ORIGINAL ARTICLE

Correlations of work, leisure, and sports physical activities and health status with socioeconomic factors: a national study in Israel

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Objective: To evaluate levels of physical activities at work, leisure, and sports and to correlate them with socioeconomic and health factors.
Methods: Validated questionnaire administered to a random sample of 406 adults. Items covered demographic data, health status, smoking, and duration, frequency, intensity of physical activities. Indices of physical activity at work, leisure, and sports were analysed.
Results: Adults (both sexes) with poor self perceived health status and less than 13 years of education, regardless of their body mass index, perform no or few physical activities during their leisure time.
Conclusions: The correlations of physical activity with socioeconomic and health factors differ significantly for work, leisure, and sports. Physicians should differentiate physical activities by type and intensity during anamneses.

Although studies over the past 10 years have provided strong proof of the health benefits of physical activity, most of the population of the Western world continues to pursue a sedentary lifestyle.[1–4] People who achieve comparatively high exertion levels during exercise are at lower risk of coronary heart disease than those with low exertion levels.[5] Physical exercise may also help to prevent and manage such disease states as hyperlipidaemia, hypertension, obesity, diabetes mellitus, cancer, and osteoporosis, in addition to the age related decline in muscular strength.[6–9]

In a previous study[10] we showed that people with a lower level of education had more physical activity at work, and that men had a higher sports index than women. Furthermore, only 1.3% of those with a high physical activity score on the self report questionnaire claimed not to engage in regular physical activity on the anamnesis type question, compared with 17.5% on those with a low questionnaire score. However, because of restrictions in the study design, we were unable to perform a regression analysis to isolate the independent impact of the risk factors examined. The aim of this national study was to evaluate the relation of background characteristics, education, and income with work, leisure, and sports related physical activities and to correlate the questionnaire results with the degree of self perceived physical activity. These findings may have important implications for identifying patients at health risk in primary care practices.

METHODS

The sample consisted of 445 men and women aged 20 to 65 years living in Israel. The participants were randomly selected from the Israeli telephone database. The interview was conducted by telephone during 2001. Interviewers were trained in two sessions of three hours each. In the first session, the principal researcher (YF) explained the questionnaire, the objective of each question, and discussed potential answers and difficulties. The second session focused on practicalities, with the interviewers acting as both (successively) interviewers and responders. The programmed length of each telephone interview was three to five minutes, as determined in a preliminary trend. Interviewers were also instructed to register the telephone number of each subject who refused to respond and, if possible, their sex and age, and the reason for refusing (I never answer telephone surveys/I don't have time now/other/no reason provided).

Sample size

The sample size was calculated to answer the question: How large a sample is needed to estimate the proportion of people who lead a sedentary lifestyle and to provide enough subjects for a multivariate analysis? In our previous study, we found that 48.2% of the sampled population of 276 people led a sedentary lifestyle; 23.2% reported low physical activity, 19.6% moderate, and 8.0% high.[10] These rates were close to the 60% of people in the USA who report little or no leisure time physical activity.[11] We assumed that in our population, the rate would be 50%, which is also the conservative statistical option, thereby providing a margin for the detection of lower rates, like that expected for high physical activity. At a 95% confidence level and a 10% deviation for relative precision of the sample (that is, from 0.45 to 0.55), this yielded a minimum sample size of 96, according to the formula, $N = Z\ 2/1-\alpha/2\ P(1-P)/0.1^2$. To maintain the minimum sample size in each of the main study variables, we then multiplied this number by 4—the number of main variables (work, leisure, and sports indexes, and lifestyle categories)—obtaining a size of 386. In the event that some responders failed to answer all the questions, we increased the calculated minimum sample size by 20 (about 5%) to 406.

Sample selection

A large random sample of telephone numbers was collected from the Israeli telephone book. The first 406 men and women aged 20–65 years who had a good understanding of Hebrew or English constituted the study group. No other inclusion/exclusion criteria were defined during formation of the study group or at data collection.

Questionnaire

Questions on the duration, frequency, and intensity of physical activities were based on the Baecke questionnaire.[12] There were also items on body weight, education, income,

Table 1 Characteristics of the study group by index (mean (SD))

	Work			Sports			Leisure		
Variable	**Number**	**Index**	**p**	**Number**	**Index**	**p**	**Number**	**Index**	**p**
Age (y)									
<50	287	2.64 (0.81)	NS	295	2.17 (0.76)	0.014	295	2.23 (0.60)	0.007
⩾50	97	2.71 (0.67)		111	2.38 (0.84)		111	2.42 (0.70)	
Sex									
Male	173	2.7 (0.81)	NS	190	2.25 (0.84)	NS	190	2.27 (0.62)	NS
Female	211	2.62 (0.75)		216	2.21 (0.74)		216	2.30 (0.64)	
BMI									
<26	255	2.63 (0.75)	NS	264	2.30 (0.78)	0.016	264	2.31 (0.63)	NS
⩾26	124	2.70 (0.84)		137	2.09 (0.79)		137	2.23 (0.64)	
Education (y)									
0–8	13	3.17 (0.79)		18	2.15 (0.81)		18	2.52 (0.66)	
9–12	184	2.82 (0.81)	<0.001	197	2.10 (0.74)	0.005	197	2.27 (0.67)	NS
13+	187	2.44 (0.69)		191	2.36 (0.82)		191	2.28 (0.64)	
Income									
<5000 NIS	215	2.72 (0.84)	0.045	235	2.12 (0.77)	0.011	235	2.31 (0.67)	NS
⩾5001 NIS	162	2.57 (0.69)		163	2.34 (0.78)		163	2.23 (0.60)	
Health*									
1 and 2	69	2.55 (0.80)		78	1.92 (0.70)		78	2.14 (0.61)	
3	163	2.69 (0.75)	NS	172	2.23 (0.76)	<0.001	172	2.30 (0.63)	NS
4	152	2.67 (0.81)		156	2.37 (0.83)		156	2.34 (0.65)	
Smoking†									
No	272	2.58 (0.74)	0.002	287	2.29 (0.81)	0.009	287	2.30 (0.64)	NS
Yes	112	2.84 (0.86)		119	2.07 (0.71)		119	2.24 (0.61)	
Symptoms (n)‡									
1–2	148	2.71 (0.79)		156	2.29 (0.73)	0.009	156	2.33 (0.59)	
3–5	98	2.54 (0.70)	NS	104	2.13 (0.76)		104	2.31 (0.67)	NS
6+	45	2.64 (0.76)		51	1.83 (0.78)		51	2.09 (0.61)	

*Self perceived health status rated on a scale of 1—bad or ''not so good''; 2—fair; 3—good; 4—excellent. †Current smoking status. ‡Number of disease related symptoms in the past month. BMI, body mass index. NS = p>0.05.

smoking habits, and number of symptoms, if any, during the past 30 days. The Baecke questionnaire has been frequently used as a general measure of occupational and leisure (sports and exercise related and non-sports and non-exercise related) physical activity[13–17] and was found to be highly reliable and valid for both men and women.[12] It is also easy to administer and to provide an accurate assessment of heavy and light intensity activities, such as walking and bicycling.[18 19] For purposes of this study, we categorised the physical activities as work, leisure time, or sports related, and graded the intensity of each category according to Baecke's four item objective index.[12] The first item dealt with whether the participant participates in physical activities (yes/no), and if yes, which one they perform most often (by number of hours per week, number of months per year) and second most often, if any. The second item compared the physical activity of the subject with others of the same age (much more/more/the same/less/much less physical activity), and the third item covered sweating during physical activity (very often/often/sometimes/seldom/never). The first three items were scored on a scale of 1 to 5, as follows: 1 = no physical activity; 2 = low; 3 = medium; 4 = medium high, 5 = high. The mean score was defined as the overall physical activity intensity. In addition, subjects answered a fourth self perception (yes/no) item formulated by a group of three primary care physicians to resemble the question usually asked by primary care physicians in a typical anamnesis. It read as follows: Taking all your physical activities (sports, work, and leisure) in consideration, can you say that you participated in regular (habitual) physical activity? Participants who declared themselves to be physically inactive were asked to provide one or more reasons why. The main objective of item 6 was to determine reasons for conducting physical activity (not analysed here). It differed from item 4, which was included to quantify, in a subjective and relative way, the amount of physical activity.

Statistical analysis

All data were analysed with the SPSSWIN software, version 9.01b. Data for each section were compared among the variables. The data were analysed with χ^2 or Fisher's exact test. Comparisons of continuous data with a non-normal distribution were done with Student's *t* test. A two tailed p value of 0.05 was used to define significance for differences between groups and to calculate confidence intervals. Results were considered significant when p was less than 0.05. To evaluate the relation between possible different explanatory indices and the variability of the work, leisure, and sport

Table 2 Stepwise linear regression model of leisure index as dependent variable against possible explanatory variables

Independent variables	**B**	**β**	**R**	**Significance**
Intercept	1.41	–	–	<0.001
Work index	0.15	0.19	0.042	<0.001
Sports index	0.24	0.29	0.090	<0.001
Symptoms	0.02	−0.11	0.012	<0.05

$R = r^2 = 0.16$. Variables excluded from final equation because of lack of significance at p<0.05: age, sex, BMI, education, income, self perceived health status, current smoking status, and self perceived practice of regular physical activity.

Table 3 Stepwise linear regression model of work index as dependent variable against possible explanatory variables

Independent variables	B	β	R	Significance
Intercept	2.77	–	–	<0.001
Leisure index	0.25	0.21	0.042	<0.001
Self perceived practice of regular physical activity	0.23	0.14	0.020	0.004
Smoking	0.22	0.12	0.017	0.01
Education	0.06	−0.23	0.057	<0.001

$R = r^2 = 0.15$. Variables excluded from final equation because of lack of significance at $p<0.05$: age, sex, BMI, income, self perceived health status, and number of disease related symptoms in the past month.

indices, three stepwise regression models were defined. The dependent variable for each model was by turn the selected index. Independent variables used in the model were all those showing a significant relation in the univariate analysis. In the models, values of negative questions were reverted.

RESULTS

All 406 subjects approached completed the questionnaire. Table 1 shows the characteristics of the study participants by physical activity variables. No significant statistical differences between men and women were detected. Younger subjects (less than 50 years) had significantly lower indices for sports and leisure. There was a significant negative correlation between body mass index (BMI), smoking, and sports index: the higher the BMI and the greater the frequency/amount of smoking, the lower the likelihood of participation in sports activities. Smoking was also positively correlated with a higher work index ($p<0.002$). Work activity level decreased with level of education, whereas sports activity increased. The sports index was also directly correlated with monthly income status: income higher than 5000 NIS (at the time of the study 4 NIS equalled US$1.00) was associated with a significantly higher sports activity index and lower physical activity at work index. The healthier the participants felt subjectively, and the fewer symptoms they reported in the past month, the more they tended to participate in work and sports physical activities.

Regression analysis (tables 2–4)

The model used to study the dependent variable leisure index (table 2) explained 16% of the variance. In this model of the three variables entered in the last step, work index and sports index were positively correlated with leisure index, and number of symptoms was negatively correlated. Table 3 shows the model used for the dependent variable work index, which predicted about 15% of the variance. Explanatory variables entered in the last step were leisure index, self perceived practice of regular physical activity, and smoking (positive correlations), and education (negative correlation). The model for the sports index (table 4) explained 38% of variance. In this model, five variables were positively correlated with the dependent variable: leisure index, self perceived practice of regular physical activity, self perceived health status, age, and education.

DISCUSSION

Our findings on sex disagree with previous studies, which reported that women tend to be more sedentary than men and less likely to achieve high sport intensity scores.[13 14 20] Other authors reported that women tend to participate in more moderate sports activities than men, and increase their sports activities after age 50 years.[15 17] However, all these findings have been questioned because of possible defects in the study methods.[21]

The model for the work index was the only one in which smoking maintained its positive correlation with physical activity after controlling for other variables. We expected a stronger negative correlation between smoking and sports and leisure indices on the basis of the well established finding that compared with their non-smoking counterparts, smokers have a reduced amount of total leisure time physical activity.[22] However, this was not confirmed in our multivariate analysis. Our regression models showed that the lower the level of education, the greater the degree of physical activity at work and the lower the degree of physical sports activity. A positive correlation between more years of education and more sports activities was reported in other studies as well.[23–25] On univariate analysis, we found that the higher the income, the greater the tendency to perform less physical activity at work and more at sports. Accordingly, international research studies found that blue collar employees and low income populations typically exhibit lower rates of leisure time physical activity.[23] The findings among the background variables may be related, as people who are more educated tend to earn more money and to engage in occupations entailing minimal manual labour. Thus, this study, conducted in a representative randomly selected sample, together with data from previous reports,[20–26] may have important implications for defining the target population for medical education for physical activities: adults between the age of 20 and 50 years of both sexes with a low

Table 4 Stepwise linear regression model of sports index as dependent variable against possible explanatory variables

Independent variables	B	β	R	Significance
Intercept constant	0.47	–	–	0.032
Leisure index	0.22	0.18	0.043	<0.001
Self perceived practice of regular physical activity	0.75	0.47	0.237	<0.001
Self perceived health status	0.10	0.12	0.210	0.003
Age (<50 or >50 y)	0.43	0.07	0.008	0.075
Education	0.04	0.14	0.030	<0.001

$R = r^2 = 0.38$. Variables excluded from final equation because of lack of significance at $p<0.05$: Work index, age, sex, BMI, income, current smoking status, and number of disease related symptoms in the past month.

self perceived health status and less than 13 years of education (with increasing risk with a decrease in years of education). This group, irrespective of BMI, tends to earn a comparatively low income and performs no or few leisure time activities.

It is noteworthy that this study used the Baecke questionnaire,[12] a short questionnaire for the measurement of habitual physical activities in epidemiological studies. Although initially used in a Dutch population (up to age 32), other authors used the same questionnaire for the screening of physical activities of an urban adult population over age 50 years,[15] much like the population in this survey.

Participants who displayed more symptoms engaged in less leisure time and sports activities (only leisure activities in the regression model), supporting the notion that sports activity has positive effects on health, or that people with fewer symptoms have fewer barriers to engage in sports and leisure activities. Analysis of the interaction among the indices showed that the performance of leisure physical activities was positively correlated with the level of activities at work and sports, and vice versa. By contrast, no correlation was found between the levels of physical activity at work and sports. These findings suggest that physicians should differentiate among the different types of physical activities (work, leisure, and sport) and their frequency and intensity—details they often omit during anamneses because of lack of time. Usually they ask one simple question, such as ''Do you practise regular physical activity?'' Although our study suggests that those who answer ''yes'' to this question perform significantly more physical activities, the value of this indicator is questionable because it predicts only 2% of the variance in physical activities at work, 20% in sports activities, and 0% in leisure activities. Thus, the rate of regular physical activity may be even lower than suspected on the basis of self perception.

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