

## PHYSICAL ACTIVITY OF KATOWICE URBAN AREA INHABITANTS WITH REGARD TO SELECTED PHYSICAL TRAITS AND SOCIAL FACTORS

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### ABSTRACT

**Background.** Modern research of health determinants and health-related behavior patterns places a particular emphasis on the assessment of physical activity levels in various social and professional groups. The deficit of physical activity has become a common cause of serious diseases. Following the ecological model of health behavior, physical activity as a biological and cultural phenomenon can be indirectly modified by such interpersonal factors as age, sex, somatic traits and education.

**Objectives.** The aim of the present study was the identification and assessment of habitual physical activity of adult inhabitants from the Katowice Urban Area with regard to selected physical traits and social determinants.

**Material and methods.** The study was carried out in the Katowice Urban Area in May and June, 2012-2014. The research material comprised 2,173 inhabitants, including 1,017 women and 1,156 men, aged 30 to 65 years. The respondents' habitual physical activity was assessed with the use of the International Physical Activity Questionnaire - Short Version (IPAQ-SF). The obtained data on the respondents' physical activity were compared with the American College of Sports Medicine (ACSM) recommendations

**Results.** The results of the study showed that the frequency and duration of high-intensity physical activity and duration of moderate-intensity physical activity were significantly greater in the male inhabitants. The age was also a significant factor affecting the levels of high-intensity physical activity in men. Body build was not a significant determinant of the frequency and duration of physical activity in both men and women from Katowice. The education level only affected the level of physical activity in men. Sex, age, and education of the respondents were statistically significant determinants of their level of fulfilment of the ACSM recommendations.

**Conclusions.** Propagation of physical activity among adults and the elderly, and women in particular, remains a continuing challenge facing health promotion professionals.

**Key words:** physical activity, urban population, physical traits, social status.

### STRESZCZENIE

**Wprowadzenie.** W badaniach uwarunkowań zdrowia i zachowań zdrowotnych współczesnych pokoleń, szczególnego znaczenia nabiera ocena aktywności fizycznej różnych grup społeczno-zawodowych. Niedobór wysiłków fizycznych jest bowiem coraz powszechniej przyczyną groźnych schorzeń. Zgodnie z modelem ekologicznym aktywność fizyczna jako zjawisko nie tylko biologiczne, lecz także kulturowe może być w sposób pośredni modyfikowane m.in. przez takie czynniki intrapersonalne, jak: wiek, płeć, cechy somatyczne, czy wykształcenie.

**Cel.** Celem pracy jest diagnoza i ocena parametrów nawykowej aktywności fizycznej osób dorosłych zamieszkujących aglomerację katowicką w świetle wybranych czynników somatycznych i społecznych.

**Material i metody.** W badaniach ankietowych przeprowadzonych na terenie aglomeracji katowickiej w latach 2012-2014 roku wzięły udział 2173 osoby, w tym 1017 kobiet i 1156 mężczyzn, w wieku od 30 do 65 lat. Do oceny nawykowej aktywności fizycznej wykorzystano kwestionariusz International Physical Activity Questionnaire Short Version (IPAQ-SF). Uzyskane informacje o aktywności fizycznej badanych pozwoliły na ich konfrontację z kryteriami zalecanymi dla uzyskania korzyści zdrowotnych przez ekspertów ACSM.

**Wyniki.** W badaniach wykazano u badanych znamienne różnicowanie płciowe w częstości i czasie trwania aktywności fizycznej o wysokiej intensywności oraz czasie trwania wysiłków umiarkowanych, na korzyść mężczyzn. Dostrzeżono również, że wiek znamienne różnicował częstość podejmowania wysiłków fizycznych o wysokiej intensywności przez

badanych mężczyzn. Wśród badanych mieszkańców aglomeracji katowickiej, parametry budowy somatycznej nie determinowały istotnie w obu grupach płci częstości oraz czasu trwania aktywności fizycznej. Wykształcenie okazało się czynnikiem modyfikującym poziom aktywności fizycznej wyłącznie u przedstawicieli płci męskiej. Płeć, wiek oraz poziom wykształcenia ankietowanych katowiczian znamienne determinowały także stopień wypełnienia przez nich zaleceń ACSM. **Wnioski.** Popularyzowanie aktywności fizycznej wśród osób dorosłych i starszych, szczególnie kobiet jest stale aktualnym wyzwaniem dla specjalistów promujących zdrowie.

**Słowa kluczowe:** *aktywność fizyczna, środowisko wielkomiejskie, cechy somatyczne, status społeczny*

## INTRODUCTION

Modern research of health determinants and health-related behavior patterns places a particular emphasis on the assessment of physical activity levels in various social and professional groups. The deficit of physical activity has become a common cause of serious diseases of the circulatory, respiratory and locomotive systems as well as metabolic diseases and cancer, which lead to the majority of premature deaths in adults [4, 28-30, 33, 42, 45, 48].

Regular and properly adjusted physical activity is one of the most recommended and desired human behaviors. An important aspect of health-related activities is their diagnosis both in individuals [6] and in populations [2, 7, 37]. Reliable evaluation of physical activity parameters is methodologically complex. One of the best measures is the assessment of energy expenditure associated with physical exercise [26, 40]; however, objective measurements of energy expenditure are possible only in laboratory conditions or with the use of expensive portable spirometers or multi-function and multi-sensory measuring devices, i.e. accelerometers [15].

In epidemiological studies one of the most commonly used methods of physical activity assessment is the diagnostic questionnaire survey, and one of the most popular questionnaire instruments worldwide is the International Physical Activity Questionnaire (IPAQ) [3, 21]. Its accuracy and reliability of measurements of caloric cost of physical activity, heart rate, or total number of steps per day, have been confirmed by numerous authors [9, 17, 22]. The studies using the IPAQ were far more accurate regarding the assessment of low- and moderate-intensity exercise, since researchers noted respondents' tendency to overestimate the declared amount of physical activity of high intensity, in particular [30, 32, 47].

IPAQ-based studies in Poland have been mostly conducted on particular professional groups comprising relatively small numbers of respondents [1, 29-30, 32]. Some exceptions include representative studies on sixteen professional groups from Warsaw [2] and on working-age populations from Wrocław [37].

No diagnostic surveys regarding the physical activity of regional populations, including representative urban

areas, have been carried out in Poland, nevertheless authors have indicated the significant role of place of residence as a predictor of physical activity levels [11, 20, 25, 44].

The Upper Silesia Province of Poland is a geographical, cultural and industrial region of Poland with its own identifiable characteristics and the dynamically developing administrative center of the Katowice Urban Area. In 2017 the local and regional authorities granted Katowice the status of a metropolitan area, which is now inhabited by about 2.5 million inhabitants.

Following the ecological model of health behavior developed by Sallis et al. [41] physical activity, being a biological and cultural phenomenon, can be indirectly modified by such interpersonal factors as age, sex, somatic traits and education. Researchers have rarely considered the impact of all these factors together, and rather focused on identifying biological [12, 13, 16] or cultural [5, 36, 38] correlates of physical activity, separately.

The aim of this study was the identification and assessment of parameters of the habitual physical activity of adult inhabitants from the Katowice Urban Area with regard to selected physical traits and social determinants.

## MATERIAL AND METHODS

The study was carried out in the Katowice Urban Area in May and June, 2012-2014. The research material comprised 2,173 inhabitants, including 1,017 women and 1,156 men, aged 30 to 65 years. The average age of the respondents was 42.3 years. All participants were informed about the aim and the course of the study and gave their written consent to participate.

The respondents' habitual physical activity was assessed using the International Physical Activity Questionnaire - Short Version (IPAQ-SF) [21]. It contains items regarding the frequency and duration of inhabitants' physical activity in three intensity ranges: vigorous physical activity (VPA=8.0 METs), moderate physical activity (MPA=4.0 METs), and light physical activity (LPA=3.3 METs) at work, while getting from place to place, as part of house and yard work, and in one's leisure time during a typical week.

The obtained data on the respondents' physical activity were compared with the American College of Sports Medicine (ACSM) recommendations [14, 33] which stipulate that health-enhancing physical activity must consist of either:

1. Vigorous-intensity aerobic physical activity for a minimum of 20 min on three days each week; or
2. Moderate-intensity aerobic physical activity for a minimum of 30 min on five days each week.

Individuals fulfilling one of the above criteria are regarded as meeting the recommendation of health-related physical activity.

Research data also included information on respondents' education, body height and body mass. The calculation of BMI allowed a categorization of respondents into normal (healthy weight), overweight, and obese.

The statistical analysis involved the calculation of arithmetic means ( $\bar{x}$ ), standard deviations (s), medians (Me), 25<sup>th</sup> and 75<sup>th</sup> centiles, and minimum (min) and

maximum (max) values. The differences in results between men and women were checked with the *Mann-Whitney U* test and *Kruskal-Wallis* test. The level of fulfillment of health-related PA recommendations with regard to respondents' sex, age, physical traits, and education was checked with the chi-squared test. The level of statistical significance was set *ex ante* at  $p < 0.05$ . All statistical calculations were made using the Statistica 9.1 software package (StatSoft).

## RESULTS

The mean ages of studied female and male respondents were similar ( $p=0.272$ ). Sex differences in physical traits of the Katowice Urban Area inhabitants were found. The men had a greater body height and body mass ( $p<0.001$ ) than the women. They also featured significantly higher BMI values ( $26.2\pm 3.2$  kg/m<sup>2</sup>) than the women ( $24.8\pm 3.6$  kg/m<sup>2</sup>) (Table 1).

Table 1. Differences in age and physical characteristics of men and women under study

Sex	Age [years]		Body height [cm]		Body mass [kg]		BMI [kg/m <sup>2</sup> ]	
	$\bar{x} \pm s$	p	$\bar{x} \pm s$	p	$\bar{x} \pm s$	p	$\bar{x} \pm s$	p
Women	42.4±8.5	0.272	166.3±6.3	<0.001*	64.0±9.8	<0.001*	23.1±3.3	<0.001*
Men	42.1±8.9		178.7±6.7		83.7±11.2		26.2±3.2	
Total	42.3±8.7		172.9±9.0		74.5±14.4		24.8±3.6	

\* $p < 0.05$

The respondents revealed statistically significant inter-sex differences in their level of physical activity. The men undertook high-intensity physical activities

more often, and the duration of their high- and moderate-intensity exercises was longer than in the female respondents ( $p<0.001$ ) (Table 2).

Table 2. Differences in physical activity frequency and duration of physical activity in men and women under study

Sex	HPA [days/week]		MPA [days/week]		HPA [min/day]		MPA [min/day]	
	$\bar{x} \pm s$	p	$\bar{x} \pm s$	p	$\bar{x} \pm s$	p	$\bar{x} \pm s$	p
Women	2.4±1.4	<0.001*	3.3±1.7	0.334	59.5±31.2	<0.001*	80.6±41.5	<0.001*
Men	3.0±1.7		3.4±1.7		80.3±42.0		94.0±48.3	
Total	2.8±1.6		3.4±1.7		71.7±39.3		87.8±45.7	

\* $p<0.05$ ; HPA [days/week] – high-intensity physical activity frequency; MPA [days/week] – moderate-intensity physical activity frequency; HPA [min/day] – high-intensity physical activity duration; MPA [min/day] – moderate-intensity physical activity duration.

Figure 1 shows differences in the frequency of undertaken physical activity with regard to the respondents' age. The results indicate that age was only a significant determinant of the frequency of high-intensity exercises undertaken by the male respondents ( $H=7.87$ ,  $p=0.019$ ). Those aged 30 to 49 years engaged in high-intensity PA significantly more

often than respondents aged 50 to 65 years. The mean frequency of high-intensity and moderate-intensity physical activity undertaken by female respondents, and the frequency of moderate-intensity PA by male respondents did not differ significantly between age categories (Figure 1).

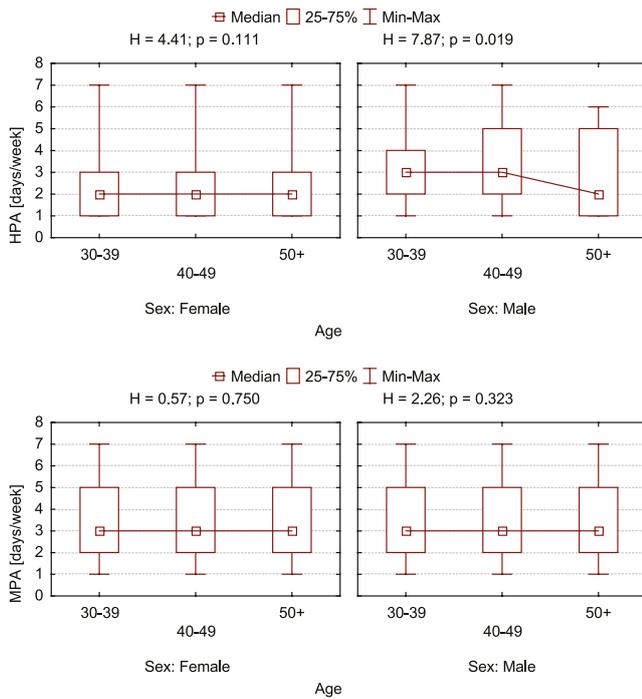


Figure 1. Differences in frequency of high-intensity physical activity (HPA) and moderate-intensity physical activity (MPA) with regard to the age of men and women under study

The duration of high-intensity physical activity of male Katowice inhabitants ( $H=7.72$ ;  $p=0.021$ ) was shown to decrease significantly with age. However, age was not a significant determinant of the duration of high- and moderate-intensity physical activity in women and of moderate-intensity physical activity in men (Figure 2).

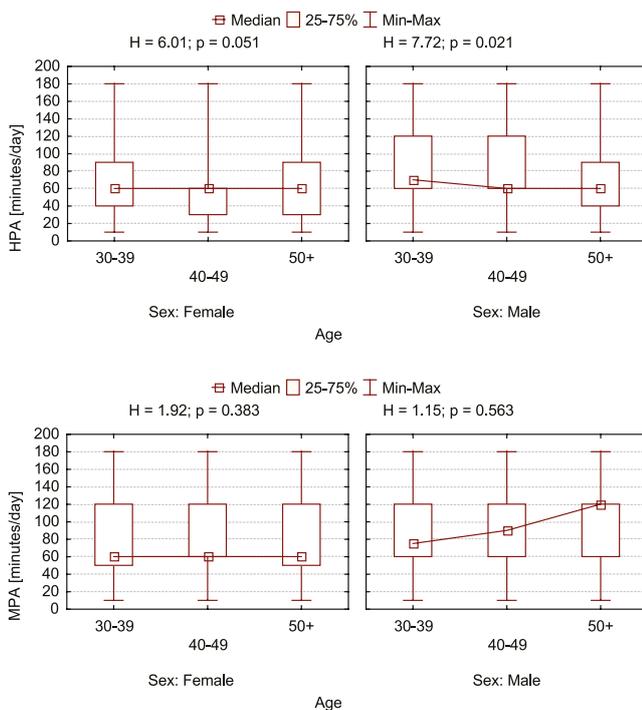


Figure 2. Differences in duration of high-intensity physical activity (HPA) and moderate-intensity physical activity (MPA) with regard to the age of men and women under study.

Body weight was not a factor that significantly affected the frequency and duration of physical activity at different levels of intensity in respondents from Katowice (Figures 3, 4).

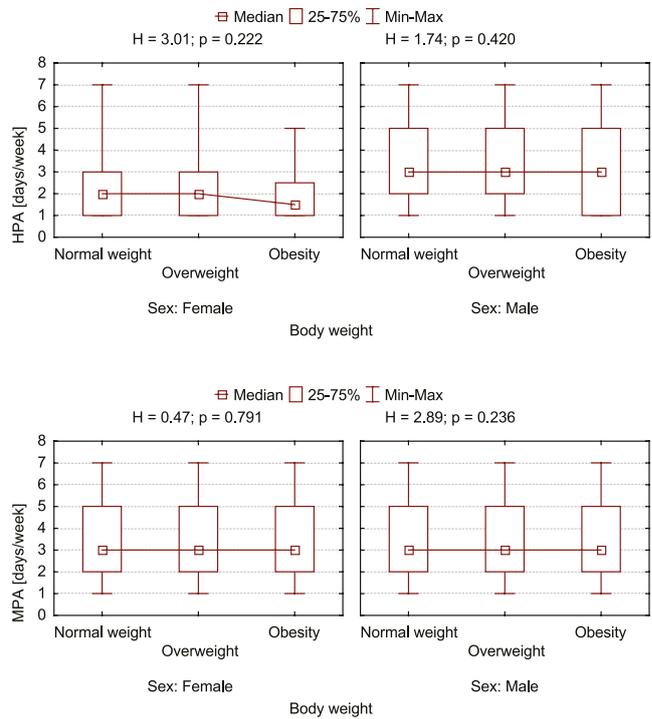


Figure 3. Differences in frequency of high-intensity physical activity (HPA) and moderate-intensity physical activity (MPA) with regard to the body weight of men and women under study.

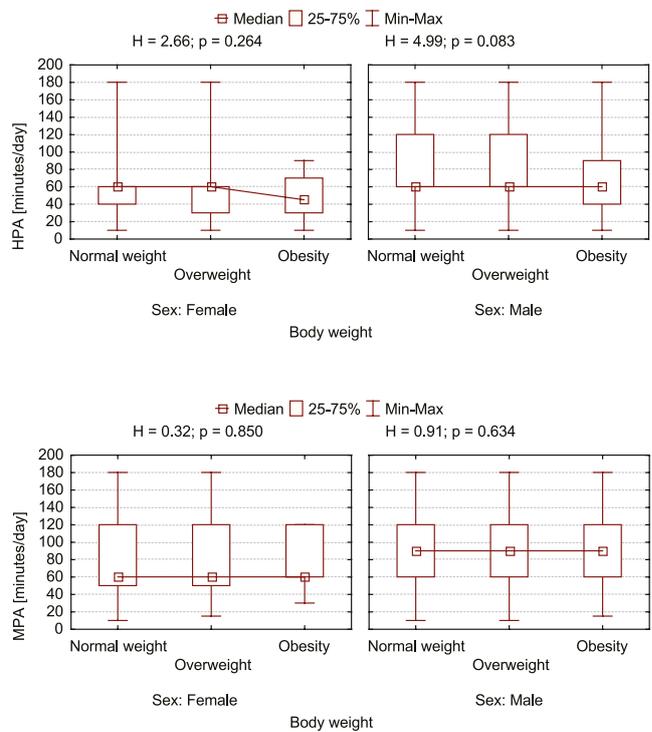


Figure 4. Differences in duration of high-intensity physical activity (HPA) and moderate-intensity physical activity (MPA) with regard to the body weight of men and women under study.

Education turned out to be a significant determinant of the level of physical activity only in male Katowice inhabitants. The mean frequency and duration of high- and moderate-intensity physical activity were significantly higher ( $p < 0.001$ ) in men with a primary and basic vocational education, than in men with a secondary and university education (Figures 5, 6).

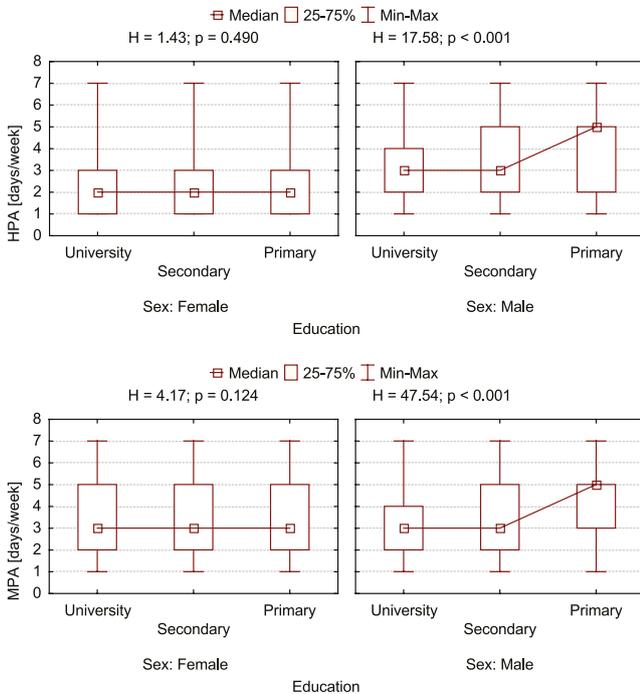


Figure 5. Differences in frequency of high-intensity physical activity (HPA) and moderate-intensity physical activity (MPA) with regard to the education level of men and women under study.

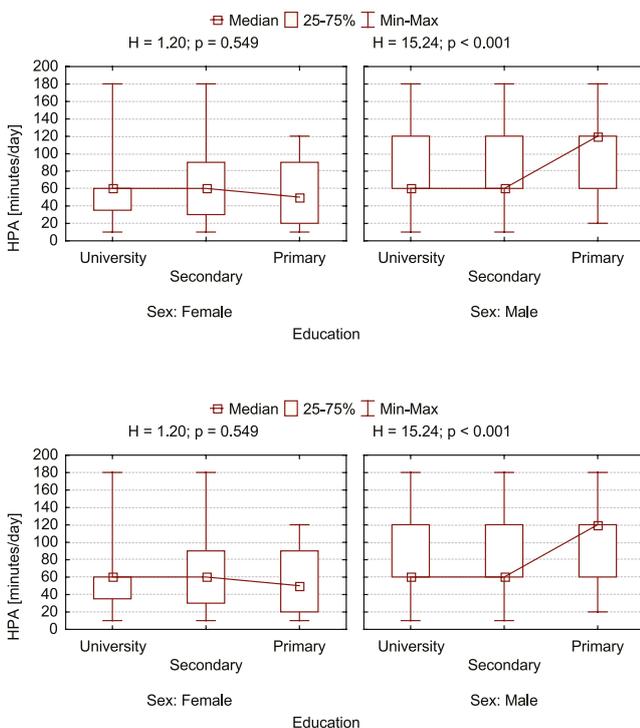


Figure 6. Differences in duration of high-intensity physical activity (HPA) and moderate-intensity physical activity (MPA) with regard to the education level of men and women under study.

The data on the frequency and duration of Katowice inhabitants' habitual physical activity were then used to calculate the percentage of respondents meeting the recommendations for health-related physical activity published by the American College of Sports Medicine (Table 3). Sex, age, and education were significant determinants of the levels of fulfilment of ACSM recommendations by the Katowice Urban Area inhabitants. Significantly more Katowice men (50%) than women (34%) met the ACSM recommendations for health-enhancing physical activity ( $\chi^2 = 57.58$ ;  $p < 0.001$ ). The highest percentage of respondents meeting the recommendations (46%) were found among the inhabitants aged 30 to 39 years. In the age group of 40 to 49 years, the ACSM recommendations were met by 43%, and in the oldest group under study – 34% ( $\chi^2 = 18.80$ ;  $p < 0.001$ ). A significantly higher percent (56%) of respondents engaged in health-enhancing physical activity were found among Katowice inhabitants with a primary and basic vocational education, than with a secondary education (45%) and higher education (37%) ( $\chi^2 = 23.04$ ;  $p < 0.001$ ). The body build measures were not significant determinants of the level of fulfilment of ACSM recommendations in the respondents under study ( $\chi^2 = 3.55$ ;  $p < 0.169$ ).

Table 3. Meeting ACSM recommendations and respondents' sex, age, body weight, and education

Category	ACSM recommendations				$\chi^2$	p
	yes		no			
	n	%	n	%		
<b>Sex</b>						
Women	342	33.6	675	66.4	57.58	<0.001*
Men	575	49.7	581	50.3		
<b>Age [years]</b>						
30-39	415	46.2	484	53.8	18.80	<0.001*
40-49	338	42.6	455	57.4		
50+	164	34.1	317	65.9		
<b>Body weight</b>						
Normal	489	41.5	689	58.5	3.55	0.169
Overweight	372	44.2	470	55.8		
Obese	56	36.6	97	63.4		
<b>Education</b>						
University	368	37.3	618	62.7	23.04	<0.001*
Secondary	478	45.1	582	54.9		
Primary	71	55.9	56	44.1		

\* $p < 0.05$

## DISCUSSION

The study assessed the levels of habitual physical activity of men and women from the Katowice Urban Area aged 30 to 65 years, in view of recommendations for health-related physical activity published by the American College of Sports Medicine [14, 33].

The results of the study showed that the frequency and duration of high-intensity physical activity and duration of moderate-intensity physical activity were significantly greater in male Katowice inhabitants. Age was a significant factor affecting the levels of PA only in men as well. These observations correspond to earlier study results on age and sex as significant correlates of physical activity levels in studied populations. The dominance of the male sex over the female sex and the young over the older with regard to the duration and frequency of physical activity had been also confirmed in some earlier research [9, 20, 39, 46].

Results of earlier studies had also indicated correlations between physical activity and body build. A higher level of physical activity was shown to be positively correlated with normal body weight, but not with overweight [10, 12, 13, 16, 19, 43]. Such correlations, however, were not found among the respondents from the Katowice Urban Area.

Numerous authors have also pointed out the significant impact of social factors on the level of physical activity [2, 3, 8, 18, 20, 22, 31, 34, 36-39]. The duration of habitual physical activity was usually shown to increase with the level of education [11, 36-37]. In the present study an opposite trend was noted. It can be most likely associated with the fact that respondents with a primary or basic vocational education usually performed physical work, often of high intensity. A relatively high level of physical activity among manual workers had been found before by *Puciato et al.* [39]. It should be noted that some researchers had also found negative correlations between education level and physical activity [2, 39].

The present study regarded mainly the subject of fulfilment of health-related physical activity parameters by studied men and women. In fact, one-third of female respondents and one-half of male respondents from the Katowice Urban Area met the physical activity recommendations by the American College of Sports Medicine.

These results correspond with results of earlier studies, e.g. the National Multicenter Health Survey in Poland program indicated that the levels of physical activity of 50-60% of Poles was not sufficient [7]. Another study of physical activity levels in various European countries showed that only 6-8% Poles were sufficiently physically active [11]. Research on top-level managers revealed that the most recent WHO and ACSM physical activity recommendations were only fulfilled by 27% of respondents [32]. The results of the present study regarding meeting the ACSM recommendations are very similar. We are, however, fully aware that the present study assessed only reported physical activity levels, which can be

overestimated by respondents [1, 3, 9, 17, 22, 27, 30, 35, 47]. The respondents' actual physical activity levels could be, therefore, lower.

The significance of the results of the present study indicates the necessity of their further practical application. The prospective research area must be wider and the research process more in-depth. Future studies should also cover populations of children and adolescents as well as senior citizens. They should also be extended to other regions of Poland and employ tools measuring physical activity levels in leisure time, at work, while getting from place to place, and at home. Studies by *Jurakic et al.* [22], *Katz et al.* [23], and *Knuth et al.* [24] indicate that the physical activity levels in all these areas of modern life can be diverse.

## CONCLUSIONS

1. The physical activity levels of studied men were higher than in women, especially in high-intensity exercises.
2. The level of physical activity undertaken by the Katowice men can be considered satisfactory as 50% of them met the health-enhancing physical activity recommendations developed by the American College of Sports Medicine.
3. The highest percentage of respondents meeting the health-related physical activity recommendations was noted in the age group of 30-39 years, among inhabitants with a primary and basic vocational education.
4. Propagation of physical activity among adults and the elderly, and among women in particular, remains a continuing challenge facing health promotion professionals.

### Conflict of interest

*The authors declare no conflict of interest.*

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