

PHYSICAL FITNESS IN FEMALES AND MALES PERFORMING HEAVY OCCUPATIONAL WORK

A. Bortkiewicz, T. Makowiec-Dabrowska, Z. Jozwiak, J. Gruchala, W. Koszada-Wlodarczyk, Z. Radwan-Wlodarczyk, C. Palczynski, E. Gadzicka
Institute of Occupational Medicine, Department of Work Physiology
Lodz, Poland

INTRODUCTION

The effects of heavy physical work on physical fitness has not been yet fully explained. Most of the authors believe, however, that such work causes impairment of physical fitness, especially when accompanied by lack of physical activity during leisure (1). Sufficient level of physical fitness seems to be particularly important in subjects performing heavy, occupational work, as it determines the ability to cope with work demands and contributes to reduce the risk of ischaemic heart disease (2,3,4). It is worth noting here that the risk of ischaemic heart disease is much higher in people performing heavy physical work than in the general population [5.4% vs.1.1%] (1). Estimation of the level of physical fitness in people performing physical work, and suitable actions to improve it, might be essential for preventing the effects of overload in cases when work requirements are higher than employees abilities to cope with them. In spite of that, physical fitness tests are not included in the pre-employment nor in the periodical employee examination procedures in Poland, and there is only limited data on the physical fitness in various professional groups (5). Our studies, through determining physical fitness in people performing various occupational work, attempted to set forth Principles for establishing permissible physical workloads. They also constituted the second stage of the study involving evaluation of the prevalence of coronary heart disease and of the level of some risk factors among people performing heavy occupational work.

METHOD

Tests were carried out in 35 women aged 24 - 50 years, employed at a printing office as printing machine operators (3 - 28 years) and on 42 men aged 30-60 years, working in Boiler and Radiator Plant as moulders, loaders, coremakers, furnacemen and pourer casters (1 - 38 years). Energy expenditure during work, determined by the indirect calorimetry method from the measurements of oxygen consumption using Korfanyi - Michaelis device were, for the women about 5000kJ/shift and for men 6375-9208 kJ/shift. This was heavy physical work accompanied by great static loads associated with the necessity of holding up and carrying loads.

The subjects had also their ambulatory ECG recorded for 24 hours using the Medilog 3000 (Oxford) from two bipolar CS₁ and CM₅ leads. During the entire ECG registration the examined persons completed activity diaries noting the character and duration of the performed functions. The ECG records were analysed and evaluated automatically and verified visually. Besides, heart rate was also calculated for working time, for leisure time and for sleep using Cardio Soft software (Temed-Zabrze, Poland).

In both groups physical fitness, as a predicted VO_{2max} , was determined according to indirect method using graded, submaximal exercise test on the ergometer Ergo-Line 900. Each exercise step was changed after two min, for women the loads steps were: 0.5, 1, 1.3, 1.7, 2 W/kg and so on, for men 25, 50, 75, 100 W and so on. Predicted VO_{2max} was calculated according to the formulas:

$$VO_{2max} = P * 6 * 1.78 + 1.5 * B$$

for women:

$$B_F = 655.096 + 9.563 * W + 1.850 * H - 4.676 * A$$

for men:

$$B_M = 66.473 + 13.752 * W + 5.003 * H - 6.755 * A$$

P - power [W]
B - Met [kcal/24h]
W - weight [kg]
H - height [cm]
A - age [years]

We also carried out a survey, using a questionnaire prepared by the authors, to determine health condition and health behaviours (leisure time activities, tobacco smoking etc.) in the examined persons.

RESULTS

In the studied groups disrythmia, conduction disturbances or ST segment changes, the number and/or form of which were classified as pathological (according to the recommendations of the 3rd International Symposium on Holter Monitoring-Vienna 1988) were found to occur in 24-hour ECG records in 9 women and 11 men.

Mean heart rate during work in women was 94 ± 9 and in men 100 ± 12 , during leisure time 89 ± 8 and 88 ± 9 respectively, during sleep 68 ± 5 and 70 ± 9 respectively.

As for the female subjects, the fitness was high in 3, moderate in 6, and low in the remaining individuals. In the male group 3 presented very high fitness, 5 high, in 26 it was moderate and in the rest the physical fitness was either low or very low. The results indicate that, according to Kozłowski's criteria of selecting occupational workload, only 3 female and 8 male workers were able, from the physiological point of view, to perform their work since heavy physical work with no risk of health effects can be performed only by individuals with high physical fitness (6). More frequent abnormalities in 24 ECG recording in the examined workers as compared to the general population may be a consequence of performing the work which requires higher physical fitness than the actual capacity of individual workers.

Since there is no data on the level of physical fitness at the onset of heavy physical work, it is not clear whether this low level of physical fitness can be attributed to its low 'input level' or, to its gradual decrease during the period of employment or, possibly, to the lack of leisure time activities. As evidenced by the survey, most of the subjects reported an inactive way of spending their free time.

CONCLUSIONS

The results of the study indicate the necessity for evaluating physical fitness during pre-employment examinations, as well as for its periodical check up. Another important issue seems to be health promotion for workers performing heavy physical work. This includes encouraging more active way of one's leisure. All these activities could prevent the adverse health effects of heavy physical work and enhance effort tolerance at work.

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