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PROTECTION OF HUMAN IN THE WORKING ENVIRONMENT

Seth Ayim Gyekye & Mohammad Haybatollahi. *Relationship Between Organizational Justice and Organizational Safety Climate : Do Fairness Perceptions Influence Employee Safety Behaviour?* S. 199-211.

This study investigated the relationships between organizational justice, organizational safety climate, job satisfaction, safety compliance and accident frequency. Ghanaian industrial workers participated in the study (N = 320). Safety climate and justice perceptions were assessed with Hayes, Parender, Smecko, et al.'s (1998) and Blader and Tyler's (2003) scales respectively. A median split was performed to dichotomize participants into 2 categories: workers with positive and workers with negative justice perceptions. Confirmatory factors analysis confirmed the 5-factor structure of the safety scale. Regression analyses and t tests indicated that workers with positive fairness perceptions had constructive perspectives regarding workplace safety, expressed greater job satisfaction, were more compliant with safety policies and registered lower accident rates. These findings provide evidence that the perceived level of fairness in an organization is closely associated with workplace safety perception and other organizational factors which are important for safety. The implications for safety research are discussed.

Thanwadee Chinda. *Organizational Factors Affecting Safety Implementation in Food Companies in Thailand.* S. 213-225.

Thai food industry employs a massive number of skilled and unskilled workers. This may result in an industry with high incidences and accident rates. To improve safety and reduce the accident figures, this paper investigates factors influencing safety implementation in small, medium, and large food companies in Thailand. Five factors, i.e., management commitment, stakeholders' role, safety information and communication, supportive environment, and risk, are found important in helping to improve safety implementation. The statistical analyses also reveal that small, medium, and large food companies hold similar opinions on the risk factor, but bear different perceptions on the other 4 factors. It is also found that to improve safety implementation, the perceptions of safety goals, communication, feedback, safety resources, and supervision should be aligned in small, medium, and large companies.

Kata Kolozsár. *Understanding Expectations of Different User Groups of a Sophisticated Fall Detection System.* S. 227-238.

The evaluation in technical invention is important because it tests functionality of the intervention and it forms an overall point of view of a user. This study aims to introduce an approach for collecting user expectations with Q methodology in Safe Private Home for Elderly Persons (CARE), which is a new development in ambient assisted living. CARE is a sophisticated fall detection system used in elderly homes to monitor elderly people and the staff. Expectations of elderly people and the staff were collected with Q sorting. Requirements of examined groups were explored successfully on the basis of the sorting and the differences in their opinions were appointed.

Mustafa Onder, Seyhan Onder, Erhan Adiguzel. *Applying Hierarchical Loglinear Models to Nonfatal Underground Coal Mine Accidents for Safety Management.* S. 239-248.

Underground mining is considered to be one of the most dangerous industries and mining remains the most hazardous occupation. Categorical analysis of accident records may present valuable information for preventing accidents. In this study, hierarchical loglinear analysis was applied to occupational injuries that occurred in an underground coal mine. The main factors affecting the accidents were defined as occupation, area, reason, accident time and part of body affected. By considering subfactors of the main factors, multiway contingency tables were prepared and, thus, the probabilities that might affect nonfatal injuries were investigated. At the end of the study, important accident risk factors and job groups with a high probability of being exposed to those risk factors were determined. This article presents important information on decreasing the number accidents in underground coal mines.

Tadeusz Missala. *Paradigms and Safety Requirements for a New Generation of Workplace Equipment.* S. 249-256.

A workplace in the manufacturing industry consists of not only stationary equipment (e.g., machining centres, fixed robots) but also mobile equipment (e.g., automated guided vehicles, mobile robots), with both kinds cooperating directly with workers. Workplace equipment should not only be safe, it should also not generate fear or anxiety; still better if it should inspire calm and confidence. In view of robot laws, this article presents selected examples of robot-human co-operation, reviews safety requirements and safety functions developed to date. It also proposes a package of selected new safety functions, necessary to fulfil this paradigm. It also suggests and presents examples of actions that can make the workplace a human-friendly environment and presents examples of such actions.

Hamideh Razavi, Ehsan Ramazanifar, Jalal Bagherzadeh. *Optimizing Noise Control Strategy in a Forging Workshop.* S. 257-264.

In this paper, a computer program based on a genetic algorithm is developed to find an economic solution for noise control in a forging workshop. Initially, input data, including characteristics of sound sources, human exposure, abatement techniques, and production plans are inserted into the model. Using sound pressure levels at working locations, the operators who are at higher risk are identified and picked out for the next step. The program is devised in MATLAB such that the parameters can be easily defined and changed for comparison. The final results are structured into 4 sections that specify an appropriate abatement method for each operator and machine, minimum allowance time for high-risk operators, required damping material for enclosures, and minimum total cost of these treatments. The validity of input data in addition to proper settings in

the optimization model ensures the final solution is practical and economically reasonable.

Narmin Hassanzadeh-Rangi, Ali Asghar Farshad, Yahya Khosravi, Gasem Zare, Roksana Mirkazemi. *Occupational Cognitive Failure and Its Relationship With Unsafe Behaviors and Accidents*. S. 265-271.

Objectives. The aim of this study was to assess the relationship between occupational cognitive failures (OCFs) and unsafe behaviors, accidents and driving offences among municipal bus drivers in Tehran, Iran. **Methods.** Systematic random sampling was used to select 190 drivers from 3 transport and traffic Tehran districts. Data were collected with the occupational cognitive failure questionnaire (OCFQ), the driver behavior questionnaire and a data collection form. **Results.** The mean (SD) numbers of driving-related offences and road traffic accidents were 1.5 (2.6) and 0.37 (1.0), respectively. The mean (SD) numbers of deliberate driving violations, unintended violations, driving slips and mistakes were 6.97 (5.5), 1.61 (1.5), 13.6 (9.0) and 4.53 (3.28), respectively. The mean (SD) number of the OCFs was 28.9 (20.5). A significant correlation was found between occupational cognitive error and unsafe driving behavior subscales. The stepwise logistic regression results showed that, while controlling the effects of confounding factors, the OCF predicts 6%, 9%, 15% and 9% of deliberate violations, unintended violations, driving slips and driving mistakes, respectively. **Conclusion.** The results of this study show that the score of the OCFQ is a predictor of unsafe driving behaviors and its subscales.

Abbasali Mokhtari Andani, Farideh Golbabaei Seyed Jamaladdin Shahtaheri, Abbas Rahimi Foroushani. *Evaluating Workers' Exposure to Metalworking Fluids and Effective Factors in Their Dispersion in a Car Manufacturing Factory*. S. 273-280.

Introduction. Metalworking fluids (MWFs), which are widely used in metalworking operations, can cause different adverse effects, e.g., dermal and respiratory disorders, and cancer. Evaluating workers' exposure to MWF mists and the effective factors in their dispersion were the purpose of this study. **Materials and Method.** Seventy-five out of 300 workers working in metalworking workshops were randomly selected. MWF concentrations were measured with the National Institute for Occupational Safety and Health (NIOSH) 5524 method. Air temperature and velocity were also determined as the predicted effective parameters on the level of exposure. **Results.** The results indicated that exposure to MWF mists in one workshop was higher than in the other ones ($p < .05$). The findings also showed that temperature was an effective factor in the dispersion of MWF mists ($p < .05$). **Discussion.** The exposure of almost all workers was under the threshold limit value of 5 mg/m³, but it was over the value recommended by NIOSH of 0.5 mg/m³. Air temperature was an effective factor in workers' exposure ($r = .576$).

PROTECTION OF HUMAN AT THE WORKSTATION

Lawrence W. Raymond, Thomas A. Barringer. *A Thermal Stress Treadmill Walk for Clinic Evaluation of Candidates for Hazardous Materials (HazMat) Duty*. S. 281-293.

U.S. guidance for examining hazmat workers recommends stress testing be considered when heat stress is expected. However, the most common stress test—Bruce protocol treadmill electrocardiography (BPTE) wearing gym clothes—creates little thermal stress. **Objective.** Evaluate a novel thermal stress treadmill walk (TSTW). **Methods.** Body temperatures and heart rates during BPTE in 93 current and potential hazmat workers wearing gym clothes were compared with later values in 35 of these subjects while they were wearing thermally-restrictive "sauna suits" during a 45-min TSTW. **Physiological**

strain index (PSI) was calculated from temperature and heart rate changes and compared with PSI values from hazmat simulations and climatic chamber exercises. Results. Tympanic temperature (TT) rose 0.5 °C (SD 0.5) during BPTTE lasting 12.4 min (SD 2.9). PSI reached 6.0 (SD 1.3). TT rose 1.0 °C (SD 0.5) during TSTW, $p < .01$. PSI averaged 6.6(SD 1.9) in 29 subjects who completed TSTW, versus 5.7 (SD 5.7) in the 6 subjects who did not. Ingested thermistor temperatures increased more than did TT during TSTW, yielding PSI of 7.0 (SD 1.5), equal to PSI values from climatic chamber exercises, i.e., 7.0 (SD 1.0). Conclusion. TSTW increased body temperature and PSI in 29 of the 35 subjects who completed it to levels matching those of operational simulations in climatic chambers and during hazmat exercises. This TSTW may be useful for evaluating candidates for hazmat duty.

David Blanc, Pierre Farre, Olivier Hamel. *Variability of Musculoskeletal Strain on Dentists : an Electromyographic and Goniometric Study.* S. 295-307.

Introduction. Dentists and hygienists are strongly affected by musculoskeletal disorders (MSDs). As workstation concepts are supported by subjective arguments only, the aim of this study was to use objective measurements to compare the variability of strain in various concepts: a dental chair equipped with a cart or an over-the-patient delivery system without an assistant, and Dr Daryl Beach's concept with an assistant. Methods. Goniometric and electromyographic recordings were made on 8 subjects, during a scaling operation. The electrical activity of their trapezius and lumbar muscles was compared, as were their cervical and lumbar ranges of motion. Results. The results showed that there was a wide variability depending on the workstation. However, the Beach concept tended to reduce physical strain on most parameters: duration of left lumbar muscle activity (2% compared to 15% of time spent in >10% maximal voluntary contraction, MVC), time spent in cervical side bending (4% compared to 30%), cervical flexion of >20° (9% compared to 40%), and left trapezius activity (9% of time spent >10% MVC compared to 28%). Conclusion. Practitioners and students should adjust their workstations to reduce the prevalence of MSDs.

Ann-Sofie Lindberg, Christer Malm, Juha Oksa, Désirée Gavhed. *Self-Rated Physical Loads of Work Tasks Among Firefighters.* S. 309-321.

Objectives. The present study sought to identify firefighters' rated physical demands for the most frequently occurring work tasks and to determine if the ratings differed between full-time and part-time firefighters to help create a basis for the development of physical employment tests for firefighters. Methods. An extensive questionnaire was completed by 125 and 68 firefighters in 2000 and 2010, respectively. The data were analysed with the Mann-Whitney U test and binominal test and ranked on the basis of the responses in each category. Results. Significant differences were seen between the full- and part-time firefighters. The work tasks rated as the most physically strenuous in terms of aerobic fitness, muscle strength, work posture and body control by most respondents were smoke diving upstairs (carrying a hose), victim rescue in different ways, carrying a stretcher over terrain and pulling a hose. Conclusions. Physically strenuous work tasks should be included in the end-point performance variables used to select physical performance tests for firefighters. The part-time firefighters with no experience in several of the work tasks suggests that work-related exercises are important if both groups of firefighters are expected to do similar work.

Serdar Ulubeyli, Aynur Kazaz, Bayram Er. *Health and Safety Perception of Workers in Turkey : a Survey of Construction Sites.* S. 323-338.

This study reports the general health and safety (HS) conditions in the Turkish construction industry from the perspective of construction labor. Toward this aim, a

questionnaire survey was carried out with 800 workers employed in 32 construction projects in Turkey. Contractors were found to neglect their legal liabilities in paying workers' insurance premiums. Also, they overlooked safety training and were reluctant to hiring physicians at construction sites and investing in personal protective equipment (PPE). As the real constructors of projects, workers did not attach adequate importance to occupational training. In addition, they were not willing to use some PPE. Key participants of HS affairs such as workers, contractors, unions, and government should comprehend their drawbacks to overcome the current dangerous view of the industry. In this regard, related government bodies should compel contractors and workers to adapt to the relatively new regulations on occupational HS.

Nuttika Nakphet, Montakarn Chaikumarn, Prawit Janwantanakul. *Effect of Different Types of Rest-Break Interventions on Neck and Shoulder Muscle Activity, Perceived Discomfort and Productivity in Symptomatic VDU Operators : a Randomized Controlled Trial.* S. 339-353.

Objective. This study evaluated the effect of different types of activities during rest-break interventions on neck and shoulder muscle activity, muscle discomfort and productivity among symptomatic video display unit (VDU) operators performing prolonged computer terminal work. Study design and setting. Randomized controlled trial was used. Thirty symptomatic VDU operators were randomly assigned to 2 active break groups (stretching and dynamic movement) and a reference group. The subjects performed the same typing task for 60 min and received 3-min breaks after each 20 min of work. Root mean square and median frequency were calculated for neck and shoulder muscle activity. Muscle discomfort was measured with Borg's CR-10 scale. Productivity was measured by counting words. Results. There were no significant differences between the types of activities during breaks on neck and shoulder muscle activity, muscle discomfort or productivity. However, there was a significant difference in the level of muscle discomfort over time. Conclusions. Three types of activity during breaks showed a favourable effect on neck and shoulder muscle activity and productivity, and a positive effect on muscle discomfort in symptomatic VDU operators.

Farideh Sadeghian, Amir Kasaeian, Pirasteh Noroozi, Javad Vatani, Seiyed Hassan Taiebi. *Psychosocial and Individual Characteristics and Musculoskeletal Complaints Among Clinical Laboratory Workers.* S. 355-361.

Musculoskeletal disorders (MSDs) are an important health problem among healthcare workers, including clinical laboratory ones. The aim of the present study was to investigate the prevalence of MSDs and individual and psychosocial risk factors among clinical laboratory workers. A cross-sectional study was carried out among 156 workers of 30 clinical laboratories in 3 towns of Iran. The Nordic questionnaire with individual and psychosocial risk factors was used to collect data. Multiple logistic regression analysis was performed. The prevalence of reported MSDs among the study population was 72.4% in the past 12 months. The most prevalent MSDs were pain in the lower back and neck; 42.7% and 33.3%, respectively. Significant relations were found between MSDs and age, gender, heavy work at home and job control ($p < .05$). MSDs among laboratory workers were high and associated with age, gender, heavy work at home and job control. More research into measuring these factors and workplace physical demands is suggested.

Rohit Sharma, Ranjit Singh. *Work-Related Musculoskeletal Disorders, Job Stressors and Gender Responses in Foundry Industry.* S. 363-373.

The main aim of this paper was to identify job stressors, gender responses and association of psychosocial work stressors with prevalence of work related

musculoskeletal disorders (MSDs) among foundry workers. The data were obtained with ergonomics checklist using Likert scale. The results of this study showed a high prevalence of MSDs among workers. The male workers were more prone to pain in neck while the female workers were more prone to MSDs in upper back and shoulders. Correlation analysis showed significant relationship of dimensions of work aspects with pain and discomfort. It proved that the work-related MSDs are the results of interaction of multiple stressors associated with work and work environment, and other personal factors. ANOVA indicated that the perception of work aspects as stressors differed significantly between male and female workers.