

Health Risks to Computer Workers in Various Indoor Facilities

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Abstract. Musculoskeletal disorders (MSDs) are the main cause of occupational diseases in Estonia and Europe. The number of MSDs has increased with the increasing number of computer workers and the increasing workload overall. In the current paper, the survey of 295 workers in Estonian enterprises is carried out to clarify the reasons of occupational stress. The causes of occupational stress are non-ergonomically designed workplace, social and human factors. The main questionnaires used were KIVA and GPSnordic. The conclusion is that KIVA questionnaire alone is too mild to point out the risk factors. The comparison with other questionnaires has to be carried out.

Keywords: computer workers, GPSnordic questionnaire, KIVA questionnaire, occupational diseases.

I. INTRODUCTION

The human body responds to stress factors through four systems – central nervous, automatic nervous, endocrine and immune – which are constantly interacting as a complex network [1]. The psychological, physiological and social factors affect office workers daily. The supplementary hazardous factors in the work environment might be draught, bad lighting or bad smells causing sick building syndrome [2]. The main physiological stress factor at workplace is badly designed workplace [3]. The number of occupational diseases is the specific indicator of influence of existing hazards and risk factors on the worker in the work environment [4]. The occupational diseases in Estonia are usually diagnosed in the late stage when the worker is already disabled. The main part of occupational diseases nowadays is connected with the musculoskeletal disorders (MSDs) [5], [6] in Estonia, Latvia and all over the European Union. The increasing amount of computer work and workers in the society is a supplementary source for developing the MSDs. In the current paper, the physiological and psychological stress connected with the social factors at work and outside the work is investigated. The workload is increasing, but the working conditions are not developing so fast. The preventive measures in occupational safety and health are often not used as these measures cause the supplementary costs for the employers [7].

Social relationships are important for the physical health of the workers [8]. The socially connected people live longer than socially isolated people [9] and the first have increased resistance to a variety of somatic diseases ranging from heart disease to cancer [10]. There is an increasing flexibility related to how work can be done today. Work is not bound by time and place anymore due to information technologies. The risk is that the employee well-being will decrease as the amount of work to be done increases. The pressure to perform better and

more at work has also increased. This may lead to a higher level of stress and burnouts. The work is not bound to a specific time and room, so that the line between personal and work life may be increasingly blurred (Fig. 1). The impact of psychosocial risk factors on the well-being at work has been investigated and analyzed by J. Seppo [11]. The Estonian workers have enough time to finish their work; 86.5% of them have a feeling that the work has been done well; 77% get the support from the co-workers; 51.5% get the support and help from the leaders; 40.6% have a possibility to influence the important work related decisions; 5.6% of the workers have to comply with the duties that are not acceptable by their own values.

The holistic image of work ability [12] consists of both the resources of the individual and factors related to work and the environment outside the work. The dimensions of work ability can be depicted in the form of a work ability house (Fig. 1), its floors, and the surrounding environment.

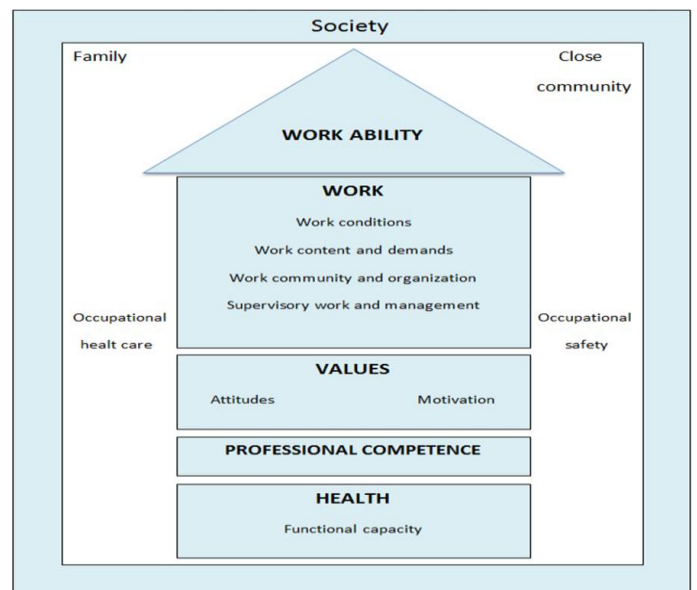


Fig. 1. Work ability house.

II. MATERIALS AND METHODS

The investigation has been carried out within the framework of WASI (Work Ability and Social Inclusion) project. The purpose of the project was to increase the work ability, stress management, good leadership behavior and thereby social inclusion of the work force. The aim of the study was to improve the leadership stress management and the communication within the organizations. 295 workers

from different enterprises (energy, services) and a high school as a control group were questioned about health risks in the work environment and health disturbances connected with their work.

The QPSnordic [13] and KIVA [14] questionnaires were used for investigating the stress factors arising from the relationship between the employers and employees at the workplace.

Part of the QPSnordic consists of the following questions:

1. Does your immediate superior encourage you to speak up, when you have different opinions?
2. Does the immediate superior encourage you to participate in important decisions?
3. Does your immediate superior help you develop your skills?
4. Does your immediate superior tackle problems as soon as they arise?
5. Do you trust the ability of the management to look after the future of the company/organization?
6. Does your immediate superior distribute the work fairly and impartially?
7. Does your immediate superior treat workers fairly and equally?
8. Is the relationship between you and your immediate superior a source of stress to you?

The marks were given as follows: 1) very little or not at all; 2) rather little; 3) somewhat; 4) rather much; 5) very much. These questions were chosen as they are more close to KIVA questionnaire.

The KIVA questionnaire consists of the following questions:

1. Have you enjoyed coming to work in the last weeks?
2. I regard my job meaningful;
3. I feel in control of my work;
4. I get on with my fellow workers;
5. My immediate superior performs as a superior;
6. How certain are you that you will keep the job with this employer?
7. How much can you influence factors concerning your job?

The marks were given from 1 (not at all) to 8 (very much so, certain or well).

The firms and enterprises (7) were chosen from service, energy and higher education area. The office rooms of the investigated firms were different (Fig. 2-7). The service enterprise office room (computer center) was built in 1986. It has undergone some repairs (Fig. 2). The office room of the energy enterprise is 10 years old and opened type (Fig. 3). The high-school building is atrium-type (Fig.4) and there are different problems in the workrooms close to the atrium (Fig.4) in autumn and winter season (for example the lack of natural lighting). In spring and summer there are problems with very hot indoor air (over 30 degrees) in the rooms outside the atrium (Fig. 6). The design of the office workrooms is not the appropriate every time. The rule is that ergonomics has to be taken into account already during the design of the building; afterwards it is very difficult to improve something. In the new buildings usually also the furniture is bought for the entire house, so that the workers seldom can influence the choice of their chair or table. The ergonomic furniture has to be bought considering the anthropologic measures of the

worker. Therefore, the indoor environment hazards might be also the sources of stress on the individual and team level for office workers. The greatest problems with the work environment are before the repairs and after the repairs during a half of the year. After that the workers get acquainted with the new conditions and do not complain anymore so often as in the beginning. The problems are related with ventilation, shortage of natural lighting or too strong luminescence lamps in the room. The glare from the screen is also a factor that burdens workers.



Fig. 2. The office room of the service enterprise (computer centre)



Fig. 3. The opened office of a big and successful energy enterprise.

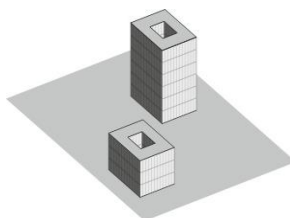


Fig. 4. Atrium-type buildings of university.



Fig.5. The work room close to the inside atrium.



Fig. 6. Workroom outside the (badly designed) workplaces.

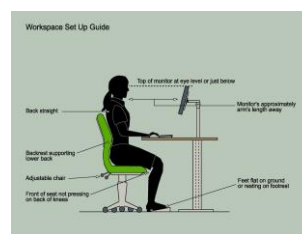


Fig. 7. Ergonomic design of the atrium.

III. THE RESULTS

The results of the questionnaire are presented in Table 1 and Table 2. The workers of the three investigated firms were divided into two groups: at the age of less than 40 years and over 40 years (included). The questionnaire consisted of 67 questions. In the tables there is given only part of QPSnordic questionnaire to clarify the relations between the employer and employee. The other questions concerned the medical history of the persons. The permission to carry out that questionnaire was received from the Ethic Committee of Estonia. The workers were very interested in the survey and they were given the feedback.

TABLE I
THE FEELING OF STRESS BY THE WORKERS (GPSNORDIC QUESTIONNAIRE)

QUESTION	Energy enterprise A	Service enterprise B	The high school, workers' age <40 years	The high school, workers' age >40 years C	The total sample, <40 years, 137 workers	The total sample, >40 years, 154 workers
1. Does your immediate superior encourage you to speak up, when you have different opinions?	3.33	3.55	3.37	3.07	3.38	3.07
2. Does the immediate superior encourage you to participate in important decisions?	3.42	3.59	3.58	3.23	3.55	3.11
3. Does your immediate superior help you develop your skills?	3.70	3.64	4.05	3.52	3.9	3.47
4. Does your immediate superior tackle problems as soon as they arise?	3.66	4.00	3.85	3.66	3.77	3.65
5. Do you trust the ability of the management to look after the future of the company/organization?	4.33	3.86	3.77	3.67	3.82	3.66
6. Does your immediate superior distribute the work fairly and impartially?	3.97	4.09	3.89	3.78	3.93	3.70
7. Does your immediate superior treat workers fairly and equally?	4.06	4.09	3.95	3.89	3.97	3.82
8. Is the relationship between you and your immediate superior a source of stress to you?	1.88	1.77	1.80	1.83	1.83	1.89

TABLE 2
THE FEELING OF STRESS BY THE WORKERS (KIVA QUESTIONNAIRE)

QUESTION	Energy enterprise total A	Energy enterprise , workers' age <40 years	Energy enterprise , workers' age >40 years	Service enterprise, total B	Service enterprise, worker s' age <40 years	Service enterprise, worker s' age >40 years	The high school, workers' age <40 years C	The high school, workers' age >40 years	Total sample , worker s' years <40	Total sample , worker s' age >40	Total sample
1. Have you enjoyed coming to work in the last weeks?	6.2	6.2	6.3	6.8	5.7	7.6	7.3	7.2	6.7	7.1	6.9
2. I regard my job meaningful	8.3	8.0	9.1	8.4	7.9	8.9	7.0	8.4	8.2	8.4	8.3
3. I feel in control of my work	7.5	7.0	8.7	7.8	7.4	8.1	8.0	7.8	7.8	8.2	8.0
4. I get on with my fellowworkers	8.5	8.5	8.4	8.6	8.7	8.6	8.3	8.9	8.3	8.5	8.4
5. My immediate superior performs as a superior	7.5	7.5	7.6	7.9	7.6	8.1	6.7	7.4	7.3	7.2	7.3
6. How certain are you that you will keep job with this employer?	7.3	6.9	8.3	8.0	7.9	8.1	7.9	7.6	7.3	8.0	7.7
7. How much can you influence factors concerning your job?	6.8	6.7	7.1	7.4	7.3	7.6	6.5	7.6	7.0	6.6	6.8

IV. ANALYSIS

Using the QSPNordic questionnaire the lowest scores were given to the first question: the superior does not take always into account the opinion of the employee (score 3.07 from 5.0 possible). The highest score (4.33) was given by the employees of the successful energy firm to the future perspectives of the enterprise. Thus, they were not afraid of losing their jobs. It seems that the high school workers are

more demanding and more sensitive to the work conflicts. There is no score over 4.0 speaking about the high school personnel over 40 years. It is also obvious that in the enterprises (compared to the high school) the workers give better marks to their managers.

In the Kiva questionnaire the lowest mark (5.7) was given by the service enterprise workers under 40 years old (they were not very eager of going to work every day). The highest mark (9.1) was given by the energy enterprise workers over

40 years old to the meaningfulness of their work. It can be said that the most stressful factors for the workers is the fact that they cannot influence the factors concerning their own job. The arrangement of the workrooms (single room or opened office) does not influence the relationship between the co-workers (the 4th question in KIVA). If the enterprise is in a good position economically (A), then the workers appreciate the employer (7th question in QPSNordic).

V. CONCLUSIONS

It is necessary to treat the workers fairly and equally, then they feel satisfaction of their work. Metal Age program [14] is the mean for training the workers and employers to decrease stress in the work environment and to prevent the possibilities for developing the musculoskeletal disorders (MSDs). The indoor air hazards may disturb the workers, but if the employer discusses the problems with the workers, then these shortages could be easily solved.

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