 zł	72.5	21.8	22.8	19.5
2,000- 2,999 zł	65.2	24.9	25.2	26.6
3,000-3,999 zł	73.6	23.7	30.1	18.5
4,000-4,999 zł	72.9	35.2	29.8	17.3
5,000-5,999 zł	68.4	24.6	17.5	26.3
≥6,000 zł	75.0	38.3 ^c	34.6	15.0
Total	70.2^a	24.4	25.5	21.5

Statistically significant differences were found for: ^a vigorous physical activity vs moderate physical activity and walking ($p<0.05$); ^b primary education vs secondary education ($p<0.001$); ^c average monthly gross income $\geq 6,000$ zł vs all remaining income ranges ($p<0.01$).

Source: own study.

Moderate physical activity (leading to a slight increase in breathing and a higher heart rate) was declared significantly more often ($\chi^2=19.1$, $p<0.01$) by those on monthly gross income $\geq 6,000$ zł (38.3%). The average leisure moderate physical activity among Polish respondents (MET-min/week) was 223 ± 652.9

and, as with walking (128.7 ± 352.4), was relatively lower than the average vigorous physical activity ($1,571.3 \pm 2,394.1$) (Table 3).

Table 3. Means, standard deviations (SD), and medians of Polish population's leisure physical activity (MET-min/week)

PA	Leisure PA (MET-min./week)					
	Male		Female		Total	
	Mean $\pm$ SD	Median	Mean $\pm$ SD	Median	Mean $\pm$ SD	Median
Vigorous	1,474.2 $\pm$ 2,281.4	720.0	1,665.2 $\pm$ 2,496.1	960.0	1,571.3 $\pm$ 2,394.1	800.0
Moderate	240.1 $\pm$ 701.2	0	206.5 $\pm$ 602.7	0	223.0 $\pm$ 652.9	0
Walking	124.4 $\pm$ 355.0	0	132.8 $\pm$ 350.0	0	128.7 $\pm$ 352.4	0

Source: own study.

The average leisure physical activity (MET-min/week) was $1,916.9 \pm 2,621$, with a median of 1,017 (see Table 4). The comparison of current results and European research findings demonstrated that the median physical activity (MET-min/week) for the Polish population was similar to the median of Czech subjects (990 for males and 1,081 for females) (Sigmund et al., 2009) and Norwegian males (Graff-Iversen et al., 2007) and nearly three times higher than Croats over 15 years of age (360) (Jurakić et al., 2009).

Table 4. Means, standard deviations (SD), and medians of Europeans' leisure physical activity MET-min/week

Variables	Weekly leisure PA	
	Mean ($\pm$ SD)	Median
Poland 2012 (n=1,633; aged 15-69)		
Male	1,816.6 (2528.6)	960.0
Female	2,013.5 (2705.1)	1,065.0
Total	1,916.9 (2621.0)	1,017.0
Greece 2004 (n=300; aged 20-50)		
Male	20-29 years	216.4 (240.6)
	30-39 years	74.1 (148.1)
	40-50 years	113.0 (137.0)
Female	20-29 years	228.0 (257.6)
	30-39 years	132.0 (126.2)
	40-50 years	136.2 (153.6)
Norway 2000 (n=2,274; 31-67 years old)		
Male	≥ 12 years of education	1,230
	< 12 years of education	891
Female	≥ 12 years of education	1,389
	< 12 years of education	1,024
Croatia 2007 (n=1,032; > 15 years old)		
Male		360
Female		360
Total		360
Czech Republic 2004-2005 (n=3,377)		
Male		990
Female		1,081
Sweden 2002-2005 (n=704; 18-65 years old)		
Female		714
Finland 2002-2005 (n=865; 18-65 years old)		
Female		792

Source: own study based on Μακαβέλου et al., 2005; Graff-Iversen et al., 2007; Jurakić et al., 2009; Sigmund et al., 2009; Södergren et al., 2010.

Similarly, the average leisure physical activity of Polish respondents (MET-min/week) aged 20-50 years was 13 times higher than Greeks (Μακαβέλου et al., 2005).

The median of all physical activities undertaken by Polish females (MET-min/week) was lower (1,065) than the median of educated Norwegian females (over 12 years of education, 1,389) (Graff-Iversen et al., 2007) but much higher than Swedish females (714) or Finns (792) (Södergren et al., 2010).

A similar pattern was observed for males: the median for Polish males was 960, whereas Norwegians with more than 12 years of education had a median of 1,230 and those with less than 12 years of education 891 (Graff-Iversen et al., 2007).

Discussion

Increasing the amount of physical activity undertaken by European citizens is challenging for the public health sector across the EU. Promoting a healthy lifestyle requires effective strategies that encourage participation in various forms of physical activity. Furthermore, there is a need for continuous monitoring and analysis of this phenomenon.

The current investigation regarding the Polish population shows that close attention should be given to specific occupational groups (i.e., farmers, gardeners, foresters, and fishermen) that show a very low level of leisure physical activity (30%). Polish respondents with gross income in the range of 2,000-2,999 zł and those educated to the secondary level show a similar percentage of physical activity (26.6% and 22.3%, respectively). This is consistent with the fact that leisure physical activity is rarely undertaken by those who do physical work (Salmon et al., 2000; Marquez et al., 2010) or those educated to the lower level (Jones et al., 1998) and with lower income (Burton & Turrel, 2000).

Given that the lack of physical activity (sedentary lifestyle) is one of the main factors putting people at a higher risk for developing cardiovascular disease and other chronic disorders, it is necessary to educate the most inactive population groups by stressing the importance of active, healthy lifestyles. These groups should be made aware of the need for physical activity in their leisure time as well as the intensity levels at which these activities should be performed. The intensity of a physical activity affects physiological outcome of that activity and is crucial for health and safety. It is suggested to undertake a moderate physical activity (≥ 150 min/week) (Drygas & Jegier, 2009) with the possibility of replacing it with a vigorous activity (≥ 75 min/week) or a combination of a moderate and vigorous activity (WHO, 2010). It should be pointed out that among Polish respondents who declared leisure physical activity, over 70% stated that they were engaged in a vigorous physical activity; only one in four declared moderate physical activity (24.4%) or walking (25.5%). Additionally, no significant differences were found in this respect when the age of subjects was taken into consideration. This might be due to limited knowledge of the training methods of the subjects or that the findings were affected by issues with the IPAQ's use in Poland (for example, misunderstanding the term "intensity"). It supports the statement put forward by the authors of Polish version of IPAQ: the practice of respondents completing the surveys (and CATI) independently may result in errors (such as overestimation of energy expenditure) (Biernat et al., 2008).

As current findings show, a relatively high percentage (nearly 80%) of active Polish population is striking when compared with British (43.85%, aged 35.3 ± 10.4 years) or Dutch (48.5%, aged 32.7 ± 10.9 years) (Rosenberg et al., 2008). This is even more shocking, considering that British and Dutch are perceived as very active nations. Perhaps these highly positive results are biased towards young people (the age range of Polish subjects was 15-69 years of age). It would be incorrect to assume that such a high proportion of active Polish people is due to misunderstanding the survey's questions.

However, research shows that the average and median leisure physical activity of Polish respondents (MET-min/week) is comparable with the results of other European citizens. The median value (MET-min/week) for Polish males and females (960 and 1,065, respectively), for instance, were nearly the same as Czech males and females (990 and 1,081, respectively) and only slightly lower than the medians of

Norwegians educated to a degree level (1,230 for males and 1,389 for females with over 12 years of education and 891 for males and 1,024 for females with less than 12 years of education) (Graff-Iversen et al., 2007). It is not surprising that the Polish population is characterized by lower levels of leisure physical activity than the Scandinavian population. According to Martinez-Gonzalez et al. (2001), northern Europeans are considered to be much more physically active than those people living in southern Europe. In light of these findings, it should not come as a surprise that the average leisure physical activity (MET-min/week) of Polish citizens ($1,916.9 \pm 2,621$) is much higher than Greeks aged 20-50 years (Μακαβέλου et al., 2005). Similarly, the median in Poland is 1,017, which is higher than the median of Croats above 15 years of age (360) (Jurakić et al., 2009). However, it is puzzling that the median leisure physical activity for Polish females (MET-min/week) is higher than Swedish (714) or Finns (792) (Södergren et al., 2010). This may be a result of the majority of Polish women (70.7%) declaring vigorous leisure physical activity, which in turn may have influenced the overall energy expenditure score.

The detailed analysis of individual types of physical activity shows that the average leisure walking MET-min/week for Polish respondents is much lower (128.7 ± 352.4 , of which the average for males was 124.4 ± 355 and females 132.8 ± 350) than Czech respondents ($1,727.5$, of which the average for males was 1,692 and females 1,763) (Sigmund et al., 2009). The Polish respondents' median equals zero, meaning that at least half of the subjects walk no more than 10 minutes in general, whereas Swedish people aged 20-65 years walk 60 minutes per day (198 MET-min/week) (Sundquist et al., 2011) and Norwegian men (depending on the level of education): 2,520 (12 years of education or more) and 3,323 MET-min/week (less than 12 years of education) (Graff-Iversen et al., 2007). Depending on level of education, the median walking for Norwegian women (MET-min/week) was 3,450 and 3,561, respectively.

The Polish respondents' average moderate leisure physical activity (MET-min/week) is close to that of Belgians aged 20-65 years (Van Dyck et al., 2011). It is 223 ± 652.9 for the Polish population and 36.1 ± 95.9 minutes per day for a Belgian group (144.4 MET-min/week). When considering Europe's younger population, there is a difference between south and north of the continent: Polish respondents aged 25-39 years undertake more physical activities of moderate intensity (196.4 ± 509.3 MET-min/week) compared to Portuguese of the same age (31 ± 84 MET-min/day, which gives 124 MET-min/week) but less when compared with the same age group in Belgium (64 ± 132 MET-min/day, which gives roughly 256 MET-min/week) (De Bourdeaudhuij et al., 2005).

The largest discrepancy was observed in vigorous physical activity: the average value for Polish subjects was $1,571.3 \pm 2,394.1$ MET-min/week ($1,474.2 \pm 2,281.4$ for males and $1,665.2 \pm 2,496.1$ for females), whereas Belgians showed an average of 58.1 ± 123.6 (464.8 MET-min/week) (Van Dyck et al., 2011).

Conclusions

1. Insufficient participation in the conscious process of caring for one's own health is a common occurrence amongst adults living in the EU. Sadly, this problem particularly challenges individuals who work physically, have lower levels of education, and a lower gross income. In Poland, these are mainly farmers, gardeners, foresters, and fishermen. Additionally, this group consists of people with monthly gross income of 2,000-2,999 zł and those educated to a secondary school level.
2. In order to encourage the Polish population to participate in physical activities, it is necessary to raise their awareness of a need of well-balanced, regular exercise. Knowledge of the intensity levels of undertaken physical activity should be an integral part of our healthy lifestyle.
3. The outcome of the current study shows that using CATI (Computer-Assisted Telephone Interview) is not error free. Exclusion of 132 participants who declared over 16 hours of physical activity per day is one of the difficulties encountered when using this questionnaire. As telephone surveys in Poland are neither particularly popular yet nor widely used, there are issues with delivering a questionnaire this way. First, the respondents are easily disheartened because the interview process is fairly long. Second, they often lack a full understanding of the content of the questionnaire, which may lead to

overestimations or underestimations. It appears that delivering surveys via phone requires much stricter and controlled training of the staff in terms of face-to-face technique, explaining questions, and consistency in asking the questions.

Acknowledgement

The project was funded by the Ministry of Sport and Tourism of the Republic of Poland.

REFERENCES

- Biernat, E. (2011). *Aktywność fizyczna mieszkańców Warszawy na przykładzie wybranych grup zawodowych /Physical activity of Warsaw's population, based on selected occupational groups/*. Warszawa: Szkoła Główna Handlowa, Urząd m. st. Warszawy. Biuro Sportu i Rekreacji.
- Biernat, E. (2013). International Physical Activity Questionnaire – Polish long version. *Polish Journal of Sports Medicine*, 29(1), 1-15.
- Biernat, E., Stupnicki, R., Gajewski, A.K. (2007). Międzynarodowy Kwestionariusz Aktywności Fizycznej (IPAQ) – wersja polska. *Phys Educ Sport*, 51(1), 47-54.
- Biernat, E., Stupnicki, R., Lebieźniński, B., Janczewska, L. (2008). Assessment of physical activity by IPAQ questionnaire. *Physical Education and Sport*, 52(2), 83-89.
- Burton, N.W., Turrel, B. (2000). Occupation, hours worked, and leisure time physical activity. *Prev Med.*, 3, 673–81.
- De Bourdeaudhuij, I., Teixeira, P.J., Cardon, G., Deforche, B. (2005). Environmental and psychosocial correlates of physical activity in Portuguese and Belgian adults. *Public Health Nutrition*, 8(07), 886-895.
- Drygas, W., Jegier, A., Bednarek-Gejo, A., Kostka, T. (2005). Long-term effects of various physical activity levels in preventing obesity and metabolic syndrome in middle-aged men. *Eur J Cardiovasc Prev Rehab*, 12, 283.
- Gajewski, A.K., Biernat, E. (2010). Zastosowanie Międzynarodowego Kwestionariusza Aktywności Fizycznej (IPAQ) – za i przeciw, czyli kilka rozważań metodycznych i ich konsekwencje /Pros and cons of the International Physical Activity Questionnaire (IPAQ) use: Methodical issues and their implications/. In K. Buśko, J. Charzewska, K. Kaczanowski (Eds.), *Współczesne metody badań aktywności, sprawności i wydolności fizycznej człowieka /Current methods of investigating physical activity, fitness and endurance/*. Warszawa: AWF Warszawa.
- Graff-Iversen, S., Anderssen, S.A., Holme, I.M., Jenum, A.K., Raastad, T. (2007). An adapted version of the long International Physical Activity Questionnaire (IPAQ-L): construct validity in a low-income, multiethnic population study from Oslo, Norway. *International Journal of Behavioral Nutrition and Physical Activity*, 4, 13.
- Jones, D.A., Ainsworth, B.E., Croft, J.B., Macera, C.A., Lloyd, E.E., Yusuf, H.R. (1998). Moderate Leisure-Time Physical Activity. *Arch Fam Med*, 7(3), 285–289.
- Jurakić, D., Pedišić, Ž., Andrijašević M. (2009). Physical Activity of Croatian Population: Cross-sectional Study Using International Physical Activity Questionnaire. *Croatian Medical Journal*, 50(2), 165-173.
- Μακαβέλου, Π., Μιχαλοπούλου, Μ., Μακαβέλου, Μ., Υφαντίδου, Γ., Κουρτέσης, Θ. & Ζέτου, Ε. (2005). Επιδράσεις Ηλικίας και Φύλου στη Φυσική Δραστηριότητα Ενηλίκων στην Ελλάδα /Effects of Age and Gender in Physical Activity of Adults in Greece/. *Inquiries in Sport & Physical Education*, 3(2), 176-186.
- Marquez, D.X., Neighbors, C.J., Bustamante, E.E. (2010). Leisure time and occupational physical activity among racial or ethnic minorities. *Med Sci Sports Exerc*, 42, 1086-93.
- Martinez-Gonzalez, M.A., Varo, J.J., Santos, J.L., De Irala, J., Gibney, M., Kearney, J., Martinez, J.A. (2001). Prevalence of physical activity during leisure time in the European Union. *Med Sci Sports Exerc*, 33, 1142-6.
- Piątkowska, M. (2012). Self-rated physical activity across Europe - Poland and other European countries. *Biol Sport*, 29(1), 23-31. DOI: 10.5604/20831862.979848.
- Rosenberg, D.E., Bull, F.C., Marshall, A.L., Sallis, J.F., Bauman, A.E. (2008). Assessment of Sedentary Behavior With the International Physical Activity Questionnaire. *Journal of Physical Activity & Health*, 5(supp 1), 30-44.
- Salmon, J., Owen, N., Bauman, A., Schmitz, M.K., Booth, M. (2000). Leisure time, occupational, and household physical activity among professional, skilled, and less-skilled workers and homemakers. *Prev Med*, 30, 191-199.
- Sidney, S., Jacobs, Jr. D.R., Haskell, W.L., Armstrong, M.A., Dimicco, A., Oberman, A., Savage, P.J., Slattery, M.L., Sternfeld, B., Van Horn, L. (1991). Comparison of two methods of assessing physical activity in coronary artery risk development in young adults (CARDIA) study. *American Journal of Epidemiology*, 133, 1231-1245.
- Sigmund, E., Sigmundová, D., Mitáš, J., Chmelík, F., Vašíčková, J., Frömel, K. (2009). Variability of selected indicators of physical activity in a randomized sample of the Czech population between the years 2003–2006: results

from the short and long self-administered format of the IPAQ questionnaire. *Acta Univ. Palacki. Olomuc. Gymn.*, 39(2), 23-31.

Södergren, M., Sundquist, K., Johansson, S.E., Sundquist, J., Hagströmer, M. (2010). Associations Between Health-Enhancing Physical Activity and Country of Birth Among Women. *Journal of Physical Activity & Health*, 7(5), 613-621.

Sundquist, K., Eriksson, U., Kawakami, N., Skog, L., Ohlsson, H., Arvidsson, D. (2011). Neighborhood walkability, physical activity, and walking behavior: The Swedish Neighborhood and Physical Activity (SNAP) study, *Social Science & Medicine*, 72, 1266-1273.

Toczek-Werner, S., Sołtysik, M. (1997). Aktualny stan badań nad czasem wolnym mieszkańców dużych miast polskich /The current state of research on leisure time of residents in large Polish cities /. In J. Wyrzykowski (Ed.), *Koncepcja badań nad czasem wolnym mieszkańców Wrocławia i jego wykorzystaniem na rekreację i turystykę. Materiały seminaryjne /The research protocol on Wrocław's population's leisure time and the use of Wrocław's recreation and tourist potential. Seminar material/*. Wrocław: AWF.

Van Dyck, D., Cardon, G., Deforche, B., Giles-Corti, B., Sallis, J.F. Owen, N., De Bourdeaudhuij, I. (2011). Environmental and Psychosocial Correlates of Accelerometer-Assessed and Self-Reported Physical Activity in Belgian Adults. *Int. J. Behav. Med.*, 18, 235-245.

Internet sources:

Drygas, W., Jegier, A. (2009). *Zalecenia dotyczące aktywności ruchowej w profilaktyce chorób układu krążenia /Physical activity recommendations for cardiovascular disease prevention/*. Retrieved 22.12.2012 from http://www.umed.lodz.pl/geriatria/pdf/Zalecenia_dotyczace_aktywnosci_ruchowej_w_profilaktyce_chorob_ukladu_krazenia.pdf

European Commission (2004). *Special Eurobarometer 213/62.0. The citizens of the European Union and Sport*. Retrieved 22.12.2012 from http://ec.europa.eu/public_opinion/archives/ebs/ebs_213_summ_en.pdf

European Commission (2010). *Special Eurobarometer 334/72.3. Sport and Physical Activity*. Retrieved 22.12.2012 from http://ec.europa.eu/public_opinion/archives/ebs/ebs_334_en.pdf

Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ) – Short and Long Forms (2005). Retrieved 22.12.2012 from www.ipaq.ki.se

International Physical Activity Questionnaire. Retrieved 22.12.2012 from www.ipaq.ki.se

O aktywności fizycznej Polaków. Komunikat z badań /Polish population physical activity. Research broadcast/(2003). Warszawa: CBOS. Retrieved 22.12.2012 http://www.cbos.pl/SPISKOM.POL/2003/K_023_03.PDF

Physical Activity and Health: a Report of the Surgeon General. (1996). Atlanta, Georgia: US Department of Health and Human Services; Retrieved 22.12.2012 from <http://www.cdc.gov/nccdphp/sgr/pdf/execsumm.pdf>

The European Social Survey. Retrieved 22.12.2012 from www.ess.nsd.uib.no

WHO (2010) *Global Recommendations on Physical activity for Health*. Retrieved 22.12.2012 from http://whqlibdoc.who.int/publications/2010/9789241599979_eng.pdf

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