

# Low physical activity as a behavioral risk factor in men of open urban population and its association with prevalence of coronary heart disease

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## Summary

### Objective

*To determine the associations of low physical activity (LPA) and ability to work in men of open urban population with high prevalence of coronary heart disease (CHD)*

### Materials and methods

*The study was conducted in the framework of cardiological screening among males aged 25-64 years in a representative sample (1000 people) taken from the electoral lists of one of the administrative districts of Tyumen, the response amounted to 85.0%. Selection of various forms of CHD was carried out based on standard methods used in epidemiological studies. CHD detection was performed according to extended epidemiological criteria and included "certain" coronary heart disease (CCHD) and "possible" CHD (PCHD). Questioning of participants was conducted using WHO-MONICA questionnaire "Knowledge and attitude towards their health".*

## Results

*According to the results, men aged 25-64 years with the presence of CCHD and CHD detected using extended epidemiological criteria tried to make physical exercises and estimated their physical activity as the passive one. At the same time, people with CHD had reduced physical activity and ability to work during the last 12 months.*

### Key words

*Epidemiological study, open urban population, males, low physical activity, work capacity.*

## Introduction

According to epidemiological studies, low physical activity (LPA) is an independent cardiovascular disease (CVD) risk factor and it takes leading positions between reversible causes of total and cardiovascular mortality of the world population [1, 2, 3]. In the developed countries the consequences of scientific-technical revolution caused muscular deficiency, since physical activity in industry and routine life has reduced, physical work has been substituted by machines, and everyday life has become more comfortable [4, 5, 6]. As the consequence of LPA, hypokinesia impairs the functioning of organs and systems, weakens the immune system, reduces physical and intellectual work capacity, and in the end leads to the development of several diseases like CVD and to lifespan shortening [7, 8]. According with the World Health Organization (WHO), LPA together with unhealthy food and smoking are the leading causes of development of main non-infectious diseases like coronary heart disease (CHD) [9].

The objective of this study was to determine the associations of LPA and work capacity in men of open urban population with high prevalence of CHD.

## Materials and methods

Single moment epidemiological study was conducted in the framework of cardiological screening among males aged 25-64 years belonging to the open urban population of Tyumen. A representative population that involved 1000 participants was taken from the electoral lists of one of the administrative districts of Tyumen, it included 250 men of each age group (25-34, 35-44, 45-54, 55-64 years), the response amounted to 85.0%. Questioning of participants was conducted using WHO-MONICA-psychosocial questionnaire [3]. The questionnaire "Knowledge and attitude towards their health" included 33 questions, the current study include questions related to LPA and work capacity.

Detection of various forms of CHD was carried out based on standard methods used in epidemiological studies (The WHO questionnaire for stable angina, electrocardiography (ECG) at rest and Minnesota cod-

ing). We selected "certain" coronary heart disease (CCHD) and "possible" CHD (PCHD).

In order to conduct correct comparative analysis with the results of other epidemiological studies, we performed standardization of variables using direct standardization method. To standardize obtained data during analysis we used the age structure of Russian urban population between 25 and 64 years. Statistical analysis was done using SPSS 11.5 Statistics, version 22.0 software.

## Results and discussion

19.0% of male population answered positively to the question "Do you make any physical exercises apart from physical exercises at work?", and 22.1% of respondents answered negatively ("No, I don't need it") to this question. More than a half of male population of Tyumen (56.7%) did not use to make physical exercises, even if considered it necessary, and 15.0% tried to make efforts of physical activity that were useless. Minimal amount of participants (1.1%) reported medical contraindications for physical exercises (Table 1).

The answer: "I should have made physical exercises, but I don't make them" was significantly less frequent in the group of older people and there were significant differences between the age groups of 55-64 years with 25-34 years and 35-44 years (37.9% vs 56.5%,  $p < 0.01$  and 37.9% vs 52.6%,  $p < 0.05$ , respectively) and with the frequency of this answer in general population (37.9% vs 48.1%,  $p < 0.01$ ). Unsuccessful attempts of physical activity were significantly more frequent in older generations of 45-54 years and 55-64 years, comparing with the younger age group of 25-34 years (9.0% vs 19.0%,  $p < 0.001$  and 9.0% vs 20.6%,  $p < 0.001$ , respectively), and in general population (9.0% vs 16.6%,  $p < 0.001$ ) (Table 1).

Physical activity at free time increased with age, reached its maximum in the older age group (55-64 years), and it had significant differences with younger age groups (25-34 years and 35-44 years (31.8% vs 18.6%,  $p < 0.05$  and 31.8% vs 15.8%,  $p < 0.001$ , respectively) and with general population (31.6% – 23.6%,  $p < 0.05$ ) (Table 1).

Table 1. Attitude to physical activity of males aged 25-64 years depending on their age

Question/attitude	Age groups										
	25-34		35-44		45-54		55-64		25-64		ASV
	Abs	%	Abs	%	Abs	%	Abs	%	Abs	%	%
Do you make physical exercises apart from physical exercises at work?											
Not, I don't need it	25	14,1	31	13,6	31	13,4	40	18,7	127	14,9	22,1
I should have made physical exercises, but I don't make them	100	56,5	120	52,6	108	46,8	81	37,9***	409	48,1**	56,7
I tried but unsuccessfully	16	9,0	37	16,2	44	19,0***	44	20,6***	141	16,6***	15,0
I make them regularly	34	19,2	38	16,7	47	20,3	44	20,6	163	19,2	19,0
According with the doctors, I have contraindications for making physical exercises	2	1,1	2	0,9	1	0,4	5	2,3	10	1,2	1,1
How do you spend your free time?											
Actively	33	18,6	36	15,8	64	27,7*	68	31,8***	201	*23,6	22,1
In different ways	107	60,5	140	61,4	113	48,9*	110	51,4	470	55,3	53,4
Physically passively (laying, sitting, watching TV, reading, writing, making crafts)	35	19,8	50	21,9	48	20,8	35	16,4	168	19,8	20,0
I have no hobbies	2	1,1	2	0,9	6	2,6	1	0,5	11	1,3	1,3
Did your physical activity (mobility, sports, etc) change during the last 12 months?											
Yes, it started to be more active	37	20,9	32	14,0	19	8,2**	18	8,4**	106	12,5*	14,2
It did not change	103	58,2	145	63,6	159	68,8*	115	53,7**	522	61,6	61,2
It started to be less active	37	20,9	49	21,5	53	22,9	81	37,9***	220	25,9**	24,4
How do you estimate your physical activity comparing with the other people of the same age?											
I started to be more active	23	13,0	20	8,8	30	13,0	27	12,6	100	11,8	11,8
I started to be a bit more active	49	27,7	61	26,8	69	29,9	59	27,6	238	28,0	27,9
I am as much active as the others	82	46,3	109	47,8	94	40,7	79	36,9*	364	42,8	43,9
I started to be a bit more passive	22	12,4	32	14,0	34	14,7	30	14,0	118	13,9	13,6
I started to be much more passive	1	0,6	6	2,6	4	1,7	19	8,9	30	3,5	2,8
Did your work capacity change during the last 12 months?											
It increased	31	17,5	20	8,8*	17	7,4**	10	4,7***	78	9,2*	10,8
It did not change	129	72,9	174	76,3	166	71,9	108	50,5***	577	67,9***	69,8
It decreased	17	9,6	31	13,6	39	16,9	68	31,8***	155	18,2*	16,0
It decreased significantly	0	0,0	3	1,3	9	3,9	28	13,1***	40	4,7***	3,4

Comment: Significance of differences between the age group of 25-34 years and other age groups is signed with \* in the upper right corner of the table cell, significance of differences between the age group of 35-44 years and other age groups is signed with \* in the lower right corner of the table cell, significance of differences between the age group of 45-54 years and other age groups is signed with \* in the upper left corner, significance of differences between the age group of 55-64 years and other groups is signed in the lower left corner.

\* -  $p < 0,05$ , \*\* -  $p < 0,01$ , \*\*\* -  $p < 0,001$ ; ASV – age-standardized variable.

Physical activity did not change during the last 12 months in the majority of men of Tyumen population (age-standardized variable (ASV) 61.2%), whereas one quarter of the population started to be less active (ASV 24.4%) and 14.2% of people started to be more active (Table 1).

The population looked more active due to the presence of young age groups. For example, the older age groups (age 45-54 and 55-64 years) and general population had significantly lower values of the dynamics of physical activity during the last year (8.2% vs 20.9%,  $p < 0.01$ , 8.4% vs 20.9%,  $p < 0.01$ , 12.5% vs 20.9%,  $p < 0.05$ , respectively). The biggest number of "It did not change" answer was found in the age group of

45-54 years, and it had significant differences with the age groups of 25-34 and 55-64 years (68.8% vs 58.2%,  $p < 0.05$  and 68.8% vs 53.7%,  $p < 0.01$ , respectively). The answer "I started to be less active" was present the most frequently in the group of more advanced age (55-64 years) and had significant differences with all the other age groups and the frequency in general population (37.9% vs 25.9%,  $p < 0.01$ ) (Table 1).

More than 80% of men of the population considered themselves more active or the same active comparing with the other people of the same age (ASV 39.7% and 43.9%, respectively). 16.4% of Tyumen men described themselves more passive comparing with the other people of the same age. Around 75% of men

answered, that their work capacity has not changed during the last 12 months, 10.8% of respondents said that their work capacity has increased, and 19.4% of men said that it has decreased (Table 1).

The frequency of increased or stable work capacity within the last 12 months decreased with age reaching minimum during the sixth decade of life. The biggest increase of work capacity within the last year was found in the age group of 25-34 years, and this value was significantly different from the other age groups and general population (17.5% vs 9.2%,  $p < 0.05$ ). The answer "It didn't change" was the least present in the age group of 55-65 years, where it had significant differences with the other three age groups and with the same value in general population (50.5% vs 67.9%,  $p < 0.001$ ). "Decreased" and "Significantly decreased" work capacity were the most frequent during the sixth decade of life (31.8% and 13.1%, respectively) and had significant differences with the other age groups and general population (Table 1).

One fifth part of men of 25-64 years had high level of physical activity (19.0% used to make physical exercises, and 22.1% preferred to spend free time actively), and people of older age (55-64 years) had higher frequency of active hobbies combined with decreased work capacity within the last 12 months, and younger age 25-34 years was characterized with increased physical activity and work capacity (Table 1).

The prevalence of CHD in the population of Tyumen men aged 25-64 years was 12.4%. Extended criteria demonstrated the increase of CHD with age and it was 14.4 times higher in the older age group. CHD frequency defined with strict criteria was 6.6%. This variable significantly increased with age from the fourth (35-44 years) to the fifth (45-54 years) (3.5% vs 8.2%,  $p < 0.05$ ) and from the fifth (45-54 years) to the sixth (55-64 years) decades of life (8.2% vs 19.2%,  $p < 0.01$ ), and the frequency of "defined" CHD was 11.3 times higher in the oldest age group comparing with the youngest one [10].

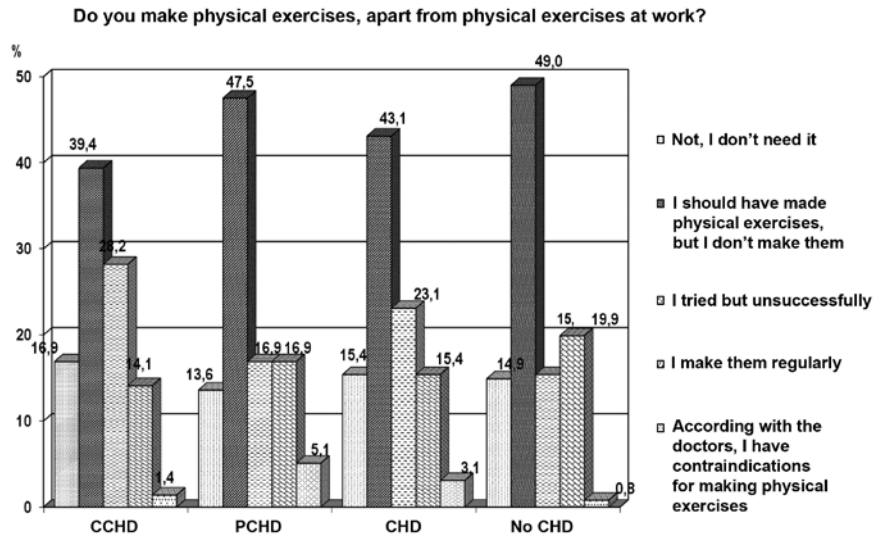
Analysis of behavioral characteristics' impact on CVD development in the population of males aged 25-64 years demonstrated the correlation between CHD prevalence and attitude to physical activity and work capacity.

People with CCHD and PCHD mostly tried to make physical exercises but pointlessly comparing with the group without CHD (28.2% vs 15.4%,  $p < 0.01$ ; 23.1% vs 15.4%,  $p < 0.05$ , respectively). Comparing with the control group, the majority of respondents with PCHD and CHD diagnosed with extended epidemiological

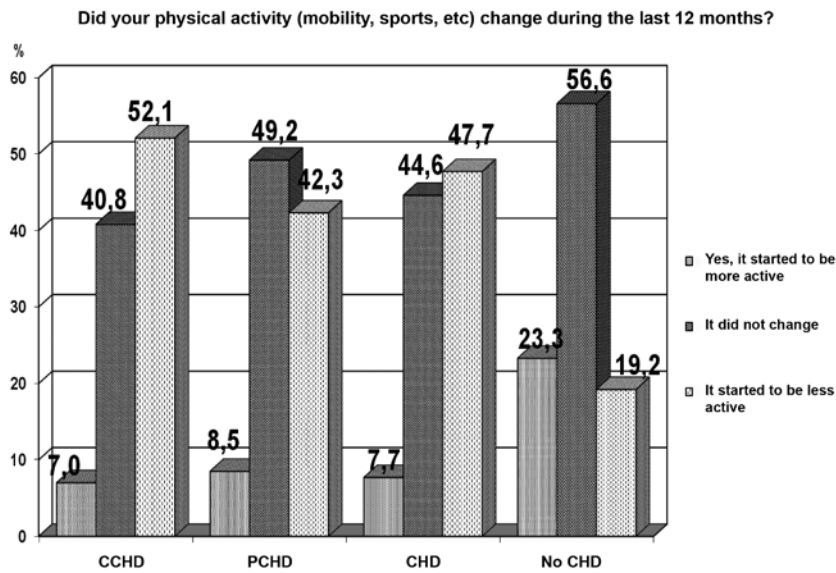
criteria explained their refusal to make physical exercises with medical contraindications (5.1% vs 0.8%,  $p < 0.01$ ; 3.1% vs 0.8%,  $p < 0.05$ , respectively) (Figure 1). There was no difference in free time physical activity between people with and without CHD. Dynamics of physical activity within the last 12 months was more significant in patients with all three grades of CHD comparing with the group without CHD (CCHD: 40.8% vs 56.6%,  $p < 0.001$ ; PCHD: 49.2% vs 56.6%,  $p < 0.05$ ; CHD: 44.6% vs 56.6%,  $p < 0.001$ ) (Figure 2). Since the frequency of the answer of the respondents to this question ("It became more passive") increased in all three groups with CHD comparing with the group without CHD ( $p < 0.05$ ), we can talk about negative dynamics of physical activity in the groups with CHD during the last 12 months. Men with CCHD (39.5%) and CHD diagnosed using extended epidemiological criteria (32.3%) estimated their physical activity comparing with other people of the same age as more passive one. There were significant differences between answers "A bit more passive" and "Much more passive" comparing with the group without CHD ( $p < 0.001$ ). The answers ("It increased" or "It did not change") to the question ("Did your work capacity change during the last 12 months?") were significantly more frequent in the group without CHD comparing with the same answers in the group with CCHD (10.3% vs 1.4%,  $p < 0.05$ ; 71.0% vs 42.3%,  $p < 0.05$ , respectively) and PCHD (10.3% vs 3.1%,  $p < 0.01$ ; 71.0% vs 50.8%,  $p < 0.001$ , respectively). The answer "It decreased" was registered significantly more often in the group without CHD comparing with the same answer in the groups with CCHD and CHD detected with extended epidemiological criteria (15.7% vs 38.0%,  $p < 0.001$ ; 15.7% vs 32.3%,  $p < 0.001$ , respectively). The answer "It decreased significantly" was registered significantly less frequently in the group without CHD comparing with the same answer in all three groups with CHD (CCHD: 3.1% vs 18.3%,  $p < 0.001$ ; PCHD: 3.1% vs 8.5%,  $p < 0.05$ ; CHD: 3.1% vs 13.8%,  $p < 0.001$ ) (Figure 3).

Consequently, men of middle age (35-44 years and 45-54 years) can be considered more vulnerable due to low physical activity and high risk of CHD development, and there was neither high frequency of active rest nor increase of physical activity and work capacity. At the same time, numerous epidemiological studies proved the connection between low physical activity at work and at rest and high risk of CHD and CVD development and total mortality [11, 12].

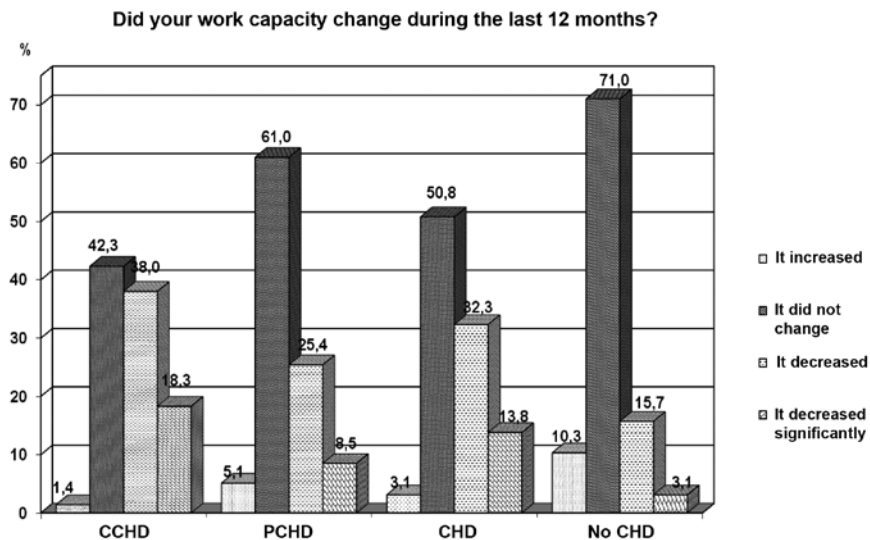
According with the results of the current study, men of 25-64 years with CCHD and PCHD comparing



**Figure 1.** Attitude to physical activity in men aged 25-64 years with and without CHD, %



**Figure 2.** Dynamics of physical activity in men aged 25-64 years with and without CHD



**Figure 3.** Dynamics of work capacity in men aged 25-64 years with and without CHD

with the group without CHD tried to make physical exercises more often and estimated their physical activity as the passive one, at the same time reduction of physical activity and work ability was registered in all groups with CHD within the last 12 months. This trend seems to be reasonable, since men with diagnosed CHD diminish their physical activity and work capacity, change their attitude to life values and put more efforts into following healthy lifestyle.

## Conclusion

Analysis of behavioral characteristics' influence on CVD development in men aged 25-64 years and belonging to the open population demonstrated the correlation between CHD prevalence and attitude to physical activity and work capacity. In the open urban population males aged 25-64 years with the presence of CCHD and CHD detected using extended epidemiological criteria comparing to the group of persons without CHD, tried to make physical exercises more frequently and estimated their physical activity as the passive one. At the same time, people with CHD had reduced physical activity and ability to work during the last 12 months.

The results obtained in this study conducted in unorganized population of Tyumen may be used as the scientific basis for organizing complex socially oriented preventive programs in other moderately urbanized Siberian cities.

**Conflict of interest:** None declared.

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