

THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND WORK ABILITY – A CROSS-SECTIONAL STUDY OF TEACHERS

MAŁGORZATA GRABARA, AGNIESZKA NAWROCKA, and ANETA POWERSKA-DIDKOWSKA

Jerzy Kukuczka Academy of Physical Education in Katowice, Katowice, Poland
Faculty of Health-related Physical Activity, Department of Physical Education

Abstract

Objectives: To assess relationship between physical activity (PA) and perceived work ability amongst teachers from the Upper Silesia, Poland. **Material and Methods:** The study involved 171 teachers (129 women, 42 men) of primary and secondary schools of the Upper Silesia, Poland. Physical education teachers were excluded from the study. The level of PA was estimated using the International Physical Activity Questionnaire short version, and perceived work ability was estimated using Work Ability Index (WAI). **Results:** Male teachers had significantly higher levels of vigorous-intensity PA, moderate-intensity PA, and total weekly PA than female teachers. The recommendations of the World Health Organization (WHO) met 46% of studied women and 74% of men. Work ability did not differ between male and female teachers. Work ability was related to age, body mass index (BMI), and PA (vigorous-intensity PA, moderate-intensity PA, total weekly PA). The female teachers with excellent or good WAI had significantly higher levels of vigorous-intensity PA, moderate-intensity PA and total weekly PA than female teachers with moderate or poor WAI. **Conclusions:** The teachers involving in high or moderate intensity PA could improve their work ability. Further studies should focus on relation between physical activity and work ability among teachers of various age and seniority, from both, urban and rural schools. *Int J Occup Med Environ Health* 2018;31(1)

Key words:

Health behavior, Lifestyle, Health promotion, Occupational health, Work Ability Index, Exercises

INTRODUCTION

Physical activity (PA) is the one of the aspects of lifestyle. The positive effects of PA are well known. Physical activity plays a very important role in primary and secondary prevention of many diseases and disorders, e.g., cardiovascular disease [1], obesity [2], type II diabetes [3], osteoporosis [4], and low back pain [5].

Previous studies proved that with aging, the physical capacity declined [6,7] but the requirements of work usually did not change with the age and years of service.

The practice of regular PA could prevent or delay the decrease of physical capacity associated with aging, and could be effective for workers to meet work requirements. However, participation in sports and physical activities substantially declines with age [8,9]. Taking up a recreational physical activity has a positive effect on a subject's perception of self-reported health related assessment [10].

The teaching profession is characterized by high level of stress and physical complaints, high workload, low collegiality, low job satisfaction, as well as a relatively high

Received: June 16, 2016. Accepted: October 5, 2016.

Corresponding author: M. Grabara, Jerzy Kukuczka Academy of Physical Education in Katowice, Faculty of Health-related Physical Activity, Department of Physical Education, Mikołowska 72a, 40-065 Katowice, Poland (e-mail: m.grabara@awf.katowice.pl).

level of absenteeism and early retirement [11,12]. Physical activity is highly important in this occupational group. The previous study revealed that leisure-time PA of teachers could be positively related to their mental and physical health and job satisfaction [12]. The teachers should also promote healthy lifestyle, especially PA. That role should be handled particularly by teachers of physical education. Those who present physically active lifestyle can better encourage their pupils to PA [13].

The objective of the study has been to assess the level of physical activity and work ability amongst teachers from primary and secondary schools of the Upper Silesia. In particular we would like to investigate if there is a relationship between the level of PA and perceived work ability in the context of work requirements.

MATERIAL AND METHODS

Participants

The study involved 171 teachers aged 24–63 years old, from primary and secondary, randomly selected schools from the cities of the Upper Silesia, Poland. There were 129 women aged 41.2 ± 8.9 years old and 42 men aged 40.1 ± 9 years old, teachers of different specializations, excluding physical education teachers. The mean of body height and body mass was, respectively: for women – 166.9 ± 6.2 cm and 65.8 ± 10.5 kg, for men – 178.7 ± 5.9 cm and 83 ± 11.8 kg. The mean of body mass index (BMI) was 23.6 ± 3.6 for women and 25.98 ± 3.1 for men (range: 18.14–33.3 kg/m²).

Based on BMI cut points, there were 1.6% of women with underweight, 68.2% of women and 45.2% of men with the body weight in norm (BMI: 18.5–24.9 kg/m²), 21.7% of women and of 42.9% men with overweight, 8.5% of obese women and 11.9% of obese men (BMI: 30 kg/m² or more). Years of work of studied teachers were as follow: up to 5 years – 11.6% of women and 19% of men, 5–9 years – 18.6% of women and 14.3% of men, 10–14 years – 12.4% of women and 16.7% men, 15–20 years – 24.8% of women and 26.2% of men, above 20 years – 32.6% of women and 23.8% of men.

Procedures

The International Physical Activity Questionnaire – the short form (IPAQ-SF) was used for assessing teacher's PA levels [14]. The IPAQ was developed as an instrument for cross-national monitoring of PA. The validity and reliability studies of the IPAQ were performed in 12 countries. The validity criterion was demonstrated as $r = 0.33$ for its long version and $r = 0.3$ for the short one [15].

The declared PA was estimated according to IPAQ-SF procedures: 8 metabolic equivalent of task (MET) for vigorous-intensity activity, 4 MET for moderate-intensity activity and 3.3 MET for walking [14]. The level of PA of studied teachers was compared with the recommendations made by the World Health Organization (WHO) [16]. According to those recommendations, adults aged 18–64 years old should do at least 150 min of moderate-intensity aerobic PA throughout the week or do at least 75 min of vigorous-intensity aerobic PA throughout the week or an equivalent combination of moderate- and vigorous-intensity activity [16].

For the assessing perceived work ability of studied teachers, the Work Ability Index (WAI) was applied [17,18]. The WAI is one of the tools used for subjective assessment of work ability. The WAI includes 7 subjective estimations on work ability in the context of job requirements and psychophysical resources, and also includes information about illnesses and work absenteeism. Each of those self-estimations was determined according to different scales arranged in order of importance [17]. The highest score was described to the most beneficial conditions. Work Ability Index (WAI) was computed by summing up estimated points for each estimation. According to the classification for work ability assessment we can distinguish: poor WAI (sum of all items values up to 27 pts), moderate WAI (28–36 pts), good WAI (37–43 pts) and excellent WAI (44–49 pts) [18].

The participants filled in questionnaires in the presence of the interviewer.

Body height was measured with a height rod of medical scale, body weight was defined using an electronic balance. The body mass index was estimated on the basis of body height and weight.

Data analysis

The normality of distribution was verified by the Chi² test. Results of 2 groups were compared with Mann-Whitney U test, and results of 3 groups were compared with Kruskal-Wallis test. The results were assumed to be statistically significant at the level of 5%. Correlations between variables of PA, somatic values, age and results of the

WAI were analyzed by Spearman's rank correlation coefficient. All correlation coefficients were statistically significant at $p < 0.05$. Statistical analyses were performed using Statistica Software version 9 (StatSoft Inc., USA).

RESULTS

The analysis of PA level indicated that male teachers had significant higher vigorous-intensity PA, moderate-intensity PA and total weekly PA than female teachers. There were no significant differences between walking PA (light PA – LPA) (Table 1). The recommendations of the WHO [16] met 46% of female teachers and 74% of male teachers.

Table 1. Physical activity (PA) level among teachers of primary and secondary schools from the Upper Silesia, Poland

Variable (IPAQ-SF)	Physical activity (M±SD)		Mann-Whitney U test	
	women (N = 129)	men (N = 42)	Z	p
VPA				
day/week	1.54±1.40*	2.00±1.24*	-2.15	0.0318
min/day	26.51±25.47*	50.97±39.83*	-3.68	0.0002
MET min/week	447.44±553.75*	955.23±1 176.92*	-3.57	0.0004
MPA				
day/week	2.11±1.82*	2.85±1.68*	-2.58	0.01
min/day	33.99±33.94*	46.09±34.08*	-2.56	0.0105
MET min/week	388.52±600.03*	560.47±717.26*	-2.78	0.0054
LPA				
day/week	4.86±2.19	4.85±1.86	0.43	n.s.
min/day	69.11±73.61	62.61±49.06	-0.16	n.s.
MET min/week	1 270.32±1 669.16	1 057.57±994.49	-0.18	n.s.
WPA [MET min/week]	2 106.28±2 049.81*	2 573.28±2 020.87*	-2.19	0.0283
EE [kcal]				
of WPA	2 237.65±2 115.67*	3 587.52±2 707.25*	-3.83	0.0001
of WPA/day	319.66±302.23*	512.50±386.75*	-3.83	0.0001

IPAQ-SF – International Physical Activity Questionnaire – short form [15].

VPA – vigorous-intensity PA; MPA – moderate-intensity PA; LPA – low-intensity PA (walking); WPA – weekly PA (total); MET – metabolic equivalent of task; EE – energy expenditure (EE) on total PA.

M – mean; SD – standard deviation.

* Statistically significant at $p < 0.05$.

n.s. – not statistically significant.

Table 2. Perceived work ability for teachers of primary and secondary schools from the Upper Silesia, Poland

Variable (WAI)	Perceived work ability [pts] (M±SD)		Mann-Whitney U test	
	women (N = 129)	men (N = 42)	Z	p
1. Current work ability in comparison to the best in life (0–10 pts)	6.93±2.27	7.28±1.95	-0.83	n.s.
2a. Work ability related to requirements of the work – physical requirements (1–5 pts)	4.09±0.77	4.28±0.77	-1.39	n.s.
2b. Work ability related to requirements of the work – mental requirements (1–5 pts)	4.24±0.67	4.45±0.59	-1.52	n.s.
3. Number of diagnosed diseases (1–7 pts)	5.97±1.26	6.14±0.95	-0.27	n.s.
4. Estimated work impairment due to diseases (1–6 pts)	5.29±1.04	5.38±0.88	-0.19	n.s.
5. Sick leave during past year (1–5 pts)	4.74±0.71	4.73±0.49	0.75	n.s.
6. Self-estimated prognosis of work ability for 2 years (1–3 pts)	2.70±0.48	2.83±0.37	-1.10	n.s.
7. Mental resources for the work (1–4 pts)	3.36±0.68	3.35±0.72	-0.03	n.s.
Total WAI	37.36±5.22	38.47±4.78	-1.27	n.s.

WAI – Work Ability Index [17,18].

Other abbreviations as in Table 1.

Based on the classification of the WAI adopted by Kaleta et al. [18], in the whole studied teachers, 16.3% of women and 14.3% of men obtained excellent WAI score, 43.4% of women and 57.1% of men good, 37.2% of women and 26.2% of men moderate, 3.1% of women and 2.4% of men obtained poor WAI score.

The analysis of WAI did not show any significant differences between female and male teachers (Table 2).

The Spearman's correlations analysis revealed a relationship between some variables of the WAI and PA and also between some variables of the WAI and age, body mass, BMI (Table 3).

As presented in the Table 4, PA was significantly different depending on work ability assessment only for female teachers. Lower level of PA was more prevalent amongst female teachers with moderate or poor WAI.

DISCUSSION

The aim of this study has been to assess the level of PA and work ability among male and female teachers. Our study revealed that male teachers had higher levels of vigorous-

intensity and moderate-intensity PA than female teachers. We also found that a larger number of men (74%) than women (46%) met the WHO recommendations regarding physical activity [16]. Previous studies confirmed higher PA of men as compared to women [19,20]. In Bogaert et al. study, 66% of secondary schools teachers in Flanders met the recommendation of physical activity of at least 150 min of moderate to vigorous activity per week [12]. In our study only 53% of teachers met the WHO recommendation [16].

The self-estimated work ability did not differ between male and female teachers. The study of Bogaert et al. indicated that male teachers had significantly better perceived physical and mental health, and significantly lower levels of occupational stress than female teachers [12]. Previous studies also suggested that higher prevalence of health problems among women may be related to a lower physical strength, lower pain threshold, higher workload combining careers and household tasks [21]. In Mäkelä and Hirvensalo's study, male physical education teachers identified their work ability better than female teachers

Table 3. Spearman's correlations – WAI vs. physical activity (PA) and age, and somatic parameters among teachers of primary and secondary schools from the Upper Silesia, Poland

Variable (WAI)	Spearman's correlation*														
	WVPA		WMIPA		WLPA		WPA		age		BM		BMI		
	women	men	women	men	women	men	women	men	women	men	women	men	women	men	
1. Current work ability in comparison to the best in life	0.33 (< 0.0001)	0.33 (0.03)	0.2 (0.03)	n.s.	n.s.	n.s.	0.25 (0.003)	n.s.	n.s.	-0.33 (0.0001)	n.s.	-0.31 (0.0004)	n.s.	-0.37 (< 0.0001)	-0.32 (0.009)
2a. Work ability related to requirements of the work – physical requirements	0.28 (0.001)	n.s.	0.23 (0.008)	n.s.	n.s.	n.s.	0.25 (0.005)	n.s.	n.s.	-0.26 (0.002)	n.s.	-0.21 (0.02)	n.s.	-0.31 (0.0003)	n.s.
2b. Work ability related to requirements of the work – mental requirements	n.s.	n.s.	0.19 (0.03)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
3. Number of diagnosed diseases	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	-0.37 (< 0.0001)	n.s.	n.s.	n.s.	-0.25 (0.003)	n.s.
4. Estimated work impairment due to diseases	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	-0.21 (0.02)	n.s.	n.s.	n.s.	-0.46 (0.002)	-0.33 (0.03)
5. Sick leave during past year	n.s.	n.s.	n.s.	0.31 (0.004)	n.s.	n.s.	n.s.	n.s.	0.33 (0.03)	n.s.	n.s.	n.s.	n.s.	-0.23 (0.01)	n.s.
6. Self-estimated prognosis of work ability for 2 years	0.25 (0.004)	n.s.	n.s.	n.s.	n.s.	n.s.	0.23 (0.01)	n.s.	n.s.	-0.19 (0.03)	n.s.	-0.19 (0.03)	n.s.	-0.26 (0.003)	n.s.
7. Mental resources for the work	n.s.	n.s.	0.19 (0.03)	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	-0.43 (0.005)	-0.38 (0.01)
Total WAI	0.3 (0.0004)	n.s.	0.21 (0.02)	n.s.	n.s.	n.s.	0.22 (0.01)	n.s.	n.s.	-0.38 (< 0.0001)	n.s.	-0.29 (0.0007)	-0.4 (0.007)	-0.39 (< 0.0001)	-0.38 (0.01)

WAI – Work Ability Index [17,18].
WVPA – weekly vigorous-intensity PA; WMIPA – weekly moderate-intensity PA; WLPA – weekly low-intensity (walking) PA; WPA – weekly PA (total).
BM – body mass; BMI – body mass index.
* In brackets: p-value.
n.s. – not statistically significant.

Table 4. Physical activity (PA) level for primary and secondary schools' teachers with different WAI status, the Upper Silesia, Poland

Variable (IPAQ-SF) / WAI status ^a	Physical activity					
	women (N = 129)			men (N = 42)		
	M±SD	Kruskal-Wallis test		M±SD	Kruskal-Wallis test	
		H	p		H	p
WVPA [MET min/week]		11.88	0.003		4.41	n.s.
excellent	583.23±697.50			1 340.00±457.99		
good	566.28±583.58			963.33±1 470.49		
moderate and poor	264.61±392.89			746.66±646.40		
WMPA [MET min/week]		7.43	0.024		1.02	n.s.
excellent	544.76±667.44			566.66±301.63		
good	479.64±750.70			601.66±906.38		
moderate and poor	227.30±274.76			475.00±383.10		
WLPA [MET min/week]		0.92	n.s.		0.61	n.s.
excellent	1 660.68±2 528.23			1 086.25±1 536.97		
good	1 322.06±1 571.38			1 097.93±960.27		
moderate and poor	1 056.95±1 308.00			962.50±818.92		
WPA [MET min/week]		10.06	0.007		1.10	n.s.
excellent	2 788.68±2 625.78			2 992.91±1 504.22		
good	2 367.99±2 193.62			2 662.93±2 439.76		
moderate and poor	1 548.87±1 438.23			2 184.16±1 211.86		
EE [kcal]						
of WPA		6.21	0.045		0.59	n.s.
excellent	2 953.94±2 800.01			3 794.00±1 822.07		
good	2 421.30±2 247.73			3 667.77±3 232.11		
moderate and poor	1 750.61±1 490.23			3 323.77±1 962.89		
of WPA/day		6.21	0.045		0.59	n.s.
excellent	421.99±400.00			542.00±260.29		
good	345.90±321.10			523.96±461.73		
moderate and poor	250.08±212.89			474.82±280.41		

IPAQ-SF – International Physical Activity Questionnaire – short form [15].

WAI – Work Ability Index [17,18].

Other abbreviations as in Table 1.

^a Women – excellent: N = 21, good: N = 56, moderate and poor: N = 52; men – excellent: N = 6, good: N = 24, moderate and poor: N = 12.

of physical education did [22]. Our study did not confirm those conclusions.

Our study revealed that work ability score was associated with age (only for female teachers), body mass and BMI

(for both male and female teachers). Older teachers and teachers with higher BMI (indicating overweight or obese) may have tendencies to poorer work ability, poorer perceived current work ability in comparison to the best in

life, poorer work ability related to physical requirements of the work and more diagnosed diseases, than younger teachers and teachers with lower BMI. Teachers with higher BMI may also have tendencies to more absenteeism. This result is in line with previous studies suggesting that higher BMI is related to lower levels of physical fitness, a larger number of physical problems [23,24] and poorer perceived physical health [12].

The findings of our study indicated relationships between vigorous-intensity PA, moderate-intensity PA, total weekly PA and certain indicators of work ability, i.e., current work ability in comparison to the best in life, work ability related to physical requirements of the work and the sum of WAI. However, the most of those relationships revealed for female teachers. The teachers who are involved in vigorous or moderate-intensity PA may have a better self-perception of current work ability and work ability related to physical requirements of the work. There were also poor negative correlations between vigorous-intensity PA and age, and moderate-intensity PA and age for female teachers.

The relationship between the WAI categories and participation in leisure-time PA among male and female workers from Łódź confirmed Kaleta et al. study [18]. The authors also found that energy expenditure of leisure time PA decreased gradually with increasing workload [25]. Bogaert et al. found a positive association between leisure-time PA and teachers' mental and physical health and job satisfaction, and negative association between leisure-time PA and occupational stress and absenteeism [12]. Vuillemin et al. suggested in their study that subjects meeting PA recommended levels had better health-related quality of life (HRQoL) than those who did not [26]. Previous studies showed that PA could affect HRQoL by influencing its 2 main components: physical functioning and well-being [27,28].

Based on the WAI status (excellent, good and jointly moderate and poor), we compared PA for female and male groups of studied teachers. The results confirmed the relationships between PA and some work ability indicators only for fe-

male teachers. The women with excellent or good WAI had significantly higher levels of vigorous-intensity PA, moderate-intensity PA and total weekly PA than women with moderate or poor WAI. Only did low-intensity PA not differ according to the WAI status. Our findings did not reveal those relationships for male teachers. This occurrence may be caused by a small sample of male teachers.

Limitation of the study

The main limitation of this study is a small sample of convenience that agreed to participate in the study and performed the full research program. Therefore, we analyzed all teachers irrespective of their age which may have significantly blurred the picture of the phenomenon. Other limitation is a subjective method of physical activity and work ability assessment. We used IPAQ short version to assess the PA level and we could not distinguish the level of leisure-time PA.

CONCLUSIONS

Slightly above 50% of studied teachers met the WHO recommendation [16]. Male teachers had significant higher vigorous-intensity PA, moderate-intensity PA and total weekly PA than female teachers. The work ability did not differ between female and male teachers.

Work ability was related to age, body mass, BMI, and physical activity (vigorous-intensity PA, moderate-intensity PA, total weekly PA).

Further studies should focus on the relation between physical activity and work ability among teachers of various age and seniority, from both, urban and rural schools.

REFERENCES

1. Nocon M, Hiemann T, Müller-Riemenschneider F, Thalau F, Roll S, Willich SN. Association of physical activity with all-cause and cardiovascular mortality: A systematic review and meta-analysis. *Eur J Cardiovasc Prev Rehabil.* 2008;15(3): 239–46, <https://doi.org/10.1097/HJR.0b013e3282f55e09>.

2. Jakicic JM, Rickman AD, Lang W, Davis KK, Gibbs BB, Neiberg R, et al. Time-based physical activity interventions for weight loss: A randomized trial. *Med Sci Sports Exerc.* 2015; 47(5):1061–9, <https://doi.org/10.1249/MSS.0000000000000482>.
3. Colberg SR, Grieco CR. Exercise in the treatment and prevention of Diabetes. *Curr Sports Med Rep.* 2009;8(4):169–75, <https://doi.org/10.1249/JSR.0b013e3181ae0654>.
4. Moayeri A. The association between physical activity and osteoporotic fractures: A review of the evidence and implications for future research. *Ann Epidemiol.* 2008;18(11):827–35, <https://doi.org/10.1016/j.annepidem.2008.08.007>.
5. Schaller A, Froboese I. Movement coaching: Study protocol of a randomized controlled trial evaluating effects on physical activity and participation in low back pain patients. *BMC Musculoskelet Disord.* 2014;15:391, <https://doi.org/10.1186/1471-2474-15-391>.
6. Mackey M, Maher CG, Wong T, Collins K. Study protocol: The effects of work-site exercise on the physical fitness and work-ability of older workers. *BMC Musculoskelet Disord.* 2007;8:9–13, <https://doi.org/10.1186/1471-2474-8-9>.
7. Kenny GP, Yardley JE, Martineau L, Jay O. Physical work capacity in older adults: Implications for the aging worker. *Am J Ind Med.* 2008;51(8):610–25, <https://doi.org/10.1002/ajim.20600>.
8. Hamrik Z, Sigmundova D, Kalman M, Pavelka J, Sigmund E. Physical activity and sedentary behaviour in Czech adults: Results from the GPAQ study. *Eur J Sport Sci.* 2014;14(2):193–8, <https://doi.org/10.1080/17461391.2013.822565>.
9. Bélanger M, Townsend N, Foster C. Age-related differences in physical activity profiles of English adults. *Prev Med.* 2011;52:247–9, <https://doi.org/10.1016/j.ypmed.2011.02.008>.
10. Kaleta D, Makowiec-Dąbrowska T, Dziankowska-Zaborszczyk E, Jegier A. Physical activity and self-perceived health status. *Int J Occup Med Environ Health.* 2006;19(1):61–9, <https://doi.org/10.2478/v10001-006-0005-x>.
11. Maguire M, O'Connell T. III-health retirement of school teachers in the Republic of Ireland. *Occup Med.* 2007;57(3):191–3, <https://doi.org/10.1093/occmed/kqm001>.
12. Bogaert I, de Martelaer K, Deforche B, Clarys P, Zinzen E. Associations between different types of physical activity and teachers' perceived mental, physical, and work-related health. *BMC Public Health* 2014;14:534, <https://doi.org/10.1186/1471-2458-14-534>.
13. Smuka I. Teacher role model and students' physical activity. *Pol J Sport Tourism.* 2012:281–6, <https://doi.org/10.2478/v10197-012-0027-9>.
14. International Physical Activity Questionnaire [Internet]. The Questionnaire; 2017 [cited 2016 May 16]. Guidelines for data processing and analysis of the International Physical Activity Questionnaire (IPAQ) – Short and long forms. Available from: www.ipaq.ki.se.
15. Craig CL, Marshall AL, Sjöström M, Bauman AE, Booth ML, Ainsworth BE, et al. International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sport Exerc.* 2003;35(8):1381–95, <https://doi.org/10.1249/01.MSS.0000078924.61453.FB>.
16. World Health Organization. Global recommendations on physical activity for health [Internet]. Geneva: The Organization; 2010 [cited 2016 May 16]. Available from: http://apps.who.int/iris/bitstream/10665/44399/1/9789241599979_eng.pdf
17. Tuomi K, Ilmarinen J, Eskelinen L, Jarvinen E, Klockars M. Prevalence and incidence rates of diseases and work ability in different work categories in municipal occupations. *Scand J Work Environ Health.* 1991;17(Suppl 1):67–74.
18. Kaleta D, Makowiec-Dąbrowska T, Jegier A. Lifestyle index and work ability. *Int J Occup Med Environ Health.* 2006;19(3):170–7, <https://doi.org/10.2478/v10001-006-0021-x>.
19. Gerovasili V, Aqaku IT, Vardavas CI, Filippidis FT. Levels of physical activity among adults 18–64 years old in 28 European countries. *Prev Med.* 2015;81:87–91, <https://doi.org/10.1016/j.ypmed.2015.08.005>.
20. Biernat E, Tomaszewski P. Association of socio-economic and demographic factors with physical activity of males and females aged 20–69 years. *Ann Agric Environ Med.* 2015;22(1):118–23, <https://doi.org/10.5604/12321966.1141380>.

21. Chong EY, Chan AH. Subjective health complaints of teachers from primary and secondary schools in Hong Kong. *Int J Occup Saf Ergon*. 2010;16(1):23–39, <https://doi.org/10.1080/10803548.2010.11076825>.
22. Mäkelä K, Hirvensalo H. Work ability of Finnish physical education teachers. *Phys Edu*. 2015;71:379–93, <https://doi.org/10.18666/tpe-2015-v72-i5-6186>.
23. Erick PN, Smith DR. A systematic review of musculoskeletal disorders among school teachers. *BMC Musculoskelet Disord*. 2011;12:260, <https://doi.org/10.1186/1471-2474-12-260>.
24. Freude G, Seibt R, Pech E, Ullsperger P. Assessment of work ability and vitality – A study of teachers of different age groups. *Int Congr Ser*. 2005;1280:270–4, <https://doi.org/10.1016/j.ics.2005.02.099>.
25. Kaleta D, Makowiec-Dąbrowska T, Jegier A. Leisure-time physical activity, cardiorespiratory fitness and work ability; a study in randomly selected residents of Łódź. *Int J Occup Med Environ Health*. 2004;17(4):457–64.
26. Vuillemin A, Boini S, Bertrais S, Tessier S, Oppert JM, Herberg S, et al. Leisure time physical activity and health-related quality of life. *Prev Med*. 2005;41(2):562–9, <https://doi.org/10.1016/j.ypmed.2005.01.006>.
27. Rejeski WJ, Brawley LR, Shumaker SA. Physical activity and health-related quality of life. *Exerc Sport Sci Rev*. 1996;24:71–108, <https://doi.org/10.1249/00003677-19960240-00005>.
28. Wendel-Vos GCW, Schuit AJ, Tijhuis MAR, Kromhout D. Leisure time physical activity and health-related quality of life: Cross-sectional and longitudinal associations. *Qual Life Res*. 2004;13(3):667–77, <https://doi.org/10.1023/B:QURE.0000021313.51397.33>.