International Journal of Occupational Medicine and Environmental Health 2006;19(3):170 – 177
DOI 10.2478/v10001-006-0021-x

LIFESTYLE INDEX AND WORK ABILITY

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Abstract
Objectives: In many countries around the world, negative changes in lifestyles are observed. The aim of this study was to analyze the influence of selected lifestyle indicators on work ability among professionally active individuals. **Materials and Methods:** The study was performed in the randomly selected group of full-time employees (94 men and 93 women) living in the city of Łódź. Work ability was measured with the work ability index and lifestyle characteristic was assessed with the healthy lifestyle index. We analyzed four lifestyle indicators: non-smoking, healthy weight, fiber intake per day, and regular physical activity. Logistic regression was used to estimate odds ratios and 95% confidence intervals to control the effects of lifestyle and work ability. **Results:** The analysis of lifestyle index indicated that 27.7, 30.9, 27.7 and 11.7% of men and 15.1, 21.5, 35.5 and 26.9% of women scored 0, 1, 2, 3 points, respectively. Only 2.1% of men and 1.1% of women met the criteria for the healthy lifestyle (score 4). Work ability was excellent, good and moderate in 38.3, 46.8 and 14.9% of men, and in 39.8, 14.9 and 19.3% of women, respectively. Poor work ability was found in 9.7% women. Work ability was strongly associated with lifestyle in both men and women. Among men with index score = 0, the risk of moderate work ability was nearly seven times higher than in men whose lifestyle index score exceeded 1 or more points (OR = 6.67; 95% CI: 1.94–22.90). Among women with lifestyle index score = 0, the risk of moderate or lower work ability was also highly elevated as compared to those with lifestyle index = 1 or higher (OR = 14.44; 95% CI: 3.53–59.04). **Conclusions:** Prophylactic schedules associated with the improvement of lifestyles should be addressed to all adults. Future programs aimed at increasing work ability should consider work- and lifestyle-related factors.

Key words:
Healthy lifestyle, Work ability, Adults

INTRODUCTION

The majority of countries all over the world experience an epidemic of noncomunicable diseases. Scientific studies have identified certain types of behavior that contribute to the development of noncomunicable diseases and early death [1,2]. According to current knowledge the most important risk factors of chronic disease are: smoking, low level of leisure-time physical activity, overweight or obesity, and poor nutrition-related habits [3,4]. Many public health recommendations and clinical guidelines emphasize the importance of healthy lifestyles [5,6]. Moreover, healthy lifestyle can bring about tangible economic benefits especially in terms of reduced health care costs and increased productivity. In recent years, more attention is also paid to the role of selected health behaviors in the modification of work ability [7,8].

Work ability is a complex feature and its level reflects the interactions between the volume of both physical and

Received: April 10, 2006. Accepted: July 31, 2006.
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mental activities and functional capabilities of workers, their health and subjective assessment of their status in the given organizational and social conditions [9].

Work ability can be assessed objectively or subjectively. One of the tools used for subjective assessment of work ability is the work ability index (WAI). This method is relatively inexpensive and uncomplicated, which can be of some importance when conducting research on large populations. The WAI has been used and checked many times all over the world, including Poland [7,8].

The aim of this study was to analyze the influence of selected lifestyle indicators on work ability among professionally active individuals.

MATERIALS AND METHODS

The study was performed in the randomly selected group of professionally active persons in the years 2001–2003. The selection was made by the Local Data Base in Łódź, which rendered the data available together with the proportional draw scheme. As an operator the personal identification number (PESEL) was used. Of the directly drawn 2000 persons, 1029 completed the questionnaire assessing physical activity. Subsequently, 825 individuals were systematically drawn and invited to take additional tests. Of this group, 317 persons reported and entered the study (attendance rate, 38%). Finally, 187 professionally active persons were included to our analysis. The study group composed of persons in good health, confirmed by the physical examination and treadmill test, comprised 94 males (mean age, 43.5 ± 11.5 years) and 93 females (mean age, 42.3 ± 11.4 years).

Subjective work ability was evaluated using the work ability index, a score composed of different items [9]. Each of those items was determined according to different scales arranged in order of importance. Current work ability compared with the lifetime best was assessed from 0 to 10 points, work ability in relation to the demands of the job from 2 to 10 points; the number of current diseases diagnosed by a physician from 1 to 7 and estimated work ability impairment due to diseases from 1 to 6 points. Sick leave during past 12 months, the subjects' own prognosis of work ability two years from now and mental resources to work were determined from 1 to 5, 1, 4 or 7 and from 1 to 4 points, respectively. In each case the highest score was attributed to the most favorable conditions, e.g., a lack of disease and sick leave, the highest capabilities. The work ability index is calculated by summing up the estimated points for each item. The highest WAI score reflects the best worker's perception of his or her work ability. The index score ranges from 7 to 49 points. According to the classification worked out by the authors, four categories of work ability assessment could be distinguished: poor (WAI up to 27 points), moderate (WAI, 28–36 points), good (WAI, 37–43 points) or excellent (WAI, 44–49 points).

The prevalence of healthy lifestyle index was also estimated [10]. We analyzed four lifestyle characteristics: nonsmoking, healthy weight, fiber intake per day, and regular physical activity. This lifestyle characteristics were added up to create a healthy lifestyle index (range, 0–4; the index of healthy lifestyle = 4) and the pattern of all four lifestyle characteristics was defined as a single healthy lifestyle indicator. All data were based on self-reports. Healthy weight was defined as a body mass index (BMI) between 18.5 and 24.9 (kg/m^2). Furthermore, while interviewing, the data on smoking status were taken. Diet was assessed by a 24-h food recall [11]. Adequate fiber consumption was recognized when daily intake was 30 g or higher per person.

Physical activity was determined by the interviewer-administrated Seven Day Physical Activity Recall (SDPAR) questionnaire [12,13]. The questionnaire provided data concerning the frequency, intensity and length of both occupational and leisure-time physical activity 7 days prior to the examination. It also permitted to collect 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, and energy expenditure during sleep (1 MET). Thus, daily or weekly energy expenditure during physical activity could be calculated (kcal/day, kcal/week), depending on the type of activity performed. To evaluate recreational physical activity, three categories were considered: lack of physical activity, unsatisfactory and satisfactory physical activity relative to health. In men, it corresponded to weekly energy ex-

penditure on leisure-time physical activity of 0 kcal/week, 0–1000 kcal/week, >1000 kcal/week, and in women of 0 kcal/week, 0–750 kcal/week and >750 kcal/week, respectively. The latter value was considered a satisfactory level of recreational physical activity.

Statistical analysis

For the statistical analysis of the longitudinal variables 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 was used. 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. For identification of risk of moderate or lower work ability, logistic regression analysis was performed. The odds ratios (OR) of the impact of lifestyle on the moderate or lower work ability in men and women studied were calculated. The analysis considered the effect of age on the risk of moderate or lower work ability in the study subjects. Moreover, the multifactorial analysis was used to consider simultaneous effects of selected healthy lifestyle indicators on WAI values. Logistic regression analysis was used to identify factors that can contribute to poor or moderate work ability in the subjects. All p values were two-sided and $p < 0.05$ was set as statistically significant. The statistical analysis was performed with use of STATGRAPHICS plus 5.1 program.

RESULTS

Based on the information obtained during an interview, it was found that the subjects were characterized by mean values of basic indices: body mass index, level of leisure time physical activity, smoking status, and fiber intake (Table 1).

Table 1. Characteristics of the study population

Variables	Men (n = 94)		Women (n = 93)	
	n	%	n	%
Body mass index (BMI) (kg/m^2)				
< 25	31	33.0	63	67.7
25–30	47	54.0	23	24.7
> 30	16	17.0	7	7.5
Smoking status				
Never smokers	23	24.5	39	41.9
Former smokers	30	31.9	24	25.8
Current smokers	41	43.6	30	32.3
Leisure-time physical activity				
None	52	55.3	51	54.8
Insufficient	27	28.7	38	40.9
Sufficient	15	16.0	4	4.3
Fiber intake				
< 30g/day	71	75.5	58	62.4
≥ 30g/day	23	24.5	35	37.6

In the group of men, WAI was 41.9 ± 4.6 and in women 40.1 ± 6.8. Table 2 shows the mean values of WAI items in the study participants. In the whole study group, 38.3% of men and 39.8% of women obtained excellent WAI score, 46.8% of men and 31.2% of women good and 14.9% of man and 19.3% of woman moderate. It should be emphasized that among persons who obtained poor WAI score there were only women (9.7%).

The analysis of lifestyle index indicated that 27.7, 30.9, 27.7 and 11.7% of male subjects had 0, 1, 2, 3 points, respectively. The healthy lifestyle in females was distributed as follows 15.1, 21.5, 35.5 and 26.9% of them scored 0, 1, 2, 3, respectively. Only 2.1% of men and 1.1% of women met the criteria for the healthy lifestyle index (score 4).

Work ability was strongly associated with lifestyle in men and women. Among men with 0 index score, the risk of poor to moderate work ability was nearly seven times higher than in men whose lifestyle index score exceeded 1 or more points (OR = 6.67; 95% CI: 1.94–22.90). Among women with lifestyle index score = 0, the risk of moderate or lower work ability was also higher as compared to those with lifestyle index score = 1 or higher (OR = 14.44; 95% CI: 3.53–59.04). Moreover; association between WAI and selected healthy lifestyle indicators was evaluated. Logistic regression analysis was used to identify factors that can

Table 2. Mean values of work ability index and its items in the study participants

Different items of work ability index	Men (n = 94)		Women (n = 93)	
	Mean	SD	Mean	SD
Current work ability	8.2	1.4	7.8	2.0
Work ability related to physical requirements	4.2	0.8	4.2	0.9
Work ability related to mental requirements	4.5	0.6	4.4	0.8
Work ability related to the demands of the job	8.7	1.3	8.5	1.5
Number of diseases diagnosed	5.5	0.8	5.2	1.1
Sick leave during past 12 months	3.9	1.1	3.9	1.1
Estimated work impairment due to diseases	6.4	1.1	6.3	1.3
Self-estimated prognosis of work ability for two years	6.2	1.0	5.8	1.5
Mental resources	2.9	0.8	2.5	0.9
Total work ability index	41.9	4.6	40.1	6.8

SD – standard deviation.

contribute to poor or moderate work ability in the subjects. The multifactorial analysis used to consider simultaneous effect of all variables on the risk of poor to moderate work ability indicated that WAI consisted to a certain degree BMI, smoking and leisure-time physical activity.

Among men with the BMI range from 25 to 30 (kg/m^2), the risk of moderate WAI score was higher than in men whose BMI did not exceed 25 (kg/m^2) (adjusted OR = 1.17; 95% CI: 0.30–4.61) (Table 3). In the group of overweight women, the risk of moderate or poor WAI score was significantly higher than among women with healthy weight (adjusted OR = 2.33; 95%CI: 1.09–7.96).

In addition, WAI was found to be negatively associated with smoking habit in the study participants. In current male smokers, the risk of moderate work ability was higher than in former smokers or never smokers (adjusted OR = 1.61; 95%CI: 0.30–8.60). In currently smoking women, the risk of poor to moderate work ability was nearly 15 times higher than in former or never smoking females (adjusted OR= 14.84; 95% CI: 3.07–26.42).

A statistically significant association was found between energy expenditure on leisure-time physical activity (kcal/week) and WAI (Tables 3 and 4). In the group of men who declared insufficient or no energy expenditure on leisure-time physical activity, the risk of moderate WAI was significantly higher than among those who were expending 1000 kcal/week or more on leisure-time physical activity (adjusted OR = 7.18; 95%CI: 1.10–31.09). Also, among women with low or no leisure-time physical activity, the risk of moderate or lower work ability was nearly 3 times

Table 3. Odds ratios (OR) and 95% confidence intervals (CI) for moderate work ability to selected health indicators in men

Variables	Men (n = 94)			
	Crude OR		Adjusted OR **	
	OR	95%CI	OR	95%CI
Body mass index (BMI) (kg/m^2)				
< 25	1.00	Referent	1.00	Referent
25–30	1.60	0.44–5.83	1.17	0.30–4.61
> 30	0.45	0.04–4.54	0.29	0.03–3.07
Smoking status				
Never and former smokers	1.00	Referent	1.00	Referent
Current smokers	2.14	0.43–10.56	1.61	0.30–8.60
Leisure-time physical activity				
None and insufficient	6.00	1.23–29.15*	7.18	1.10–31.09*
Sufficient	1.00	Referent	1.00	Referent
Fiber intake				
< 30g/day	27.63	3.44–221.71*		
≥ 30g/day	1.00	Referent		

* $p < 0.01$; ** In adjusted OR all other variables in the model were taken into account.

Table 4. Odds ratios (OR) and 95% confidence intervals (CI) for moderate or lower work ability to selected health indicators in women

Variables	Women (n = 93)			
	Crude OR		Adjusted OR**	
	OR	95%CI	OR	95%CI
Body mass index (BMI) (kg/m^2)				
< 25	1.00	Referent	1.00	Referent
25–30	3.53	1.25–9.92*	2.33	1.09–7.96*
> 30	2.88	0.56–14.85	1.37	0.36–8.15
Smoking status				
Never and former smokers	1.00	Referent	1.00	Referent
Current smokers	15.95	3.42–74.44*	14.84	3.07–26.42*
Leisure-time physical activity				
None and insufficient	3.23	1.19–8.77*	2.70	1.82–8.46*
Sufficient	1.00	Referent	1.00	Referent
Fiber intake				
< 30g/day	–	–	–	–
≥ 30g/day	1.00	Referent	1.00	Referent

* $p < 0.01$; ** In adjusted OR all other variables in the model were taken into account.

higher than in women reaching a satisfactory level of recreational physical activity (adjusted OR = 2.70; 95% CI: 1.82–8.46).

The multifactorial analysis to consider the effect of fiber intake on work ability could not be conducted because of low number of subjects in the analyzed groups. In men with fiber intake < 30 g/day, the risk of moderate work ability was 27.63 times higher than in men who consumed ≥ 30 g fiber/day; crude OR = 27.63; 95% CI: 3.44–221.71 (Table 3).

DISCUSSION

The average work ability index and excellent work ability was found in 38.3% of men and 39.8% of women. This results is not as good as that obtained by Ilmarinen [14] who among workers from the Western European countries found even 71.9% of employees with excellent abilities to work. In our study, 46.8% of men and 31.2% of women achieved good WAI score, whereas 14.9% of men and 19.3% of women obtained moderate and 9.7% of persons poor score. This reflects the negative difference in the work ability index between workers in Poland and West Europe. One of the most important factors responsible for this difference seems to be a poorer socio-economic situation in Poland as compared to West Europe. Healthy lifestyle involves patterns of health-related behavior, values, and attitudes adapted by groups of persons in response to their social, cultural and economic environments. Differences in living habits between individual categories of workers especially between blue- and white-collar workers are quite common [15]. 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 negative health behaviors in workers with lower social status [16]. Lallukka et al. in the study of 40 to 60 year-old employees of the City of Helsinki found that among women, mentally strenuous work and high job control were associated with healthy diet [17]. Work fatigue was associated with physical inactivity, whereas physically strenuous work and satisfaction with work-home interface were more often reported by physically active women. Work fatigue was associated with alcohol abuse among men. The recent studies carried out among Polish employees have also indicated that in blue-collar workers, particularly in those who performed heavy work, reluctance to participate in leisure-time physical activity was quite common. Among the study subjects, the level of education and the type of work undertaken as well as a high energy expenditure on occupational activity

determined the lack of interest in taking up leisure-time physical activity [18]. Additionally, Bojarska et al. [19] found smoking, obesity or poor diet to be the factors that largely increase the risk of high incidence of coronary arterial disease.

Besides, according to Ilmarinen et al. [20] age and physical work load are critical factors affecting the work ability of both genders. The previous studies indicated that the highest disease prevalence was associated with physically demanding occupations and those with mixed physical and mental demands, especially in men. Female auxiliary workers, domestic helpers and cooks, and also male installation and transport workers, showed the poorest health. The best health and work ability was observed in both men and women involved in mental work [21]. Moreover, in the follow-up study of municipal workers, unhealthy lifestyle was associated with a deterioration in work ability [22]. The WAI decline was explained by a decrease in vigorous leisure-time physical exercise. The WAI improvement was explained apart from other variables by an increased amount of vigorous leisure-time physical exercise. The observed beneficial influence of physical activity during leisure time on work ability is in agreement with the results of a 4-year follow-up, according to which the physical performance of workers over 45 years of age decreases in the absence of regular physical activity [14].

The results of the present study reveal that only 2.1% of men and 1.1% of women followed a combination of four modifiable lifestyle characteristics: non-smoking, healthy weight, adequate fiber consumption and leisure-time physical activity. The study of Reeves et al. as well as other studies have provided comparable findings of extremely low healthy lifestyle prevalence in inhabitants of the United States [10,23]. The results generated from nationally representative database indicate that just 3.0% of US adults meet healthy lifestyle criteria [10].

The results of this study illustrate very low prevalence of selected healthy lifestyle indicators in the study group. The worst situation was observed in physical activity patterns. Only 16.0% of men and 4.3% of women participated in leisure-time physical activities at the level providing health benefits. Sedentary life style 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 the residents of Łódź was found to be more extensive than among adults living in other countries, and particularly in West Europe [24,25]. It is estimated that 15 to 22.2% of the adult population in the USA take part in leisure-time physical activity at the satisfactory level [10,26], while the proportion of those leading a sedentary life style reaches even 68%, depending on the gender and ethnical group of the subjects studied [26]. In studies carried out to date, the highest percentage of responders 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 and Hungary (6.9%) [24]. This is of particular importance as, according to the outcome of current study, taking up physical activity of sports-recreational character in the recommended amount evidently influences a work ability (Tables 3 and 4). Moreover, the recently published studies have pointed to a strong association between insufficient physical activity and a lower work ability as well as worse subjective health perception in men and women examined [8,27]. As literature data show, the benefits associated with taking up leisure-time physical activity do not consist only in improvement of subjective work abilities and well-being, but also in reduction of the number of risk factors for developing cardiovascular diseases [8].

The prevalence of overweight and obesity is rising in Europe. Some surveys show that between 27 and 35% of adults in the European Union are overweight and between 7 and 12% are obese [28,29]. Our study confirms these findings. In our study group, 54.0% of men and 24.7% of women were overweight and 17.0% of men and 7.5% of women were obese. As indicated by literature data, unhealthy weight may lead to serious health complications, which can contribute to lowered work ability [1,30]. The results of our study showed that the risk for a moderate or poor WAI was over two times higher in the group of overweight women than in women with healthy weight (adjusted OR = 2.33; 95% CI: 1.09–7.96). This relationship was not statistically significant among men, but the trend of alterations remained.

Over the past 20 years, smoking has declined in Europe, but the results of previous and this study confirm still high prevalence of smoking in Poland [31]. Besides, like in other studies, a higher prevalence of smoking among men than among women was found [1,4]. It should also be emphasized that in our study, statistically significant relationship between smoking habit and poor WAI was recorded among women (adjusted OR = 14.84; 95% CI: 3.07–26.42). Among male current smokers, the risk of low WAI was about two times higher, but this result was not statistically significant. Other studies also confirm the negative relationship between smoking and health state and subjective health perception, which can negatively influence work ability [4].

In the previously cited study of Reeves et al., only 23.3% of persons consumed fruits and vegetables in adequate amounts, similarly in our study suitable fiber intake declared only 24.5% of men and 37.6% of women [10]. Numerous studies indicate the significance of diet in creation of better work ability [32]. One possible explanation of this finding is that people declaring correct diet habits are likely to have other healthy habits, e.g., take exercise regularly, do not smoke cigarettes, which prevent WAI deterioration. Another possibility is that proper diet may reduce the risk of serious diseases, improve health and thus influence work ability. This findings have important public health implications.

It should be emphasized that in our study, work ability was strongly associated with life style in men and women.

More attention needs to be paid to an analysis of the interaction between health behaviors and work ability. In our study, we could not distinguish which of lifestyle factors or WAI is the cause and which is the effect. Our study results are rather limited and cannot solve this problem, but we can expect that positive changes in lifestyle (especially increasing leisure-time physical activity) may improve ability to work.

In summary, the results of the study present a significant spread of negative lifestyle indicators in the investigated subjects. Because the risk of many chronic diseases is associated with unhealthy behaviors, the prevention of selected health patterns overlaps the prevention of a variety of noncommunicable diseases. The findings of the present study emphasize the need to develop programs aimed at increasing recreational physical activity as well as at managing smoking and unhealthy weight among people at economically productive age.

CONCLUSIONS

1. The results of the present study reveal that only 2% of men and 1% of women followed a combination of four modifiable lifestyle characteristics, including nonsmoking, healthy weight, daily fiber intake, and regular physical activity.
2. Unhealthy weight, smoking and lack of leisure-time physical activity were found to negatively influence work ability in the study participants.
3. Prophylactic schedules associated with the improvement of lifestyles should be addressed to all adults.
4. Future programs aimed at increasing work ability should take account of work- and lifestyle-related factors. The findings of the present study emphasize the need to target programs promotinging healthy lifestyle.

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