

International Journal of Occupational Safety and Ergonomics – rok 2015, ročník 21

Číslo 3



Nina Ogińska-Bulik. *Social support and negative and positive outcomes of experienced traumatic events in a group of male emergency service workers.* Pages 119-127.

The paper investigates the relationship between perceived social support in the workplace and both negative (post-traumatic stress disorder (PTSD) symptoms) and positive outcomes (post-traumatic growth) of experienced traumatic events in a group of male emergency service workers. Data of 116 workers representing emergency services (37.1% firefighters, 37.1%, police officers and 30% medical rescue workers) who have experienced a traumatic event in their worksite were analyzed. The range of age of the participants was 21–57 years ($M = 35.27$; $SD = 8.13$). Polish versions of the Impact of Event Scale – Revised and the Post-traumatic Growth Inventory were used to assess the negative and positive outcomes of the experienced event. A perceived social support scale was measured by the scale What support you can count on. The data obtained from the study revealed the negative dependence of social support from supervisors with PTSD symptoms and positive – social support from co-workers with post-traumatic growth. Moreover the results of the study indicate the positive relationship between negative and positive outcomes of experienced traumatic events in the workplace. Perceived social support plays a more important role in gaining benefits from trauma than preventing negative outcomes of the experienced traumatic event. Support from co-workers, compared to support from supervisors, has greater importance.

- **Keywords:** PTSD symptoms, post-traumatic growth, perceived social support, emergency service workers

Magdalena Warszewska-Makuch, Sylwia Bedyńska, Dorota Żołnierczyk-Zreda. *Authentic leadership, social support and their role in workplace bullying and its mental health consequences.* Pages 128-140.

The aim of this study was to show how authentic leadership is related to social support and exposure to workplace bullying and how these variables are related to mental health. For our sample of 820 office workers employed in different Polish organizations and sectors, social support from supervisors moderated the relationship between authentic leadership and workplace bullying. Social support from co-workers moderated the relationship between workplace bullying and mental health and authentic leadership moderated the relationship between workplace bullying and mental health.

- **Keywords:** authentic leadership, workplace bullying, social support at work, worker's mental health

Masanori Ohta , Yasumasa Eguchi , Tomohiro Inoue , Toru Honda , Yusaku Morita , Yoshimasa Konno , Hiroshi Yamato , Masaharu Kumashiro. *Effects of bench step exercise intervention on work ability in terms of cardiovascular risk factors and oxidative stress: a randomized controlled study.* Pages 141-149.

Work ability is partly determined by physical and mental fitness. Bench step exercise can be practiced anywhere at any time. The aim of this study was to determine the effects of a bench step exercise on work ability by examining cardiovascular risk factors and oxidative stress. Thirteen volunteers working in a warehousing industry comprised the bench step exercise group ($n = 7$) and the control group ($n = 6$). The participants in the step exercise group were encouraged to practice the step exercise at home for 16 weeks. The step exercise improved glucose metabolism and antioxidative capacity and increased work ability by reducing absences from work and improving the prognosis of work ability. The improvement in work ability was related to a reduction in oxidative stress. These results suggest that a bench step exercise may improve work ability by reducing cardiovascular risk factors and oxidative stress.

- **Keywords:** work ability, bench step exercise, cardiovascular risk factors, oxidative stress, physical fitness

Karsten Krüger, Carmen Petermann, Christian Pilat, Emil Schubert, Jörn Pons-Kühnemann, Frank C. Mooren. *Preventive strength training improves working ergonomics during welding.* Pages 150-157.

To investigate the effect of a preventive strength training program on cardiovascular, metabolic and muscular strains during welding. Welders are one of the occupation groups which typically have to work in extended forced postures which are known to be an important reason for musculoskeletal disorders. Subjects (exercise group) accomplished a 12-week strength training program, while another group served as controls (control group). Pre and post training examinations included the measurements of the one repetition maximum and an experimental welding test. Local muscle activities were analysed by surface electromyography. Furthermore, heart rate, blood pressure, lactate and rating of perceived exertion were examined. In the exercise group, strength training lead to a significant increase of one repetition maximum in all examined muscles ($p < .05$). During the experimental welding test muscle activities of trunk and shoulder muscles and arm muscles were significantly reduced in the exercise group after intervention ($p < .05$). While no changes of neither cardiovascular nor metabolic parameters were found, subjects of the exercise group rated a significantly decreased rate of perceived exertion welding ($p < .05$). Effects of strength training can be translated in an improved working ergonomics and tolerance against the exposure to high physical demands at work.

- **Keywords:** resistance training, working ergonomics, cardiovascular/metabolic strains, workplace health promotion

Riitta Sauni, Pauliina Toivio, Toppila Esko, Rauno Pääkkönen, Jukka Uitti. *Effective information campaign for management of exposure to hand–arm vibration in the metal and construction industries.* Pages 158-165.

European Directive 2002/44/EC defines employers' responsibilities in the risk management of hand–arm vibration (HAV). However, the directive is still not completely implemented in all risk industries. The aim of our study was to determine whether it is

possible to improve the recognition and management of the risks of HAV at workplaces with a one-year information campaign. A questionnaire on opinions and measures for controlling HAV exposure at workplaces was sent to all occupational safety representatives and occupational safety managers in the construction and metal industry in Finland ($n = 1887$) and once again to those who responded to the first questionnaire ($n = 961$) one year after the campaign. The campaign increased recognition of HAV in risk assessment from 57.0% to 68.3% ($p = .001$), increased measures to decrease exposure to HAV from 54.6% to 64.2% ($p = .006$) and increased the number of programmes to control the risks due to HAV ($p < .001$). The information campaign, which focuses on the construction and metal industries, proved to be effective in increasing the awareness of the risks of HAV and the measures needed to control exposure to HAV. A similar campaign can be recommended in the case of risks specific to certain occupations.

- **Keywords:** hand–arm vibration, exposure, intervention, information campaign, construction, metal industry

Friderika Kresal, Vasja Roblek, Andrej Jerman, Maja Meško. *Lower back pain and absenteeism among professional public transport drivers.* Pages 166-172.

Drivers in public transport are subjected to lower back pain. The reason for the pain is associated with the characteristics of the physical position imposed on the worker while performing the job. Lower back pain is the main cause of absenteeism among drivers. The present study includes 145 public transport drivers employed as professional drivers for an average of 14.14 years. Analysis of the data obtained in the study includes the basic descriptive statistics, χ^2 test and multiple regression analysis. Analysis of the incidence of lower back pain showed that the majority of our sample population suffered from pain in the lower back. We found that there are no statistically significant differences between the groups formed by the length of service as a professional driver and incidence of lower back pain; we were also interested in whether or not the risk factors of lower back pain affects the absenteeism of city bus drivers. Analysis of the data has shown that the risk factors of pain in the lower part of the spine do affect the absenteeism of city bus drivers.

- **Keywords:** absenteeism, lower back pain, the work position, professional bus drivers

Jaejin Hwang, Myung-Chul Jung. *Age and sex differences in ranges of motion and motion patterns.* Pages 173-186.

This study investigated the effects of age and sex on joint ranges of motion (ROMs) and motion patterns. Forty participants performed 18 motions using eight body segments at self-selected speeds. Older subjects showed smaller ROMs than younger subjects for 11 motions; the greatest difference in ROM was 44.9% for eversion/inversion of the foot. Older subjects also required more time than younger subjects to approach the peak angular velocity for six motions. In contrast, sex significantly affected ROMs but not motion patterns. Male subjects exhibited smaller ROMs than female subjects for four motions; the greatest sex-dependent difference in ROM was 29.7% for ulnar/radial deviation of the hand. The age and sex effects depended on the specific segments used and motions performed, possibly because of differences in anatomical structures and frequencies of use of the joints in habitual physical activities between the groups.

- **Keywords:** range of motion, motion pattern, age, sex

Yong-Ku Kong, Dae-Min Kim. *The relationship between hand anthropometrics, total grip strength and individual finger force for various handle shapes.* Pages 187-192.

The design and shape of hand tool handles are critical factors for preventing musculoskeletal disorders (MSDs) caused by the use of hand tools. We explored how these factors are related to total force and individual finger force in males and females with various hand anthropometrics. Using the MFFM system, we assessed four indices of anthropometry, and measured total force and individual finger force on various handle designs and shapes. Both total force and individual finger force were significant according to gender and handle shape. Total grip strength to the handle shape indicated the greatest strength with D shape and the least with A shape. From the regression analysis of hand anthropometric indices, the value of R was respectably high at 0.608–0.696. The current study examined the gender and handle shape factors affecting grip strength based on the force measurements from various handle types, in terms of influence on different hand anthropometric indices.

- **Keywords:** hand tools, handle shapes, MFFM system, grip strength, finger force

Reza Khani Jazani, Mahnaz Saremi, Tara Rezapour, Amir Kavousi, Hadi Shirzad. *Influence of traffic-related noise and air pollution on self-reported fatigue.* Pages 193-200.

A growing body of evidence suggests that exposure to environmental pollutions is related to health problems. It is, however, questionable whether this condition affects working performance in occupational settings. The aim of this study is to determine the predictive value of age as well as traffic related air and noise pollutions for fatigue. 246 traffic officers participated in this study. Air pollution data were obtained from the local Air Quality Control Company. A sound level meter was used for measuring ambient noise. Fatigue was evaluated by the MFI-20 questionnaire. The general and physical scales showed the highest, while the reduced activity scale showed the lowest level of fatigue. Age had an independent direct effect on reduced activity and physical fatigue. The average of daytime equivalent noise level was between 71.63 and 88.51 dB(A). In the case of high noise exposure, older officers feel more fatigue than younger ones. Exposure to PM_{10} and O_3 resulted in general and physical fatigue. Complex Interactions between SO_2 , CO and NO_2 were found. Exposure to noise and some components of air pollution, especially O_3 and PM_{10} , increases fatigue. The authorities should adopt and rigorously implement environmental protection policies in order to protect people.

- **Keywords:** subjective fatigue, noise, air pollution, traffic, police officers

Mohsen Aliabadi, Mohammad Fereidan, Maryam Farhadian, Leila Tajik. *Determining the effect of worker exposure conditions on the risk of hearing loss in noisy industrial workroom using Cox proportional hazard model.* Pages 201-206.

In noisy workrooms, exposure conditions such as noise level, exposure duration and use of hearing protection devices are contributory factors to hearing loss. The aim of this study was to determine the effect of exposure conditions on the risk of hearing loss using the Cox model. Seventy workers, employed in a press workshop, were selected to study their hearing threshold using an audiometric test. Their noise exposure histories also were analyzed. The results of the Cox model showed that the job type, smoking and the use of protection devices were effective to induce hearing loss. The relative risk of hearing loss in smokers was 1.1 times of non-smokers. The relative risk of hearing loss in workers with the intermittent use of protection devices was 3.3 times those who used these devices continuously. The Cox model could analyze the effect of exposure

conditions on hearing loss and provides useful information for managers in order to improve hearing conservation programs.

- **Keywords:** Cox model, noise induced hearing loss, noise exposure conditions

Elżbieta Szczygieł, Katarzyna Zielonka, Tadeusz Mazur, Sylwia Mętel, Joanna Golec. *Respiratory chest movement measurement as a chair quality indicator – preliminary observations. Pages 207-212.*

Regardless of the constantly increasing time man is spending in a sitting position, there is still a lack of objective chair quality assessment criteria. The aim of this paper is to find the answer to whether respiratory chest movement measurements can be a chair quality indicator. The study included 34 participants (mean 34.7 years \pm 5.2). Their chest movements were assessed using respiratory inductive plethysmography while sitting on two subsequent chairs. Significant differences in chest movements depending on chair type were observed concerning the breathing duct (upper and lower) and breathing movement amplitude. The amplitude of the upper respiratory track in the first chair was higher (239.4 mV) compared with the second seat (207.3 mV) ($p = .018$). The analyzed parameters of respiratory chest movement may become a helpful indicator for design and selection of chairs which enable people to both work and relax in the most ergonomic conditions.

- **Keywords:** chair, breath, chest breathing movements, sitting posture

Patryk Zradziński. *Difficulties in applying numerical simulations to an evaluation of occupational hazards caused by electromagnetic fields. Pages 213-220.*

Due to the various physical mechanisms of interaction between a worker's body and the electromagnetic field at various frequencies, the principles of numerical simulations have been discussed for three areas of worker exposure: to low frequency magnetic field, to low and intermediate frequency electric field and to radiofrequency electromagnetic field. This paper presents the identified difficulties in applying numerical simulations to evaluate physical estimators of direct and indirect effects of exposure to electromagnetic fields at various frequencies. Exposure of workers operating a plastic sealer have been taken as an example scenario of electromagnetic field exposure at the workplace for discussion of those difficulties in applying numerical simulations. The following difficulties in reliable numerical simulations of workers' exposure to the electromagnetic field have been considered: workers' body models (posture, dimensions, shape and grounding conditions), working environment models (objects most influencing electromagnetic field distribution) and an analysis of parameters for which exposure limitations are specified in international guidelines and standards.

- **Keywords:** numerical simulations, human body model, exposure scenario, plastic sealer, European directive 2013/35/EU

Leena Korpinen, Rauno Pääkkönen. *Self-reported depression and anxiety symptoms and usage of computers and mobile phones among working-age Finns. Pages 221-228.*

The aim of the work is to study self-reported depression and anxiety symptoms among working-age Finns using logistical regression models. The study was carried out as a cross-sectional study by posting a questionnaire to 15,000 working-age persons. The responses (6121) revealed that 101 (1.7%) Finnish working-age persons suffered depression very often and 77 (1.3%) suffered anxiety very often during the last 12 months. Symptoms uncovered in the comparative analysis of respondents who had quite

often or more often depression to respondents who had less depression showed differentiation. The same result was obtained in the analysis of self-reported anxiety symptoms. With the logistical regression models (from depression and anxiety), we found associations between physical symptoms (in shoulder) and depression and between different mental symptoms and anxiety or depression. In the future, it is important to take into account that persons with physical symptoms can also have mental symptoms (depression or anxiety).

- **Keywords:** depression, anxiety, symptoms, questionnaire, logistical regression model

Leena Korpinen, Harri Kuisti, Hiroo Tarao, Jarmo Elovaara, Vesa Virtanen. *Cardiac pacemakers in magnetic fields of a shunt reactor at a 400 kV substation. Pages 229-232.*

The use of cardiac pacemakers (PMs) increases in Western countries. The aim of the study is to investigate cardiac pacemakers (PMs) using a human-shaped phantom in magnetic fields of a shunt reactor at a 400 kV substation. We performed seven PM experiments using a phantom. Two locations close to the shunt reactors were chosen. The magnetic field exposure was over 1000 μT in one location and over 600 μT in the other one. The magnetic field exposure did not disturb the tested five different PMs (in unipolar or bipolar configurations). It can be stated that in our experiment, the magnetic field exposure (over 600 μT and over 1000 μT) did not disturb the PMs (in unipolar or bipolar configurations). Since we only studied some PMs, it is possible that the magnetic field exposure at 400 kV substations can cause disturbances to other PMs. However, the risk of disturbances does not seem to be high.

- **Keywords:** cardiac pacemakers, magnetic fields, reactor, substation

Jing-Jang Hwang , Chien-Hsing Wu , Zheng-Yun Zhuang , Yi-Chang Hsu. *Safety management for polluted confined space with IT system: a running case. Pages 233-239.*

This study traced a deployed real IT system to enhance occupational safety for a polluted confined space. By incorporating wireless technology, it automatically monitors the status of workers on the site and upon detected anomalous events, managers are notified effectively. The system, with a redefined standard operations process, is running well at one of Formosa Petrochemical Corporation's refineries. Evidence shows that after deployment, the system does enhance the safety level by real-time monitoring the workers and by managing well and controlling the anomalies. Therefore, such technical architecture can be applied to similar scenarios for safety enhancement purposes.

- **Keywords:** IT system, occupational safety, confined space, polluted, wireless technology