

Socio-Economic Determinants of Physical Activity of Non-Manual Workers, Including the Early Senior Group, from the City of Wrocław in Poland

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Abstract—Physical activity as a part of people's everyday life reduces the risk of many diseases, including those induced by lifestyle, e.g. obesity, type 2 diabetes, osteoporosis, coronary heart disease, degenerative arthritis, and certain types of cancer. That refers particularly to professionally active people, including the early senior group working on non-manual positions. The aim of the study is to evaluate the relationship between physical activity and the socio-economic status of non-manual workers from Wrocław—one of the biggest cities in Poland, a model setting for such investigations in this part of Europe. The crucial problem in the research is to find out the percentage of respondents who meet the health-related recommendations of the World Health Organization (WHO) concerning the volume, frequency, and intensity of physical activity, as well as to establish if the most important socio-economic factors, such as gender, age, education, marital status, per capita income, savings and debt, determine the compliance with the WHO physical activity recommendations. During the research, conducted in 2013, 1,170 people (611 women and 559 men) aged 21–60 years were examined. A diagnostic poll method was applied to collect the data. Physical activity was measured with the use of the short form of the International Physical Activity Questionnaire with extended socio-demographic questions, i.e. concerning gender, age, education, marital status, income, savings or debts. To evaluate the relationship between physical activity and selected socio-economic factors, logistic regression was used (odds ratio statistics). Statistical inference was conducted on the adopted ex ante probability level of $p < 0.05$. The majority of respondents met the volume of physical effort recommended for health benefits. It was particularly noticeable in the case of the examined men. The probability of compliance with the WHO physical activity recommendations was highest for workers aged 21–30 years with secondary or higher education who were single, received highest incomes and had savings. The results indicate the relations between physical activity and socio-economic status in

the examined women and men. People with lower socio-economic status (e.g. manual workers) are physically active primarily at work, whereas those better educated and wealthier implement physical effort primarily in their leisure time. Among the investigated subjects, the youngest group of non-manual workers have the best chances to meet the WHO standards of physical activity. The study also confirms that secondary education has a positive effect on the public awareness on the role of physical activity in human life. In general, the analysis of the research indicates that there is a relationship between physical activity and some socio-economic factors of the respondents, such as gender, age, education, marital status, income per capita, and the possession of savings. Although the obtained results cannot be applied for the general population, they show some important trends that will be verified in subsequent studies conducted by the authors of the paper.

Keywords—International physical activity questionnaire, non-manual workers, physical activity, socio-economic factors, WHO.

I. INTRODUCTION

PHYSICAL activity, which is nowadays usually performed during work, home duties, moving from one place to another, and in leisure time, plays an important role in the prevention and treatment of diseases in professionally active people [1]–[5]. The implementation of appropriately programmed physical exercises helps reduce the risk of many diseases, including lifestyle-induced ones, e.g. obesity, type 2 diabetes, osteoporosis, coronary heart disease, degenerative arthritis, and certain types of cancer [6]–[12]. Improving the health of people in productive age contributes to reducing the very high costs of treating of the diseases, reducing disease or rehabilitation benefits, improving the economic efficiency of enterprises owing to an increase in labor productivity, extending occupational activity by maintaining psychomotor performance at the level required to perform work [13], [14].

Particularly noteworthy, in the authors' opinion, are so-called white-collar workers, i.e. non-manual workers. As a result of limited physical activity at work, central nervous system overload, and usually heavy and continuous stress, they are at risk not only of lifestyle diseases but also of lower back pain, burnout, and depression [15]–[20].

The low physical activity of non-manual workers at work may, however, be compensated by the implementation of physical effort in other areas of life, especially in their leisure time. The socio-economic status of this occupational group, and, consequently, its cultural capital, are generally on a high level, which, as indicated by results of empirical studies, is

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associated with a greater awareness of the health-enhancing role of movement in human life and greater opportunities for financing various forms of physical activity [13], [21]. It should be noted, however, that the positive effect of physical activity on human welfare is associated with its appropriate volume, frequency, and intensity [4], [6], [7], [22]. WHO recommends implementing 150 minutes of moderate intensity or 75 minutes of high intensity physical activity per week as a means to maintain or improve health. This kind of physical effort should also be accumulated in a minimum 10-minute time intervals [23]. It can therefore happen that people who do not arrange for sufficient physical effort in their leisure time cannot compensate the shortages in other areas of life and do not achieve the desired health effects [12], [17], [24].

A review of the literature shows that there are significant intermediate relationships between physical activity and variables such as age, sex, education, marital status, and income level [25]–[27]. Generally, it can be said that people from lower socio-economic groups implement higher physical activity mostly at work, at home or while travelling to and from work [22], whereas those better educated and wealthier—during their leisure time [13].

Despite the existence of many papers on socio-economic determinants of physical activity [1], [8], [13], [21], [25]–[28], the problem is still not fully recognized. This applies particularly to non-manual workers, representing the core of the middle class forming in Poland, which plays a key socio-economic role in developed countries. It should also be noted that the group of white-collar workers is quite differentiated, and characterized by a multidirectional impact of socio-economic status on physical activity. This refers particularly to economic factors such as income per capita, owned savings or debts. These are less often described in the literature than social factors, but owing to the impoverishment of some groups of intellectuals and the growing indebtedness of Polish households, their impact on physical activity may be slightly different than in other countries.

In the context of the outlined introductory remarks, the authors aimed at assessing the relationship between Wrocław non-manual workers' physical activity and socio-economic status. The research questions are as follows:

1. What percentage of respondents meets the health-related recommendations of the WHO concerning the volume, frequency, and intensity of physical activity?
2. Do such socio-economic factors as gender, age, education, marital status, per capita income, savings, and debt determine the compliance with the WHO physical activity recommendations?

II. MATERIAL AND METHODS

The study was conducted in November 2013 in Wrocław, the capital of Lower Silesia. It involved a group of non-manual workers which included the following professions and specialties listed in the Polish official labor market classification [29]: (1) parliamentarians, senior managers, and clerks; (2) specialists; (3) technicians and associate professionals; and (4) office workers. The study involved

1,170 people (611 women and 559 men) aged 21–60 years, comprising about 1% of non-manual workers living in Wrocław. The quota sampling method was applied: (1) control population characteristics were defined: gender, age, and groups (quotas) of elements of the population corresponding to the structure of the population of Wrocław; (2) the established quotas were divided among interviewers. The interviewers were third year students of the Wrocław WSB University, trained to conduct the research questionnaire in direct contact with respondents. Detailed characteristics of respondents with selected socio-economic variables are presented in Table I.

TABLE I
SOCIO-ECONOMIC CHARACTERISTICS OF THE EXAMINED GROUP

Variables	n	%
Sex		
Women	611	52.2
Men	559	47.8
Age (years)		
21–30	320	27.4
31–40	296	25.3
41–50	288	24.6
51–60	266	22.7
Education		
Basic vocational	50	4.3
Secondary	777	66.4
Graduate degree	343	29.3
Marital status		
Single	493	42.1
Married	677	57.9
Per capita income (USD)		
≤322	329	28.1
323–484	382	32.7
485–645	239	20.4
>645	220	18.8
Savings		
No	476	40.7
Yes	694	59.3
Debts		
No	811	69.3
Yes	359	30.7

To evaluate the physical activity habits of non-manual workers from Wrocław, the diagnostic poll method was applied with an auditorium survey technique. The research tool was the International Physical Activity Questionnaire (IPAQ), short version, containing six questions about the respondents' physical activity in their typical week of life [30]. The tool is widely used in population-based studies [1], [7], [12], [18], [26] because it is characterized by a relatively high reliability, and its use is much cheaper than the use of tools directly measuring physical activity [1], [13], [30]. Owing to the very high costs and only slightly higher reliability as compared with indirect measurement tools, direct measurement instruments are rarely used to assess physical activity in large representative groups. The physical activity studied included physical efforts executed at work, at home,

and in the environment, while moving from place to place, and in leisure time. The study analyzed the respondents' self-assessment of the frequency and duration of physical effort in two intensity levels: high and moderate. The information collected allowed to compare the parameters of physical activity declared by white-collar workers from Wrocław with the values recommended by WHO [23]. In the paper, respondents who fulfilled at least one of the criteria described in the introduction were considered meeting the health recommendations (WHO Yes). Respondents who did not meet any of the specified criteria were considered performing physical activity below the health benefit recommendations (WHO No).

In the study, information was also obtained about selected socio-economic factors, i.e. gender (male, female), age (21–30, 31–40, 41–50, 51–60 years), education (vocational, secondary, higher), marital status (single, married), monthly income per household (up to 322 USD, 323–484 USD, 485–645 USD, more than 645 USD), having savings (yes, no) and debts (yes, no).

Logistic regression (odds ratio statistics) allowed to evaluate the relationship between physical activity and chosen socio-economic factors. Statistical inference was employed with the adopted *ex ante* $p < 0.05$ probability level. Calculations were made using the IBM SPSS Statistics 20 computer software.

III. RESULTS

The analysis of the study results indicates that in most respondents (67.4% women and 82.3% men) the level of physical activity is sufficient to achieve health benefits (Table II). However, the obtained odds ratio indicates that the probability of meeting the WHO recommendations was more than twice as high in the surveyed men compared with women (OR [95% CI], 2.24; 1.66–3.02).

Comparing the percentages of people who meet the guidelines for frequency and duration of physical activity in separate age groups, one can notice that among 21–30-year-old respondents, the WHO recommendations are met by the largest share (74.4%) of individuals, among 41–50-year-olds the share is slightly smaller (70.5%), being the smallest in the 51–60-year-olds (65.0%) and in 31–40-year-olds (60.5%). The group that was least likely to achieve a health-beneficial level of physical activity were 31–40-year-olds (OR, 0.52; 0.34–0.79) and 51–60-year-olds (OR, 0.64; 0.38–1.09) in comparison with a benchmark category of 21–30-year-olds (Table II).

A detailed analysis of the relationship between physical activity and education reveals that 74.0% of respondents with secondary education, 69.4% with higher education, and 68.0% with vocational education declare the implementation of a level of physical effort that may be health-beneficial. The chances of meeting healthy physical activity standards in relation to the reference group—people with vocational education—were as follows: inhabitants of Wrocław with secondary education: OR, 1.34; 0.72–2.48, inhabitants with higher education: OR, 1.07; 0.56–2.02 (Table II).

Considering the marital status, it should be noted that more often the WHO recommendations were met by single white-collar workers from Wrocław (75.1%) in comparison with married ones (66.8%). The chance to implement sufficient, in the context of health, physical activity in the latter group was therefore about one-third less (OR, 0.67; 0.51–0.88) than in the reference group of the unmarried (Table II).

Among the respondents from Wrocław, the probability of meeting the WHO requirements concerning physical activity increased with better financial situation. The highest percentage of workers who meet the WHO guidelines was noted in the group with earnings per person over 645 USD (75.5%), then 485–645 USD (74.1%), and 323–484 USD (72.8%), whereas the smallest (68.7%) among those whose incomes were the lowest—up to 322 USD. The chances for the implementation of health-beneficial physical activity were also more than 1.5 times higher among people with savings compared with those without savings (OR, 1.54; 1.19–1.99). Also, the debtors less frequently filled the WHO standards (OR, 0.78; 0.59–1.02) than those of the control group, with no debts. The latter relationship, however, was not statistically significant (Table II).

IV. DISCUSSION

The ability to perform work at the appropriate level depends to a large extent on the worker's psychophysical condition. Physical activity is essential for maintenance or improvement of this ability, and, besides the diet, is the most important part of healthy lifestyle. Implementation of physical effort brings benefits not only to somatic but also to mental health. This is particularly important in the context of high intensity in today's work environment, such negative phenomena as the widespread "rat race", growing the percentage of workers with burnout syndrome or not coping with stress. It should also be remembered that the welfare of employees associated with their adequate involvement in professional duties results in the effectiveness and development perspectives of the employing companies and institutions, and consequently, of the entire national economy.

It should be recognized as a positive phenomenon that the majority of non-manual workers surveyed in Wrocław declared the implementation of sufficient physical activity, beneficial for health. Despite a possible slight overestimation of the results obtained due to the applied research tool, this corresponds, in the authors' opinion, to the growing popularity of an active lifestyle currently observed in Poland. This phenomenon applies particularly to people of higher socio-economic status, for whom various, sometimes quite original forms of physical activity are a part of modern lifestyle. Mass participation in an increasing number of sport and recreation events, balanced diet, and taking care of the body are important for the health of contemporary Poles. It should be remembered, however, that this kind of fashion can be short-term and temporary. In addition, performing too strenuous physical exercise by people who had not been physically active before may expose them to the risk of injury. This fashion does not apply to children, who usually prefer passive

leisure activities, such as computer games or Web surfing. activity when growing up are highest. This can be very harmful because the needs for physical

TABLE II
THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND SOCIO-ECONOMIC FACTORS AMONG RESPONDENTS

Variables	WHO				OR	CI		p
	Yes		No			-95%	95%	
	n	%	n	%				
Sex								p<0.05
Women	412	67.4	199	32.6	1.00	-	-	
Men	460	82.3	99	17.7	2.24	1.66	3.02	
Age (years)								p<0.05
21-30	238	74.4	82	25.6	1.00	-	-	
31-40	179	60.5	117	39.5	0.52	0.34	0.79	
41-50	203	70.5	85	29.5	0.82	0.49	1.36	
51-60	173	65.0	93	35.0	0.64	0.38	1.09	
Education								p<0.05
Basic vocational	34	68.0	16	32.0	1.00	-	-	
Secondary	575	74.0	202	26.0	1.34	0.72	2.48	
Graduate degree	238	69.4	105	30.6	1.07	0.56	2.02	
Marital status								p<0.05
Single	370	75.1	123	24.9	1.00	-	-	
Married	452	66.8	225	33.2	0.67	0.51	0.88	
Per capita income (USD)								p<0.05
≤322	278	72.8	104	27.2	1.00	-	-	
323-484	226	68.7	103	31.3	0.82	0.59	1.14	
485-645	177	74.1	62	25.9	1.07	0.74	1.54	
>645	166	75.5	54	24.5	1.15	0.79	1.68	
Savings								p<0.05
No	320	67.2	156	32.8	1.00	-	-	
Yes	527	75.9	167	24.1	1.54	1.19	1.99	
Debts								p>0.05
No	600	74.0	211	26.0	1.00	-	-	
Yes	247	68.8	112	31.2	0.78	0.59	1.02	

CI = confidence interval, OR = odds ratio, p = values of Wald test.

The study participants carry out physical effort mainly in their spare time, and sometimes also at home or in the garden. In fact, such activities are an increasingly popular hobby of the middle class. Some people also choose using public transport, which is usually associated with a necessity to walk certain distances on foot. This can be more often observed in large, rapidly developing urban areas, such as Wrocław. As already mentioned, other empirical research confirms the assumption that lower socio-economic status is frequently bound with physical activity at work (e.g. in manual workers), and better education and wealth imply channeling physical effort primarily in leisure time [13], [17].

The observation that a higher percentage of people who meet the standards of physical activity are among men than among women is confirmed by other studies [10], [13], [18], [21]. Despite the progressive emancipation of women, one of the reasons may be the fact that women generally perform most household duties and more often, as compared with men, take care of children. Their resources of free time that could be spent on physical activity are therefore quite limited. Women also usually perform more sophisticated physical activities than men, which is associated with higher expenses

for classes, transportation, clothing, and sports equipment. Paradoxically, some women for whom the main aim of physical activity is to improve their figures do not undertake physical exercises because of their unsatisfactory appearance. They postpone the time of undertaking physical activity until they obtain a better figure, e.g. by applying different types of diets. This relates especially to such forms of physical activity as swimming, aerobics, strength training, and dancing.

Interesting observations refer to the relations of physical activity and age in non-manual workers. The best chances to meet the WHO standards are bound with the age of the youngest group of respondents (21-30 years), and the smallest chances—with the age of 31-40 years. In the group of 31-40-year-olds, the percentage of people who undertake enough physical effort is the lowest. It is probably due to the fact that people at this age are very much involved in their work. They are usually in the prime of their careers, they already have a lot of experience, they often occupy attractive positions or have real promotion opportunities. Their financial needs are also high because they have to ensure financial security for their families with preschool or school children, to repay consumer loans and mortgages, or save for retirement. With

many family obligations, this can limit the amount of their free time and consequent possibilities for active time.

The results of the study confirm that secondary education has a positive effect on public awareness on the role of physical activity in human life. Other authors also reported higher levels of physical activity in groups of better educated people [1], [2], [5], [27]. It should be noted, however, that owing to the nature of the group (white-collar workers) its structure by the level of education was fairly homogeneous. Among the respondents, there were definitely more people with secondary and higher education than those with vocational education. However, in this case, probably even people with vocational education, by doing non-manual work, have suitably high intellectual and cultural capital to be aware of healthy lifestyle importance.

Larger chances to meet the standards of physical activity were also noticed among people who declared their marital status as single. Similar associations were noted by Choi et al. [5], and Schneider and Becker [9]. The reasons for this phenomenon are probably behavioral and cultural. Unmarried people tend to have fewer household responsibilities and do not have to take care of children and thus their free time resources are bigger. In addition, people living alone often prefer individualistic philosophy of life, caring deeply about their welfare and development, also in the physical sphere. It should be emphasized that these results should be considered with caution, as in postmodern societies, including the Polish one, the number of people living in informal relationships increases. Some respondents declaring to remain unmarried (having no husband or wife) may in fact live in informal relationships, whose impact on the quality of human life is similar to marriage.

An important research problem, not very often discussed in Polish studies, is the associations of physical activity with economic factors. This applies in particular to such financial categories as the size of per capita income, savings and debts possession. The study reported positive correlations between the level of physical activity and these variables. The chance to meet the WHO standards increases in line with the income per household. This corresponds with the results of studies carried out in other countries [5], [8], [25]. Also, having savings or lack of debts increased the probability of undertaking physical effort which can positively affect health. It is very important that the purchasing power, and thus the possibility of satisfying the household needs, is influenced by income and various types of savings, benefits, social assistance and financial help from other people, inheritances, and donations on one hand, and by the limiting impact of alimony, repayments of loans and credits on the other. A broader look at the respondents' financial situation allowed to conclude that it affected lifestyle, including physical activity implementation. As already mentioned, more and more forms of physical activity are paid for and associated with arrival needs, purchases of equipment and sports facilities. Such expenses are usually financed from the so-called free consumption fund, the money that remains after all necessary expenses related to meeting existential needs, i.e. buying food

and clothes and paying for housing and transport. Economic sciences also document a law according to which, together with outrunning certain thresholds of human wealth (income), man prefers to receive more time off than extra working hours (overtime). Wealthy people can spend this free time on different forms of physical activity.

Summing up the results of the research, it can be observed that the examined non-manual workers from Wroclaw are characterized by relatively high physical activity. However, owing to the limited spatial and temporal scope of the research, as well as the applied research tool, this observation cannot be applied to any general population—it must be treated as an optimistic trend rather. Extending the scope of the research to include other Polish cities and regions would be advisable, but it is also necessary to analyze the physical activity of other social groups, such as collar workers, entrepreneurs, students, pensioners, residents of small towns and villages or the unemployed. However, after analyzing the results of the research, one can reasonably conclude that special protection, with reference to stimulating physical activity, should be addressed to the groups of the lowest socio-economic status, at risk of poverty and social exclusion. Various physical activity and health promotion programs should be addressed to these groups, being co-financed not only from public funds but also from EU aid funds—especially as one of the main development objectives for the current programing period is the problem of equal opportunities and social inclusion.

V. CONCLUSIONS

1. The majority of the non-manual workers from Wroclaw implement a level of physical activity, which according to WHO, has a positive effect on health. This phenomenon was particularly pronounced with regard to male citizens of Wroclaw.
2. The study allows to come up to a conclusion that the respondents' physical activity pattern is related to some socio-economic factors, such as gender, age, education, marital status, income per capita, and the possession of savings.
3. The obtained results cannot be referred to the general population, but they reveal some trends that will be verified in subsequent studies conducted by the authors of the paper.

REFERENCES

- [1] E. Biernat, and P. Tomaszewski, "Socio-demographic and leisure activity determinants of physical activity of working Warsaw residents aged 60 to 69 years," *J. Hum. Kinet.*, vol. 30(4), pp. 173–181, 2011, <http://dx.doi.org/10.2478/v10078-011-0085-y>.
- [2] A. da Silva Garcez, R. Canuto, V. M. Vieira Paniz, B. Anselmo Olinto, J. Macagnan, *et al.*, "Association between work shift and the practice of physical activity among workers of a poultry processing plant in Southern Brazil," *Nutr. Hosp.*, vol. 31(5), pp. 2174–2181, 2015, <http://dx.doi.org/10.3305/nh.2015.31.5.8628>.
- [3] S. Mansi, S. Milosavljevic, S. Tumilty, P. Hendrick, and G. Baxter, "Use of pedometer-driven walking to promote physical activity and improve health-related quality of life among meat processing workers: a feasibility trial," *Health and Quality of Life Outcomes*, vol. 11, p. 185, 2013, <http://dx.doi.org/10.1186/1477-7525-11-185>.

- [4] K. Roessler, R. Rugulies, R. Bilberg, L. Andersen, M. Zebis, *et al.*, "Does work-site physical activity improve self-reported psychosocial workplace factors and job satisfaction? A randomized controlled intervention study," *Int. Arch. Occup. Environ. Health*, vol. 86, pp. 861–864, 2013, <http://dx.doi.org/10.1007/s00420-012-0823-z>.
- [5] B. Choi, P. Schnall, H. Yang, M. Dobson, P. Landsbergis, *et al.*, "Psychosocial working conditions and active leisure-time physical activity in middle-aged US workers," *Int. J. Occup. Med. Environ. Health*, vol. 23(3), pp. 239–253, 2010, <http://dx.doi.org/10.2478/v10001-010-0029-0>.
- [6] A. Holtermann, O. Mortensen, and H. Burr, "The interplay between physical activity at work and during leisure time-risk of ischemic heart disease and all-cause mortality in middle-aged Caucasian men," *Scand. J. Work Environ. Health*, vol. 35(6), pp. 466–474, 2009, <http://dx.doi.org/10.5271/sjweh.1357>.
- [7] A. Nawrocka, W. Mynarski, A. Powerska, M. Grabara, D. Groffik, *et al.*, "Health-oriented physical activity in prevention of musculoskeletal disorders among young Polish musicians," *Int. J. Occup. Med. Environ. Health*, vol. 27(1), pp. 28–37, 2014, <http://dx.doi.org/10.2478/s13382-014-0224-5>.
- [8] N. Sherwood, and R. Jeffery, "The behavioral determinants of exercise: implications for physical activity interventions," *Annu. Rev. Nutr.*, vol. 20, pp. 21–44, 2000.
- [9] S. Schneider, and S. Becker, "Prevalence of physical activity among the working population and correlation with work-related factors. Results from the first German National Health Survey," *J. Occup. Health*, vol. 47, pp. 414–423, 2005.
- [10] N. Heron, F. Kee, M. Cupples, and M. Tully, "Correlates of sport participation in adults with long-standing illness or disability," *BMJ Open Sport & Exercise Medicine*, 1:e000003, 2015, <http://dx.doi.org/10.1136/bmjsem-2015-000003>.
- [11] K. Martin, D. Kuh, T. Harris, J. Guralnik, D. Coggon, *et al.*, "Body mass index, occupational activity, and leisure-time physical activity: an exploration of risk factors and modifiers for knee osteoarthritis in the 1946 British birth cohort," *BMC Musculoskelet. Disord.*, vol. 14, p. 219, 2013, <http://dx.doi.org/10.1186/1471-2474-14-219>.
- [12] W. Mynarski, M. Grabara, A. Nawrocka, M. Nistrój-Jaworska, B. Wołkowycka, *et al.*, "Rekreacyjna aktywność fizyczna i dolegliwości mięśniowo-szkieletowe pielęgniarek," *Med. Pr.*, vol. 65(2), pp. 181–188, 2014, <http://dx.doi.org/10.13075/mp.5893.2014.018>.
- [13] D. Puciato, M. Rozpara, W. Mynarski, A. Łoś, and B. Królikowska, "Aktywność fizyczna dorosłych mieszkańców Katowic w aspekcie ich statusu zawodowego oraz wybranych cech społeczno-ekonomicznych," *Med. Pr.*, vol. 64(5), pp. 649–657, 2013, <http://dx.doi.org/10.13075/mp.5893.2013.0064>.
- [14] D. Puciato, "Socio-economic conditions of physical activity of manual workers from Wrocław," *Appl. Econ. Lett.*, 2015, <http://dx.doi.org/10.1080/13504851.2015.1111983>.
- [15] G. Kayihan, "Relationship between daily physical activity level and low back pain in young female desk-job workers," *Int. J. Occup. Med. Environ. Health*, vol. 27(5), pp. 863–870, <http://dx.doi.org/10.2478/s13382-014-0315-3>.
- [16] C. Chan, D. Ryan, and C. Tudor-Locke, "Health benefits of a pedometer-based physical activity intervention in sedentary workers," *Prev. Med.*, vol. 39, pp. 1215–1222, 2004, <http://dx.doi.org/10.1016/j.ypmed.2004.04.053>.
- [17] A. Nawrocka, A. Prończuk, W. Mynarski, and W. Garbaciak, "Aktywność fizyczna menedżerów wyższych szczebli zarządzania w kontekście zaleceń prozdrowotnych," *Med. Pr.*, vol. 63(3), pp. 271–279, 2012.
- [18] A. Kouvonen, M. Kivim, M. Elovainio, M. Virtanen, A. Linna, *et al.*, "Job strain and leisure-time physical activity in female and male public sector employees," *Prev. Med.*, vol. 41, pp. 532–539, 2005, <http://dx.doi.org/10.1016/j.ypmed.2005.01.004>.
- [19] E. B. Josephson, N. D. Caputo, S. Pedraza, T. Reynolds, R. Sharifi, *et al.*, "A sedentary job? Measuring the physical activity of emergency medicine residents," *J. Emerg. Med.*, vol. 44(1), pp. 204–208, 2013, <http://dx.doi.org/10.1016/j.jemermed.2012.02.039>.
- [20] R. Elbel, S. Aldana, D. Bloswick, and J. Lyon, "A pilot study evaluating a peer led and professional led physical activity intervention with blue-collar employees," *Work*, vol. 21(3), pp. 199–210, 2003.
- [21] D. Van Dyck, G. Cardon, B. Deforche, and I. De Bourdeaudhuij, "The contribution of former work-related activity levels to predict physical activity and sedentary time during early retirement: moderating role of educational level and physical functioning," *PLoS ONE*, vol. 10(3), 2015, e0122522, <http://dx.doi.org/10.1371/journal.pone.0122522>.
- [22] T. S. Church, D. M. Thomas, C. Tudor-Locke, P. T. Katzmarzyk, C. P. Earnest, *et al.*, "Trends over 5 decades in U.S. occupation-related physical activity and their associations with obesity," *PLoS ONE*, vol. 6(5), 2011, e19657.
- [23] Global recommendations on physical activity for health. WHO, Geneva, <http://www.euro.who.int/en/home> (access: 25 August 2015).
- [24] W. Mynarski, B. Królikowska, M. Rozpara, M. Nawrocka, and D. Puciato, "The caloric cost of practicing martial arts on the background of health recommendation," *Arch. Budo.*, vol. 9(2), pp. 125–132, 2013.
- [25] Y. Fogelman, B. Bloch, and E. Kahan, "Assessment of participation in physical activities and relationship to socioeconomic and health factors. The controversial value of self-perception," *Patient Educ. Couns.*, vol. 53(1), pp. 95–99, 2004.
- [26] D. Jurakić, Ž. Pedišić, and Z. Greblo, "Physical activity in different domains and health-related quality of life: a population-based study," *Qual. Life Res.*, vol. 19, pp. 1303–1309, 2010, <http://dx.doi.org/10.1007/s11136-010-9705-6>.
- [27] X. He, and D. Baker, "Differences in leisure-time, household, and work-related physical activity by race, ethnicity, and education," *J. Gen. Intern. Med.*, vol. 20, pp. 259–266, 2005, <http://dx.doi.org/10.1111/j.1525-1497.2005.40198.x>.
- [28] Z. Ignasiak, T. Sławińska, A. Dąbrowski, and R. Rowiński, "The structure of physical activity in seniors from Lower Silesia," *Rocz. Panstw. Zakł. Hig.*, vol. 64(1), pp. 67–73, 2013.
- [29] Rozporządzenie Ministra Pracy i Polityki Społecznej w sprawie klasyfikacji zawodów i specjalności na potrzeby rynku pracy oraz zakresu jej stosowania, *Journal of Laws*, 2010, No. 82, item 537 (27 April 2010).
- [30] International Physical Activity Questionnaires, <http://www.ipaq.ki.se/ipaq.htm> (access: 25 August 2015).