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### **PROTECTION OF HUMAN IN THE WORKING ENVIRONMENT**

**Cesar F. Nascimento, Paulo Fernando F. Frutuoso e Melo. *A Behavior- and Observation-Based Monitoring Process for Safety Management*. S. 407–420.**

The objective of this paper is to demonstrate that a combination of a behavior-based monitoring process—using an at-risk behavior and unsafe condition observation system—and an observation-based safety adherence monitoring process that can indicate the compliance level with well-defined and agreed safety critical aspects and operational practices and procedures will be an effective safety management tool. This tool herein described represents a particular case, developed by a Praxair Inc. subsidiary in Brazil. Other safety surveillance systems usually adopted in industrial environments can rarely be used on construction sites. They also do not share information, knowledge and skills among the safety staff and other professionals invited to observe, usually covering specific tasks or specific professionals only, not a complete working area, which causes functional observing and monitoring limitations in terms of capturing behaviors and environmental safety issues. This tool also offers a wide range of learning opportunities and continuous improvement.

**Joanna Kamińska, Danuta Roman-Liu, Tomasz Zagrajek, Paweł Borkowski. *Differences in Lumbar Spine Load Due to Posture and Upper Limb External Load*. S. 421–430.**

As the lumbar region of the spine is particularly predisposed to musculoskeletal disorders, the aim of this article was to assess lumbar spine load on the basis of an accurate model of this part of the body. The model was developed with the finite element method and the energy criterion for optimising muscle work. Computer calculations confirmed that stresses and compression forces in intervertebral discs increased with an increase in the load force and that they were significantly larger in the bent forwards posture than in the erect posture. This result clearly shows that lifting light objects and the erect posture are important elements in minimising spine load.

**Seth Ayim Gyekye, Simo Salminen. *Organizational Safety Climate and Work Experience*. S. 431–443.**

The study examined the relationships between work experience and (a) safety perceptions, (b) job satisfaction, (c) compliance with safety management policies and (d) accident frequency. Participants were Ghanaian industrial workers (N = 320). They were divided into 2 cohorts: experienced and inexperienced workers. Workplace safety perceptions were assessed with Hayes et al.'s 50-item work safety scale. MANOVA was used to test for differences of statistical significance. Posterior comparison with t test consistently revealed significant differences between experienced cohorts and their inexperienced counterparts. Experienced workers indicated the best perceptions on safety, expressed the highest level of job satisfaction, were the most compliant with safety procedures and recorded the lowest accident frequency. From a practical perspective, analysing differences in work experience in relation to safety perceptions could be useful for organizations as the workers' experience could indicate a need for special safety programmes for particular groups.

**Joanna Ejdys, Agata Lulewicz-Sas. *An OH&S Management System as a Source of Information*. S. 445–454.**

The concept of an occupational health and safety management system (OH&S MS) has become widespread over the past 20 years. However, there are few studies on the subject, they are generally methodologically weak and in many cases cannot be generalized. A formalized OH&S MS is a set of rules and connected elements of the general organization management system which guarantees accomplishment of the organization's objectives in the area of upgrading safety conditions of both employees and the environment. The need for research on voluntary management systems stems from the necessity to propagate appropriate solutions and their continuous development processes. This paper discusses an OH&S MS as a source of data and essential information on the process of developing a system. It examines the relationship between the degree to which the requirements of Standard No. PN-N-18001:2004 have been adapted and the demand for health and safety data and information.

**Zahid A. Khan, Sayed Aliul H. Rizvi. *A Study on the Effects of Human Age, Type of Computer and Noise on Operators' Performance of a Data Entry Task*. S. 455–463.**

The effects of human age, type of computer, and noise on computer operators' performance of a data entry task were investigated. Twenty male subjects aged 10–55 were assigned into 4 age groups each consisting of 5 persons. They performed the task for 15 min on desktop and laptop computers in a sitting posture under varying levels of noise. The mean number of characters entered per minute (MNCEPM) was statistically analyzed. Operators in the 16–25 age group achieved the highest rate of data entry at each level of noise investigated. Operators performed better on desktop than on laptop computers. Their performance decreased when noise level increased from 82 to 92 dB(A), but it improved at 102 dB(A). The effects of age and noise were statistically significant. However, the effects of the type of computer, the interactions between age and type of computer, age and noise level, and type of computer and noise were not found to be statistically significant.

## **PROTECTION OF HUMAN AT THE WORKSTATION**

**Małgorzata Gołofit-Szymczak, Rafał L. Górny. *Bacterial and Fungal Aerosols in Air-Conditioned Office Buildings in Warsaw, Poland : the Winter Season*. S. 465–476.**

The microbial quality of the working environment was assessed in winter in air-conditioned office buildings in Warsaw. The average indoor concentrations of bacterial and fungal aerosols were low ( $<10^3$  cfu·m<sup>-3</sup>), below Polish proposals for threshold limit

values in public service buildings. Even during cold months, if the air-conditioning system works properly, people remain the main source of bacterial aerosol in offices, whereas infiltration of outdoor air remains a major mechanism responsible for their fungal contamination. An analysis of the bioaerosol size distribution showed that microbial propagules that reach both the upper and lower respiratory tract may evoke numerous adverse health effects from irritation and asthmatic reactions to allergic inflammation. A comparative analysis of viable and total airborne microbial counts showed that viable micro-organisms accounted for up to 0.3% of the total number of microbial propagules. Hence, a comprehensive hygienic assessment of office workplaces should include an efficient control of both these elements.

**Hossein Kakooei, Zahra Zamanian Ardakani, Mohammad Taghi Ayattollahi, Mortaza Karimian, Gebrael Nasl Saraji, Ali Akbar Owji. *The Effect of Bright Light on Physiological Circadian Rhythms and Subjective Alertness of Shift Work Nurses in Iran. S. 477–485.***

In this study, the effects of bright light (BL) on the rhythms in body temperature, plasma melatonin, plasma cortisol and subjective alertness, in 34 shift work nurses at a university hospital were assessed. They were exposed to very BL (4500 lx) during 2 breaks (21:15–22:00 and 3:15–4:00) or dim light (300 lx). The subjects were studied under 24 h of realistic conditions during which their plasma cortisol and melatonin were measured at 3-h intervals; their body temperature was also measured during and after night shift work. Subjective alertness was evaluated with the Karolinska sleepiness scale. Administration of BL significantly suppressed night-time melatonin levels. A one-way ANOVA revealed that BL tended to increase cortisol levels and body temperature and significantly improved alertness. These results demonstrate that photic stimulation in a hospital setting can have a powerful influence on the adjustment of the circadian system.

**Jakob Honborg Hansen, Ingunn Holmen Geving, Randi Eidsmo Reinertsen. *Offshore Fleet Workers and the Circadian Adaptation of Core Body Temperature, Blood Pressure and Heart Rate to 12-h Shifts : a Field Study. S. 487–496.***

The aim of this study was to investigate the circadian adaptation of  $t_{cr}$  (core body temperature), BP (blood pressure), HR (heart rate) and subjective sleep quality after 7 days of working 12-h night shifts in offshore fleet workers. **Methods.** Night workers (N = 7) (18:00–6:00) and day workers (N = 7) (6:00–18:00) were recruited from a Norwegian offshore company operating in the North Sea. We measured  $t_{cr}$ , BP and HR on days 1 and 7. **Results.** An increase of 0.6°C ( $p = .03$ ) was observed within the group of night workers from day 1 to day 7. Between the night and day workers there was a significant difference of 0.6 °C from day 1 to day 7 ( $p = .01$ ). Sleep latency and sleep length also showed significant differences between the groups ( $p = .01$  and  $p = .04$ ). There was an interaction effect in tiredness during the shift ( $p = .02$ ). **Conclusion.** The significant increase in  $t_{cr}$  indicates an adaptation in the night workers to the new working schedule, and the extended working hours and sleep deprivation are hypothesized to be the main cause of the increased  $t_{cr}$ . Light exposure, altered pattern of food availability and physical activity are likely to have contributed as well. Subjective sleep quality showed inconclusive results.

**Ananga Mohan Chandra, Suhana Ghosh, Sangita Barman, Rauf Iqbal, Nachiketa Sadhu. *Effect of Exercise and Heat-Load on Simple Reaction Time of University Students. S. 497–505.***

Visual and auditory simple reaction times for both right and left hands of young university male students were recorded with a simple reaction timer, before and after an exercise schedule without and with elevated temperatures in a climatic chamber. The

results indicated a decrease in both visual and auditory reaction times after the exercise, but a marked increase in them was noticed when exercise was performed at elevated temperatures. The difference in reaction times in preferred and nonpreferred hands was negligible at rest, i.e., without any exercise and elevated temperature. However, the difference was significant when exercise was performed at elevated temperatures. Visual reaction time was longer than auditory reaction time in all conditions. The results suggest that in hot industries, increased temperature has a specific rather than general effect on cognitive processes, perception and attentiveness, leading to increased chances of human errors, fatal accidents and loss of productivity.

## **REVIEW**

**Paolo Capodaglio, Gianluca Castelnuovo, Amelia Brunani, Luca Vismara, Valentina Villa, Edda Maria Capodaglio. *Functional Limitations and Occupational Issues in Obesity : a Review*. S. 507–523.**

Four hundred million adults are obese. Such a pandemic involves people of working age. Excess weight imposes abnormal mechanics on body movements, which could account for the high incidence of musculoskeletal disorders in these subjects. This article reviews the physiological and biomechanical causes of the reduced work capacity in obese workers and speculates on the relationships between occupational exposure and obesity. The reduction in work capacity appears to be due to the following factors: reduced spine flexibility, decay in endurance, limited range of movement of the major joints, reduced muscle strength and capacity to hold prolonged fixed postures, impaired respiratory capacity and visual control. Work capacity in morbidly obese workers should always be evaluated to match specific job demands. Due to the relationship between obesity, musculoskeletal disorders, disability and health costs, prevention of obesity and ergonomic interventions on-site are a priority in the work place.