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Characteristics of leisure sports activity in a population with high cardio-vascular disease mortality

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Authors' Contribution:

- A Study Design
- B Data Collection
- C Statistical Analysis
- D Data Interpretation
- E Manuscript Preparation
- F Literature Search
- G Funds Collection

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abstract

- Background** This paper will study factors behind leisure sports activity. Physical inactivity is a cause of cardiovascular diseases; therefore, it is important to know the factors related to sporting activity. The study is conducted on a sample from Estonia, which is a country with very high mortality from cardiovascular diseases.
- Material/Methods** The study involved 1184 participants – 639 women (aged 45.7 ±12.4 years) and 545 men (aged 45.5 ±12.1 years). The following information was gathered: leisure sports activity, age, sex, marital status, ethnicity, income, education, body mass index (BMI), smoking, alcohol consumption and physical activity at work. Participants were divided into three groups using a leisure sports activity level: 1) inactive; 2) insufficient sporting activity; 3) at least minimal recommended sporting activity.
- Results** Statistically significant relationship ($p > 0.05$) was found between leisure sports activity and ethnicity, education, and income. This relationship is confirmed for men and women. In addition, statistically significant relationship was found between leisure sports activity and age, marital status, smoking, and physical activity at work for men.
- Conclusions** Policymakers should pay more attention to people who belong to the risk groups of low physical activity.
- Key words** leisure, sports activity, MET, Estonia

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INTRODUCTION

Each year cardiovascular diseases (CVD) cause nearly half of all deaths in Europe (49%; 4.39 million) [1]. The morbidity and mortality from CVD are the highest in Eastern Europe, including Estonia [2, 3]. The National Health Plan for Estonian Population in 2009-2020 states that physical activity is too low in Estonia, and this is related to high mortality from cardiovascular diseases [4].

It is well known that regular physical activity reduces the risk of CVD [5, 6]. Physical inactivity is one of the most important public health problems of the 21st century [7] and is identified as the fourth leading risk factor for global mortality [8]. In order to avoid problems caused by physical inactivity, it is recommended for adults to do cardiorespiratory exercises using moderate intensity or combine different intensities where energy expenditure is at least 500-1000 METs/min/week [9]. Physical activity is related to many factors such as socio-demographic characteristics, psychological, behavioural, environmental factors and childhood physical activity [10,11,12,13]. A higher level of physical activity is more common among men, individuals with higher education and higher income level, single individuals, individuals with no children, of younger age, non-smoking and in normal weight [10, 14, 15, 16].

Many previous studies have investigated determinants of physical and sporting activity, and there are also some studies on Estonian data. Previous studies on Estonian data have investigated motivation to be physically active [17], determinants of children's physical activity [18], yet previous studies have not used database with such a large sample size as in this study and have not studied the role of so many characteristics. The mortality from cardiovascular diseases is very high in Estonia compared to other European countries. This paper will study the relationship between leisure sports activity and socio-demographic, anthropometrical and behavioural characteristics in the Estonian urban population.

MATERIAL AND METHODS

The survey was carried out in 2007-2009. The procedures followed were in accordance with the Helsinki Declaration of 1983. The study was approved by the Tallinn Ethics Committee. It is a cross-sectional population-based survey covering the capital region of Tallinn in Estonia. The random sample was drawn from the (total) population of Tallinn. The total population of Estonia is approximately 1.3 million, and the population in Tallinn is around 400,000. The calculation of the sample size was based on the protocol of the World Health Organisation/Countrywide Integrated Non-communicable Disease Intervention (CINDI) Programme [19]. A special computer program for randomized selection was used to select potential participants. The participants were invited by mail with up to two follow-up letters for non-respondents. The response rate was 54% for men and 64% for women. The study involved 1184 participants – 545 men (aged 45.5 ± 12.1 years) and 639 women (aged 45.7 ± 12.4 years). Participants were asked to answer a questionnaire about their leisure sports activity and other characteristics, while their body mass and height were measured in laboratory. The following information was gathered: leisure sports activity, age, sex, marital status, ethnicity, income, education, body mass index (BMI), smoking, alcohol consumption and physical activity at work.

Leisure sports activity was measured using questions: “Have you done regularly sport during the last 12 months”, and if “yes” then “What kind of sport do you do?” and “How many hours per week?”. Leisure sports activity was measured using metabolic equivalent (MET) units. MET is a unit that expresses energy cost during physical activity; one MET is equal to oxygen consumption of 3.5 ml/min/kg [20]. Participants were divided into three groups using a leisure sports activity level: 1) inactive, 0 MET/min/week, 2) insufficient sporting activity, 1-499 MET/min/week, 3) at least minimal recommended sporting activity, ≥ 500 MET/min/week. The methodology was based on ACSM recommendations, which recommends the minimal sporting activity to be 500 MET/min/week [9]. The reported sporting activity by kind of sport and frequency was transferred into MET units using Ainsworth’s et al. [20] “Compendium of physical activities”.

Participants were divided into four groups based on the body mass index: underweight <18.5 kg/m², normal weight 18.5-24.9 kg/m², overweight 25.0-29.9 kg/m², obesity ≥ 30.0 kg/m². Alcohol and smoking consumption were evaluated by the following questions: “How frequently do you consume alcoholic drinks?” and “Do you smoke cigarettes?”. Physical activity level at work was measured by the question: “How much do you do physical work at work?”.

The Chi-square test was applied to investigate whether leisure sports activity and various individual characteristics were statistically significantly related.

RESULTS

The results of the Chi-square tests for women and men are presented in Table 1 and Table 2, respectively. Tables report the list of characteristics analysed in the first column, the frequency of characteristics in the second column, the frequency of characteristics by physical activity groups in columns three to five and the results of Chi-square test in the last column.

Table 1. Women with different levels of leisure sports activity and their socio-demographic, anthropometrical and behavioural characteristics.

	%	Sporting activity			Level of significance (χ^2 -test) %
		Group I: physically inactive %	Group II: insufficient sporting activity %	Group III: at least minimal sporting activity %	
Age (n = 593)					
20-29 (n = 71)	12.0	69.0	9.9	21.1	
30-39 (n = 131)	22.0	67.2	16.0	16.8	
40-49 (n = 140)	23.6	57.1	17.9	25.0	
50-59 (n = 159)	26.8	71.7	15.7	12.6	
60-69 (n = 92)	15.5	73.9	12.0	14.1	n.s
Total		67.0	14.9	18.1	
Marital status (n = 634)					
Single/single living (n = 207)	32.7	71.0	11.6	17.4	

Married/cohabiting (n = 427)	67.3	65.1	16.4	18.5	n.s
Ethnicity (n = 637)					
Estonian (n = 427)	67.0	61.2	16.1	22.7	
Russian (n = 95)	14.9	72.2	13.7	14.1	
Other (n = 115)	18.1	82.1	12.8	5.1	p < 0.05
Education (n = 635)					
Tertiary (n = 260)	40.1	61.2	17.7	21.2	
Secondary (n = 351)	55.3	69.2	14.0	16.8	
Primary or less (n = 24)	3.8	95.8	-	4.2	p < 0.05
Income (per family member) (n = 630)					
Less than 224 euro (n = 67)	10.6	79.1	10.5	10.5	
> 224-320 (n = 141)	22.4	71.6	12.1	16.3	
> 320-640 (n = 317)	50.3	67.8	14.5	17.7	
> 640 (n = 105)	16.7	51.4	21.9	26.7	p < 0.05
Body mass index (n = 637)					
Underweight (n = 18)	2.8	72.2%	11.1%	16.7%	
Normal weight (n = 280)	44.0	63.6%	13.6%	22.9%	
Overweight (n = 176)	27.6	66.5%	18.2%	15.3%	
Obese (n = 163)	25.6	73.0%	14.1%	12.9%	n.s
Smoking (n = 637)					
Yes, regularly (n = 120)	18.8	74.2	11.7	14.2	
Non-regularly (usually less than 1 cigarette per day) (n = 39)	6.1	64.1	12.8	23.1	
No (n = 478)	76.5	65.5	15.9	18.6	n.s
Alcohol consumption (n = 637)					
Every day or almost every day (n = 5)	0.8	80.0	-	20.0	
3-4 times a week (n = 11)	1.7	63.6	27.3	9.1	
1-2 times a week (n = 131)	20.6	55.7	17.6	26.7	
1-2 times a month (n = 254)	39.9	68.9	13.8	17.3	
Less frequently than once a month (n = 179)	28.1	73.2	14.0	12.9	
I don't know (n = 57)	8.9	64.9	15.8	19.3	n.s
Physical activity at work (n = 637)					
Not working (n = 147)	23.0	67.4	13.6	19.1	
My job is done mostly sedentary (n = 263)	41.3	65.0	14.1	20.9	
I walk quite a lot at work (n = 166)	26.1	68.7	18.1	13.3	
I walk and carry things a lot (n = 61)	9.6	70.5	13.1	16.4	
I have heavy physical work (n = 0)	-	-	-	-	n.s

χ^2 -test presents the level of significance from the Chi-square test between the listed characteristic and physical activity

Table 2. Men with different levels of leisure sports activity and their socio-demographic, anthropometrical and behavioural characteristics.

	Sporting activity				Level of significance (χ^2 -test) %
	%	Group I: Physically inactive %	Group II: insufficient sporting activity %	Group III: at least minimal sporting activity %	
Age (n = 531)					
20-29 (n = 70)	13.2	38.6	17.5	37.1	
30-39 (n = 107)	20.2	60.2	17.4	22.4	
40-49 (n = 129)	24.3	59.5	17.5	23.1	
50-59 (n = 137)	25.8	70.6	16.6	12.9	
60-69 (n = 88)	16.6	70.8	15.1	14.1	p<0.001
Total		59.4	18.9	21.7	
Marital status (n = 534)					
Single/single living (n = 112)	21.0	56.3	12.5	31.3	
Married/cohabiting (n = 422)	79.0	60.2	20.6	19.2	p < 0.05
Ethnicity (n = 534)					
Estonian (n = 309)	57.9	53.4	22.0	24.6	
Russian (n = 168)	31.5	65.5	15.5	19.1	
Other (n = 57)	10.7	73.7	12.3	14.0	p < 0.05
Education (n = 533)					
Tertiary (n = 182)	34.1	45.1	22.5	32.4	
Secondary (n = 325)	61.0	65.0	17.9	17.2	
Primary or less (n = 26)	4.9	88.5	7.7	3.8	p < 0.001
Income (per family member) (n = 530)					
Less than 224 euro (n = 47)	8.9	70.2	17.0	12.8	
> 224-320 (n = 66)	12.5	75.8	6.1	18.2	
> 320-640 (n = 259)	48.9	61.4	20.1	18.6	
> 640 (n = 158)	29.8	46.2	22.2	31.7	p < 0.001
Body mass index (n = 534)					
Underweight (n = 3)	0.6	100	0%	0%	
Normal weight (n=159)	29.8	52.8	21.4	25.8	
Overweight (n = 246)	46.1	59.8	18.7	21.5	
Obese (n = 126)	23.6	65.9	16.7	17.5	n.s.
Smoking (n = 534)					
Yes, regularly (n = 187)	35.0	69.0	15.5	15.5	
Non-regularly (usually less than 1 cigarette per day) (n = 24)	4.5	62.5	16.7	20.8	
No (n = 323)	60.5	53.6	21.1	25.4	p < 0.05
Alcohol consumption (n = 534)					
Every day or almost every day (n = 27)	5.5	66.7	18.5	14.8	
3-4 times a week (n = 60)	11.2	60.0	21.7	18.3	
1-2 times a week (n = 207)	38.8	58.5	19.3	22.2	
1-2 times a month (n = 160)	30.0	58.8	17.5	23.8	
Less frequently than once a month (n = 47)	8.8	59.6	23.4	17.0	
I don't know (n = 33) 8,9 %	6.2	60.6	12.1	27.3	n.s
Physical activity at work (n = 534)					
Not working (n = 72)	13.5	57.0	19.4	23.6	
My job is done mostly sedentary (n = 177)	33.1	48.0	20.9	31.1	
I walk quite a lot at work (n = 146)	27.3	56.2	25.3	18.5	
I walk and carry things a lot (n = 104)	19.5	78.9	8.7	12.5	
I have heavy physical work (n = 35)	6.6	77.2	11.4	11.4	p < 0.001

χ^2 -test presents the level of significance from the Chi-square test between the listed characteristic and physical activity

It was found that 63% of participants were physically inactive (Group I); 17% do sport, but the training load was not enough (Group II); and 20% practiced sport at least at the minimal recommended level (Group III). Among women, 67% belonged to the first group; 15% to the second group; and 18% to the third group. Men's sporting activity was higher compared to women: 59% of men belonged to the first group; 19% to the second group; and 22% to the third group. The most popular sporting activity was swimming (47%) followed by cycling (14%), gym training (13%), jogging (11%) and aerobics (9%). Overweight was more widespread among men than women, 70% and 53% respectively. 23% of women and 56% of men consumed alcohol at least once a week. 25% of women and 40% of men smoked cigarettes regularly or seldom.

Women's leisure sports activity was related ($p < 0.05$) to ethnicity, education and the income level. Less Estonian women were physically inactive (Group I - 61%) and more belonged to the highest activity group (Group III - 23%) compared to the other ethnicities (Group I - 82% and Group III - 5%). There was a positive relationship between education and sporting activity. Similarly to education, a positive relationship also occurred between income and sporting activity: in the lowest income group 11% of women had minimal or higher sporting activity, while in the highest income group 27% of women had minimal or higher sporting activity. The percentage of physically inactive women decreased with the income level from 79% to 51%.

Men's leisure sports activity was statistically significantly related to age, marital status, ethnicity, education, income level, and smoking and physical activity at work. Men's leisure sports activity was greatest at age 20-29, where 38% of men were physically inactive and 37% of men had minimal or higher sporting activity. The percentage of men belonging to the first group increased with age, while the percentage of men belonging to the third group decreased with age. Similarly to women, Estonian men were more physically active than Russian men and men from other ethnicity groups. 54% of Estonian men belonged to the first group and 25% to the third group, while 66% of Russian men belonged to the first group and 19% to the third group, and 74% of men from other ethnicities to the first and 14% to the third group. Single men were more physically active than married or cohabiting men (31% of single men belong to the third group and 19% of married or cohabiting men to the third group).

Men's leisure sports activity increased with the level of education: 32% of men with tertiary education and 4% of men with primary education belonged to the third group. A similar trend appeared for the income level: leisure sports activity increased with the level of income. 32% of men from the highest income group and 13% of men from the lowest income group belonged to the third physical activity group. 35% of males smoked regularly and 5% non-regularly, while 61% were non-smokers. Non-smoking men were physically more active than smokers: 25% of non-smokers and 16% of smokers belonged to the third group. Leisure sports activity and physical activity at work was negatively related: when physical activity at work was low then leisure sports activity was high. 31% of men whose work was done mostly sitting and 11% of men who did heavy physical work belonged to the third physical activity group.

DISCUSSION

The results of studies investigating physical and/or sporting activity are often incomparable, as the applied methodology is different. Some studies use various questionnaires to measure physical activity, some use objective measuring with devices like a pedometer or an accelerometer. Estimating physical activity is problematic as the definition of physical activity is very wide and contains activities like recreational activities, activities at work, going to work and back home, and housework [21]. The percentage of people belonging to the highest physical activity group in this study was at a similar level as in previous studies, but the percentage of people who did not participate in any sporting activity was found to be higher in this study than in previous studies [22, 23]. One possible explanation for this discrepancy is that our study covered population from the capital region, which is a lot bigger than other cities in the country. Physical activity tends to be lower in big cities than in small towns [11]. The given results about sporting activity are well in line with a previous study in which it was found that less than 40% of population were regularly sporting in Europe and 25% in Estonia. Estonia holds 20th place among 25 European countries in terms of sporting activity [24]. There are more physically passive people in Estonia than in Greece [25], Denmark [26], Germany [27], France [28], the Czech Republic [11] or the UK [29].

The most popular sporting activities in our study were partly in line with the previous study by Tekkel et al. [22]. The most popular sporting discipline was swimming (47%). However, there were differences between disciplines in terms of activity frequency. Men's regular sporting activity was higher than women's, which is the same result as in previous studies [30, 31]. Van Tuyckom et al. [24] found that men were more likely to be engaged in regular sporting activity than women in most of the studied countries, but there were some countries like Finland, Sweden, Denmark and the Netherlands where women were sporting more.

We found that sporting activity decreased with age, which corresponds to previous studies [10, 15]. Our study found that men's sporting activity was highest at the age of 20-29 years, and women's sporting activity at the age of 40-49 years. One of the reasons why women might be more active at the age of 40-49 years is that then they have more time for themselves as children have become older [10].

We found that the percentage of overweight women was similar to the percentage found in other studies, but we found the percentage of overweight men to be higher in this study than in previous studies [22, 32]. Our study found the percentage of obese people to be higher than in previous studies [22, 32]. Eurostat [32] reports that Estonia is on the third place out of 18 countries from Europe in women's obesity, 21% of women are obese in Estonia. Our paper confirms the relevance of this problem, because even more women, 26%, are obese according to our study. In addition, we also found overweight and obesity problem to be severe for men: 46% of men were overweight and 24% of men were obese. These percentages were higher than those found by Eurostat [32], where 39% of men were overweight and 16% of men were obese. Our methodology can explain the higher obesity propensity; we measured weight and height in laboratory, while other studies collected data usually by self-reporting. Self-reported BMI is inappropriate for measuring overweight

and obesity, because people tend to under-estimate their weight and over-estimate their height [33, 34, 35, 36].

This study did not find a statistically significant relationship between sporting activity and the body mass index. However, the highest physical activity was found among people from the normal body mass index group. This result is in line with a previous study where it was found that overweight and obese people had lower sporting activity [16].

The prevalence of smoking (regular and non-regular) was 34%, which corresponds to the findings of Tekkel et al. [22]. The Estonian smoking rate is at an average level in Europe, 24-30% in European countries and 26% in Estonia [11, 26, 27]. Our study found a statistically significant relationship between sporting activity and smoking among men. The smokers' physical activity was lower than non-smokers'. No statistically significant relationship was found between smoking habits and sporting activity for women. The results of the current study are partly in line with the previous study where the relationship between smoking and physical activity was confirmed for the Finnish population [10]. Previous findings indicated that the relationship between smoking and physical activity was ambiguous; there are findings that confirm a negative relationship and those that cannot find a statistically significant relationship [37]. Audrain-McGovern et al. [38] found that higher levels of physical activity may reduce the risk of smoking, and that physical activity has a protective effect against smoking.

The Estonian alcohol consumption rate is higher than in other Baltic countries, in Latvia and Lithuania [39]. Our study did not find a statistically significant relationship between alcohol consumption and leisure sports activity, while some previous studies have confirmed it [25, 40, 41]. Authors explain this by the mentality "Work hard, play hard" [25]. In addition, it is believed that higher physical activity is accompanied with higher social activity, which in turn is related to more frequent alcohol consumption [36].

Our study found that single or single living men had higher sporting activity than married or cohabiting men. This finding was well in line with a previous study by Yang et al. [10]. We also found that people with a higher level of education have higher physical activity, which corresponds to previous findings [14, 42, 43]. One of the explanations for this relationship can be due to higher income and flexible working conditions among people with higher education, which overall increases sporting opportunities. We found that men with higher income were physically more active, and ethnicity was also an important factor affecting physical activity, which is in line with previous studies [14, 44, 45, 46]. In addition, we found that men who worked in occupations with high physical activity have lower leisure sports activity. This finding is also in line with previous findings [10, 47].

CONCLUSIONS

Our study found that regular leisure sports activity is low in Estonia. This finding is in line with previous findings. The country has also very high mortality from cardiovascular diseases and low sporting activity is one of the important risk factors behind it. The paper brings out characteristics that are statistical-

ly significantly related to sporting activity, which enables addressing health risks due to physical inactivity.

We found a statistically significant relationship between leisure sporting activity and ethnicity, education, and income. This relationship is confirmed for men and women. In addition, a statistically significant relationship was found between leisure sporting activity and age, marital status, smoking, and physical activity at work for men. The profile of the least physically active people can be brought out — woman, at the age of 50 or more years, from non-titular ethnicity, with little education, with low income, obese, and regularly smoking. The profile of the most physically active people is — man, at the age of 20-29 years, from titular ethnicity, single/single living, with higher education, with high income, non-smoker, and with low physical activity at work. The public sector should contribute more to eliminate economic obstacles for sporting, as low income is related to low leisure sporting activity. As people with less education tend also to be less active in sports, it is important to pay more attention to health and physical activity already in the programs of primary schools. Different ethnicity groups also need different attention in campaigns aimed to improve leisure sporting activity.

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