

Is the combination of organizational and environmental stressors contributing to the aging process?

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1. Introduction

The interaction between workers and production processes is mediated by a number of factors, with distinctive complexities. The working environment are characterized by a group of interdependent stressors which interfere with the work itself and the health and well-being of the workers. Among the potential found in workplaces are their sound, thermal, lighting, and physical characteristics, the equipment used to perform the tasks, the work pace, pauses, working schedules, relations between colleagues, supervisors, etc. As Levi (1983) pointed out, "... the principles for workers' protection and health promotion should be based: on a comprehensive view of human beings and their environment, an ecological strategy, i.e. the consideration of the interaction between the entire individual and the entire environment (physical, chemical, psychosocial) and of the dynamics of the complex system; a continuous evaluation of the effects (physical, mental, social, and economic) of different working environments and change in them, and a democratic strategy, giving individuals the greatest possible influence over their own situation...". The effects of combined environmental and organizational factors on workers' health and well-being have been investigated. Several studies showed that work demands can cause early health impairment and decrease in work ability (Ilmarinen, 1993; Tuomi, et al, 1991; Nygard, C.H. et al, 1991).

The aim of this study was to explore the combined effects of environmental and organizational factors on several health outcomes in rotogravure printing industry workers from São Paulo, Brazil. This paper presents the results of self-report diagnosed diseases, which developed after the workers started working at the studied plant.

2. Methodology

The design of this study was cross-sectional. The study group was comprised of 124 male workers employed for a minimum of one year at the studied plant. They were from the departments of Rotogravure Printing, Paint Preparation, Engraving, Lamination, Color Proofing, Cylinder Preparation, Cutting and Packing. They were exposed to various levels of noise, a mixture of organic solvents (toluene, ethyl acetate and ethanol, among others),

several organizational stressors, such as intense work pace, bad posture, thermal discomfort, short pauses, and overtime. Data on work history, psychosocial aspects of their job, present health and diagnosed diseases were collected through an interview. Present exposure to noise and chemicals were evaluated through noise dosimetry, biological and environmental monitoring. The comprehensive questionnaire, partially based in the Standard Shiftwork Index (Barton et al, 1994), was developed following site visits, extensive interviews and ergonomic evaluation of the workplaces. The self-reported diagnosed diseases were evaluated through stepwise logistic regression. At each step, the variable with the lowest p value (less than 0.05) is added to the model and values of probabilities greater than 0.05 are removed from the model. Variables considered for inclusion in the models were: age, tenure, time in shiftwork, job function, family income, quetelet index, exercise, alcohol and coffee consumption and smoking habits, occupational exposure data (noise, solvents), day sleep duration, environmental and organizational conditions (E.O.C.), physical and psychological stressors, and medical history.

3. Results and Discussion

The mean age of the workers was 33.8 years old (S.D.= 8.5) and mean tenure was 7.7 years (S.D. 6.1). The assessment of solvents exposure showed that ethyl acetate concentrations in air ranged from 1.1 to 2635 mg/m³. The highest ethyl acetate concentrations were observed in the Rotogravure Printing and Lamination Departments, where the exposure indices were greater than one for some job categories. Levels of toluene in air ranged from 0.14 to 919 mg/m³. The highest toluene levels were observed in the Engraving and Rotogravure Printing Departments, the only areas in which their exposure index exceeded unity. When exposure indices were calculated for the mixture of the three solvents, toluene levels caused the resulting concentrations to be greater than 1. The results of biological monitoring of toluene indicated that 8% of the workers had levels of urinary hippuric acid that exceeded 2.5 g/g creatinine, the ACGIH recommended Biological Exposure Index. Sound pressure measurements revealed continuous noise levels in the range of 71 to 93 dBA. Table 1 presents the 12 most frequent self-reported diagnosed diseases which developed after the person started working at the plant and the variables that met the significance criterion to remain in the final logistic regression models (p < .05).

The most frequent disease is chronic back pain, probably caused by bad posture and heavy lifting during the printing processes. Varicose veins were probably also associated with continuous standing posture during all workday. The high concentration of solvents, especially ethyl acetate and toluene in the workplace partly explain the incidence of skin allergy, eczema, and allergic rhinitis. The occurrence of cardiac arrhythmia associated with time on shiftwork reaffirms the importance of the organizational factors associated with cardiovascular disorders, as previously showed by Knutsson (1989) and other researchers. Among the working conditions that can be associated with conjunctivitis, gastritis, depression and angina pectoris, important factors are odor, ventilation, lighting, thermal conditions, noise, work pace, pauses.

4. Conclusions

Bad working conditions, including ergonomic and organizational factors, contaminants at the workplace, as well as risks of accidents, acting in combination contribute to deterioration of workers' health. Despite the lack of data on drop-outs from work, and

absence due to illnesses, the incidence of chronic diseases in this population and the prospective long-term negative consequences, negatively impacts work ability to work and may cause eventually, earlier work retirement. This can be prevented by continuous improvement of the work environment and life conditions.

Table 1. The twelve most frequent self-reported diagnosed diseases among printing industry workers and variables in the final model of the multiple logistic regression analysis.

Diseases	Frequency (%)	Variables in the final model
Chronic back pain	23.4	Physical and psychological stressors
Skin allergy	22.6	Ethyl acetate, anxiety
Conjunctivitis	17.7	Time in shiftwork, anxiety, E.O.C.
Eczema	16.9	Ethyl acetate, job function
Allergic rhinitis	16.1	Job function, anxiety, E.O.C.
Gastritis	15.3	Tenure, coffee consumption, E.O.C., physical and psychological stressors
Vision problems	14.5	Time in shiftwork
Varicose veins	12.9	Job function, E.O.C.
Depression	12.9	Family income, E.O.C., ethanol
Hypertension	8.9	Age, anxiety, job function
Cardiac arrhythmia	5.6	Time in shiftwork
Angina pectoris	4.0	Job function

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