

OCCUPATIONAL ENERGY EXPENDITURE AND LEISURE-TIME PHYSICAL ACTIVITY

DOROTA KALETA¹ and ANNA JEGIER²

¹ Department of Preventive Medicine

² Department of Sports Medicine

Medical University of Łódź

Łódź, Poland

Abstract

Objectives: In the majority of countries around the world, a decrease in the leisure-time physical activity is observed. The aim of the study was to evaluate the correlation between occupational energy expenditure and leisure-time physical activity. Moreover, the correlation between other factors and leisure-time physical activity was assessed. **Materials and Methods:** The study was performed in a randomly selected group of full-time employees (272 men and 236 women) living in the city of Łódź. Logistic regression was used to estimate odds ratios and 95% confidence intervals as well as to control the effects of occupational workload and leisure-time physical activity limitations. Physical activity was determined by the Seven Day Physical Activity Recall (SDPAR). **Results:** Leisure-time physical activity was strongly associated with energy expenditure on occupational physical activity in men and women. Among men who expended 4000 kcal/week or more on occupational physical activity, the risk of inactivity at leisure was 1.5 times higher than in men whose weekly energy expenditure on occupational activity did not exceed 4000 kcal (adjusted OR = 1.33, 95% CI: 1.06–2.34). Among women who expended 3500 kcal/week or more on occupational physical activity, the risk of not taking up leisure-time physical activity was also higher as compared to those whose weekly energy expenditure on occupational activity was lower than 3500 kcal (adjusted OR = 1.41, 95% CI: 1.09–3.40). **Conclusions:** Prophylactic schedules associated with the improvement of leisure-time physical activity should be addressed to all adults, particularly to blue-collar workers. Future programs aimed at increasing physical activity in adults should consider work-related factors.

Key words:

Occupational energy expenditure, Leisure-time physical activity, Adults

INTRODUCTION

In the majority of countries around the world, socio-economic transformations contribute to the decrease in the level of physical activity. There are rapid changes in the nature of employment and the transition from high physical activity needed for daily living towards considerable physical inactivity is observed. In most countries, unprecedented social and economic changes have rapidly affected physical activity and dietary patterns, which in turn have contributed to current rise in noncommunicable diseases. The burden of chronic diseases is increasing worldwide. It has been estimated that in 2001, chronic diseases con-

tributed to about 60% of the total 56.5 million deaths reported throughout the world and to about 46% of the global burden of disease [1]. The proportion of the burden of noncommunicable diseases is expected to increase to 57% by 2020.

Various studies indicate that low physical activity is thought to be an essential risk factor for developing cardiovascular diseases, overweight, obesity, diabetes, certain neoplastic growths and other chronic diseases [2–4]. Regular physical activity of a recreational type is a crucial element in health promotion, maintenance of good health status and prevention of chronic diseases. Recreational physical ac-

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Address reprint requests to D. Kaleta, MD, Department of Preventive Medicine, Medical University of Łódź, Żeligowskiego 7/9, 90-752 Łódź, Poland (e-mail: office@cindi.org.pl).

tivity has a positive impact on health status of subjects at any age and should be considered in preventive programs, also including professionally active people [5]. For health promotion and chronic disease prevention purposes endurance training with moderate intensity (60–75% of max heart rate) undertaken at least 4–5 times a week for 30–45 min is recommended. Energy expenditure on exertion should exceed 1000 kcal/week [6].

Despite the proved health benefits resulting from regular leisure-time physical activity, nowadays the majority of world population, including Poland do not take up physical exercises at a satisfactory level, or any training at all [7]. To date investigations point to numerous factors that can exert an influence on the level of recreational physical activity [8–10]. More attention has been focused on occupational workload in creating leisure-time physical activity [11]. At the same time, the role of workplaces in the implementation of preventive programs improving physical activity should be emphasized [12].

The aim of the study was to evaluate the correlation between occupational energy expenditure and leisure-time physical activity and other factors among adult men and women.

MATERIALS AND METHODS

The study was performed in the population of adults randomly selected by the Local Data Bank in Łódź, which rendered the data available with the proportional draw scheme. As an operator the personal identification number (in Polish PESEL) was used. Of the directly drawn 2000 persons, 949 answered all the questions included in the questionnaire assessing physical activity. Of this group, 508 full-time employees, including 272 men (mean age, 42.6 ± 10.6 years) and 236 women (mean age, 41.5 ± 9.9 years) were analyzed.

Physical activity was determined by means of the Seven Day Physical Activity Recall (SDPAR) [13,14]. Information was obtained during an interview conducted by adequately trained interviewers. The questionnaire permitted the collection of data concerning the frequency, intensity and length of both occupational and leisure-time physical

activities seven days prior to the examination. SDPAR also permitted the collection of data on the number of hours of physical activity with low (1.5 METs – metabolic equivalents), moderate (4 METs), high (6 METs) and very high (10 METs) intensity. SDPAR also included energy expenditure during sleep (1 MET). Taking into consideration all the data, daily or weekly energy expenditure could be calculated (kcal/day, kcal/week).

Three categories were considered to evaluate leisure-time physical activity: lack of physical activity, unsatisfactory, and satisfactory physical activity conducive to health. They corresponded to weekly energy expenditure on leisure-time physical activity of 0 kcal/week, 0–1000 kcal/week, >1000 kcal/week. Occupational physical activity was analyzed also in three categories: light, partially hard, and hard, which in men corresponded to weekly energy expenditure on work of <4000 kcal/week, 4000–7500 kcal/week, >7500 kcal/week, and in women to <3500 kcal/week, 3500–5000 kcal/week and >5000 kcal/week, respectively.

Furthermore, while interviewing the subjects, the data on occupation, type of job performed, education, income and marital status were collected.

Statistical analysis

For the statistical analysis of the measurable characteristics, their range (minimum–maximum), mean values (arithmetic mean and median) and also standard deviation were calculated. To compare the frequency of the given categories of quantitative characteristics in the analyzed groups the chi-square test or the chi-square test with Yates' correction were implemented. The distribution of measurable characteristics was analyzed using the Shapiro-Wilk test. To compare the mean values between two groups in relation to the type of distribution, the test for two independent trials or the Mann-Whitney test was applied. A significance level was established at $p = 0.05$ for the values included in the critical region of a given distribution. To identify risk factors that can contribute to lack of leisure-time physical activity, the logistic regression analysis was performed. At the first stage, crude coefficients – odds ratios (OR) of the impact of singular variables on

the risk of lack of recreational physical activity in men and women were calculated. Subsequently, the multifactorial analysis, considering simultaneous effect of all variables on the risk of lack of leisure-time physical activity in the study subjects, was employed. All *p* values were two-sided and *p* < 0.05 was set as statistically significant. The statistical analysis was performed with the STATGRAPHICS plus 5.1 program.

RESULTS

Based on the information collected during interviews, the subjects were characterized by means of basic anthropometric indices: weight, height, body mass index (BMI) and selected socio-economic features (Table 1).

Table 1. Characteristics of the study population

Characteristics	Men n = 272		Women n = 236	
	Mean	SD	Mean	SD
Age (years)	42.6	10.6	41.5	9.9
Height (cm)	176.6	6.6	162.3	5.5
Weight (kg)	82.3	12.4	63.6	11.4
BMI (kg/m ²)	26.4	3.8	24.2	4.3
Age (years)	n	%	n	%
25–34	78	28.7	70	29.7
35–44	66	24.3	65	27.5
45–54	86	31.6	79	33.5
55–64	42	15.4	22	9.3
Education				
Primary/Secondary	83	30.5	53	22.5
High school	122	44.9	114	48.3
University	67	24.6	69	29.2
Job characteristics				
Mental work	167	61.4	198	83.9
Mixed physical and mental work	89	32.7	37	15.7
Physical work	16	5.9	1	0.4
The level of income in EUR				
<124	64	23.5	54	22.9
125–249	131	48.2	136	57.6
250–299	46	16.9	31	13.1
> 300	31	11.4	15	6.4

SD – standard deviation;

BMI – body mass index.

Over half of the study sample (61.1%), including 58.5% of men and 63.7% of women, did not participate in any sports or leisure-time physical activities during the examination period. Of the remaining subjects, only 19.9% of males and 15.3% of females expended 1000 kcal/week or more on this type of movement activity (Table 2). The characteristics of occupational physical activity according to the value of energy expenditure (kcal/week) is presented in Table 3.

Logistic regression analysis was used to identify factors that can contribute to the lack of leisure-time physical activity in the subjects. The multifactorial analysis considering simultaneous effect of all variables on the risk of lack of leisure-time activity indicated that participation in this activity consisted to a certain degree in the type and level of occupational workload. Among men who performed physical work and expended 4000 kcal/week or more on occupational physical activity, the risk of not undertaking any leisure-time physical activity was nearly 1.5 times higher than in men whose weekly energy expenditure on occupational activity did not exceed 4000 kcal (adjusted OR = 1.33, 95% CI: 1.06–2.34). Moreover, in the group of men, a statistically significant correlation between oc-

Table 2. Leisure-time physical activity characteristics (kcal/week) in the study population

Physical activity kcal/week	Men (n = 272)		Women (n = 236)	
	n	%	n	%
0	159	58.5	150	63.7
1–999	59	21.6	50	21.0
≥1000	54	19.9	36	15.3

Table 3. Occupational physical activity characteristics (kcal/week) in the study population

Physical activity kcal/week	Men (n = 272)		Physical activity kcal/week	Women (n = 236)	
	n	%		n	%
Occupational			Occupational		
<4000	165	60.7	<3500	197	83.5
4000–7500	105	38.6	3500–5000	38	16.1
>7500	2	0.7	>5000	1	0.4

cupation, education and leisure-time physical activity was recorded (Table 4).

Among women engaged in physical work, the risk of not taking up leisure-time physical activity was about 1.5 times higher than in women performing mental work (adjusted OR = 1.40, 95% CI: 1.05–3.53). In the group of women, besides the type of work, energy expenditure on occupational activity was also negatively correlated with participation in recreational activities. Among women who expended 3500 kcal/week or more on occupational physical activity, the risk of not taking up leisure-time physical activity was also higher as compared to those whose weekly energy expenditure on occupational activity was lower than 3500 kcal (adjusted OR = 1.41, 95% CI: 1.09–3.40). Furthermore, the risk of lack of leisure-time physical activity in women was significantly correlated with age (Table 5).

Table 4. Odds ratios (OR) and 95% confidence intervals (CI) for inactivity during leisure-time to sociodemographic and other characteristics in men

Characteristics	Crude OR		Adjusted OR**	
	OR	95%CI	OR	95%CI
Age (years)				
25–34	1.00	Referent	1.00	Referent
35–44	1.64	0.84–3.20	1.48	0.73–3.01
45–54	1.00	0.54–1.85	1.05	0.54–2.03
55–64	1.63	0.75–3.50	1.71	0.76–3.80
Education				
Primary	4.48	2.34–8.50*	3.65	1.71–7.42*
High school	3.91	2.11–8.58*	2.92	2.28–6.64*
University	1.00	Referent	1.00	Referent
Job characteristics				
Mental work	1.00	Referent	1.00	Referent
Physical work and mixed physical and mental work	1.61	0.98–2.64	1.00	0.31–1.34
Occupational physical activity (kcal/week)				
<4000	1.00	Referent	1.00	Referent
>4000	1.70	1.19–2.79*	1.33	1.06–2.34*
The level of income in EUR				
<124	3.26	1.62–6.58*	1.78	0.80–3.97
125–249	1.93	1.08–3.42*	1.14	0.58–2.23
>250	1.00	Referent	1.00	Referent

* Statistically significant, $p < 0.01$;

** Adjusted OR took account of all other variables in the model.

Table 5. Odds ratios (OR) and 95% confidence intervals (CI) for inactivity during leisure-time to sociodemographic and other characteristics in women

Characteristics	Crude OR		Adjusted OR**	
	OR	95%CI	OR	95%CI
Age (years)				
25–34	1.00	Referent	1.00	Referent
35–44	1.98	0.99–3.94	1.74	0.83–3.62
45–54	4.40	2.19–8.83*	4.05	1.94–8.47*
55–64	3.41	1.23–9.50*	4.08	1.42–11.71*
Education				
Primary	4.40	2.19–8.83*	4.05	1.94–8.47*
High school	1.98	0.99–3.94	1.74	0.83–3.62
University	1.00	Referent	1.00	Referent
Job characteristics				
Mental work	1.00	Referent	1.00	Referent
Physical work and mixed physical and mental work	2.00	1.16–4.12*	1.40	1.05–3.53*
Occupational physical activity (kcal/week)				
<3500	1.00	Referent	1.00	Referent
>3500	2.10	1.14–4.47*	1.41	1.09–3.40*
The level of income in EUR				
<124	3.93	1.92–8.05*	1.21	0.37–3.97
125–249	2.04	1.14–3.36*	1.02	0.43–2.44
>250	1.00	Referent	1.00	Referent

* Statistically significant, $p < 0.01$;

** Adjusted OR took account of all other variables in the model.

No correlation between the level of income and participation in sports-recreation activities was found.

DISCUSSION

The SDPAR questionnaire and subsequent calculations of energy expenditure in the study subjects were conducted in accordance with the original formula [13]. The calculated energy expenditure of leisure-time physical activity in the study group of the Łódź residents does not significantly differ from the values expected in the properly designed study [15]. Low physical activity appears to be a significant problem all over the world, however, the spread of lack of leisure-time physical activity or its unsatisfactory level among residents of Łódź was found to be higher than in adults of other countries, particularly in Western Europe

[7]. It is estimated that 15% of the adult population in the USA take part in leisure-time physical activity at the satisfactory level, whereas 25% do not do any exercises [16]. In the USA the proportion of people leading a sedentary life style reaches even 68%, depending on gender and ethnical group of the subjects studied [17]. In current studies, the highest percentage of respondents declaring high physical activity has been noted in Finland (29.9%), Germany (19.9%), Spain (17.6%), Russia (13.9%), and the lowest in Poland (6.4%) and Hungary (6.9%) [7].

In older age groups of women (aged 45–64 years) the risk of lack of leisure-time physical activity is higher than in individuals aged 25–34 years. Numerous studies also confirm a negative relationship between age and the level of leisure-time physical activity [18].

The recent studies have indicated that among blue-collar workers, particularly in those who work hard, reluctance to participate in leisure-time physical activity is quite common [19]. In the study by Drygas et al. [7], 11% of the Łódź inhabitants reported hard occupational physical work as a principle cause of not taking up any physical endurance. The results of this study confirm that among men and women physically loaded at work, the risk of not taking up leisure-time physical activity was nearly 1.5-fold higher compared to individuals whose occupational activity did not require high physical exertion (Tables 4 and 5). They also substantiate findings of other authors who report the correlation between the level of education and leisure-time physical activity [20,21]. In our study, the level of education significantly correlated with leisure-time physical activity of the study subjects. Moreover, the type of occupational activity was of significant importance. Women performing physical work were at 1.5 higher risk of not taking up any leisure-time physical activity as compared to white-collar female workers (adjusted OR = 1.41, 95% CI: 1.09–3.40). Literature data show that people with lower level of education commonly take on work involving more physical load than individuals with higher education, which can contribute to the lack of leisure-time physical activity in workers with lower social status [22].

In the study subjects, the type of undertaken work and high energy expenditure on occupational activity determined the lack of taking up leisure-time physical activity.

The results of the present study reveal the need for targeting preventive programs aimed at improving physical activity at blue-collar workers. This is of particular importance in view of the outcome of recent studies indicating that the benefits of taking up leisure-time physical activity by blue-collar workers result in the increase in their physical endurance, the decrease in the risk factors of cardiovascular and other chronic diseases as well as in the improvement of work ability and health-related self-assessment [23].

CONCLUSIONS

1. The results of the present study reveal that leisure-time physical activity in the adult residents of Łódź appears to be low and does not reach the values recommended for the prevention of chronic diseases, including cardiovascular diseases.
2. In the study subjects, the type of undertaken work and high weekly energy expenditure on occupational activity determined the lack of leisure-time physical activity.
3. Prophylactic schedules associated with the improvement of leisure-time physical activity should be addressed to all adults, particularly to blue-collar workers.

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