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Min Gi Kim, Ju-il Seo, KyooSang Kim & Yeon-Soon Ahn. *Nationwide firefighter survey: the prevalence of lower back pain and its related psychological factors among Korean firefighters.* Pages: 447-456.

The main objective of this study was to assess the prevalence of lower back pain (LBP) and clarify the effect of work-related psychological factors on LBP. Nationwide survey data collected from male Korean firefighters (FIFS) were used. To identify the risk factors (work-related psychological factors such as job stress and depression) affecting LBP, the χ^2 test and multivariate logistic regression analyses were conducted. The prevalence of LBP was 19.3% and was highest in the emergency medical service (31.8%) part of FF job types. Within job stress, an uncomfortable physical environment, high mental job demand and organizational injustice were associated with LBP. However, inadequate social support inversely associated with LBP. Depression and high-risk alcohol drinking were related to LBP. LBP was closely related to job stress, depression and alcohol intake. Proper interventions of psychological factors should therefore be addressed to control LBP in FIFS.

- **Keywords:** lower back pain, firefighters, job stress, depression

Samira Sadeghi, Leyla Sadeghi, Nicolas Tricot & Luc Mathieu. *Design and application of a tool for structuring, capitalizing and making more accessible information and lessons learned from accidents involving machinery.* Pages: 457-471.

Accident reports are published in order to communicate the information and lessons learned from accidents. An efficient accident recording and analysis system is a necessary step towards improvement of safety. However, currently there is a shortage of efficient tools to support such recording and analysis. In this study we introduce a flexible and customizable tool that allows structuring and analysis of this information. This tool has been implemented under TEEXMA®. We named our prototype TEEXMA®SAFETY. This tool provides an information management system to facilitate data collection, organization, query, analysis and reporting of accidents. A predefined information retrieval module provides ready access to data which allows the user to quickly identify the possible hazards for specific machines and provides information on the source of hazards. The main target audience for this tool includes safety personnel,

accident reporters and designers. The proposed data model has been developed by analyzing different accident reports.

- **Keywords:** accident report, accident analysis, reuse, lessons learned, information system

Oscar Oviedo-Trespalacios, Laura Martínez Buelvas, José Hernández & Jaime Escobar. *Hand anthropometric study in northern Colombia*. Pages: 472-480.

The main purpose of this study is to gather information about the dimensions of the northern Colombian (Caribbean region) population, focusing on the dimensions of the hand and comparing them with measurements from other regions. Thirty-two hand dimensions were chosen and 120 males and 86 females were measured. Results indicated that there were differences between the dimensions of the hand for men and women, showing that men are larger. Also, there was a comparison made between some measurements of other studies in different regions of Colombia, the USA, Chile, Jordan, Korea and Japan. The results indicated important physiological differences between regions in Colombia and across countries. It was therefore concluded that differences in anthropometric measurements must be included in the design and procurement of machinery and apparatus in order to avoid productivity loss, occupational injuries or illness.

- **Keywords:** anthropometry, ergonomics, industrial workers, occupational health, work design

Sahar Norloei, Mohammad Javad Jafari, Leila Omid, Soheila Khodakarim, Davood Bashash, Mohammad Bagher Abdollahi & Mina Jafari. *The effects of heat stress on a number of hematological parameters and levels of thyroid hormones in foundry workers*. Pages: 481-490.

The objective of this research was to determine the effects of heat stress on some hematological parameters and thyroid hormones among foundry workers. This study was performed on 25 heat-acclimated subjects while 10 office workers were selected as the control group. Wet bulb globe temperature (WBGT) was determined to estimate the heat stress. Blood sampling was conducted before and after the daily work shift. The mean value of the WBGT index was 35 °C. The levels of plasma osmolality ($p = 0.04$) and white blood cells ($p = 0.03$) in the case group (before exposure to heat) were significantly higher than those in control group. No significant differences were observed between the average levels of T3 ($p = 0.79$) and T4 ($p = 0.17$) hormones between two groups. A positive relationship was found between the variation of some hematological parameters and thyroid hormones with WBGT index and air temperature.

- **Keywords:** heat stress, exposure, WBGT index, hematological parameters, thyroid hormones

Hamid Salmani Nodooshan, Alireza Choobineh, Mohsen Razeghi & Taymaz Shahnazar Nezhad Khaled. *Designing, prototype making and evaluating a mechanical aid device for patient transfer between bed and stretcher*. Pages: 491-500.

Introduction. The present study aimed at designing, prototype making and evaluating a new assistive device to improve patient transfer conditions. **Methods.** A new aid device for patient transfer was designed and its prototype was made. Comfort and perceived physical exertion of users and stability and applicability of the device were examined. The test subjects included 37 healthcare workers from a hospital with patient transfer

experience. The data collection tools consisted of visual analog scales (VAS) and Borg's rating physical effort scale. The rapid entire body assessment (REBA) method was applied to evaluate working posture. **Results.** The results showed that in 70% of the wards, patient transfer was performed manually more than five times per shift. While using the newly designed device, the mean (*SD*) of the users' comfort, and the clients' comfort and safety, was measured as 8.59 (0.87), 8.46 (0.92) and 8.67 (0.71), respectively, as reported by VAS. The results revealed a significant reduction in the users' rating of perceived exertion ($p < 0.001$). Additionally, the REBA score was lower in mechanical transfer. **Conclusion.** The new assistive device increased the users' and the clients' comfort, reduced the users' physical exertion and improved working postures.

- **Keywords:** musculoskeletal disorders, patient handling, design

Kandemir Aysun & Şahin Bayram. *Determining the level and cost of sickness presenteeism among hospital staff in Turkey.* Pages: 501-509.

Objective. This study aimed to determine the associations between sickness presenteeism and socio-demographic factors, perceived health status and health complaints among hospital staff and to calculate the cost burdens and productivity losses attributed to presenteeism. **Methods.** A cross-sectional study was conducted using 951 hospital staff, including physicians, nurses, midwives, other health personnel and administrative staff working in two hospitals located in Kırıkkale province in Turkey. The health and work performance questionnaire developed by Kessler et al. was revised to measure sickness presenteeism. **Results.** After performing Student's t test and a one-way analysis of variance, presenteeism was mostly observed in women, nurse-midwives, young employees, university health staff and health workers with low health status. Average productivity loss and cost of lost productivity per staff member were calculated as 19.92 h/TRY 315.57 for 2 weeks and 478.08 h/TRY 7573.68 for 1 year. **Conclusions.** The problem of sickness presenteeism is mostly observed in women and nurses. It causes both financial burdens and productivity losses for hospitals. These survey results are thus expected to provide critically important information on presenteeism for decision-makers and healthcare managers.

- **Keywords:** sickness presenteeism, productivity, hospital, health staff, cost

Agnieszka Mościcka-Teske, Joanna Sadłowska-Wrzesińska, Marcin Butlewski, Agnieszka Misztal & Aleksandra Jacukowicz. *Stressful work characteristics, health indicators and work behavior: the case of machine operators.* Pages: 510-518.

This article shows the results of research on psychosocial risks for a group of machine and plant operators ($n = 1014$) from the construction, chemical, energy, mining, metal and food industries in Poland. The Psychosocial Risk Scale designed in Nofer Institute of Occupational Medicine (NIOM) by Mościcka-Teske and Potocka was used to indicate the occurrence of general and specific occupational stressors and the level of their stressfulness. The results revealed that the studied machine and plant operators experience job context stress – related to working environment features concerning work organization – more frequently than job content stressors – related to the type of tasks they perform. Moreover, a correlation analysis between work features and the health and occupational functioning of the respondents revealed significant but weak relationships between the variables (from -0.08 to -0.23). Comparative analysis revealed the differences between the studied sectors. Such a comparison makes it possible to set goals for each sector and to attempt to improve the distinctive areas.

- **Keywords:** mental strain, stress, working conditions, machine operators, psychosocial risk

Mohamad Sadegh Ghasemi, Payam Hosseinzadeh, Farhad Zamani, Hossein Ahmadpoor & Naser Dehghan. *Ergonomic design and evaluation of a diagnostic ultrasound transducer holder*. Pages: 519-523.

Background. Work-related musculoskeletal disorders (WMSDs) are injuries and disorders that affect the body's movement and musculoskeletal system. Awkward postures represent one of the major ergonomic risk factors that cause WMSDs among sonographers while working with an ultrasound transducer. This study aimed to design and evaluate a new holder for the ultrasound transducer. **Materials and methods.** In the first phase a new holder was designed for the transducer, considering design principles. Evaluation of the new holder was then carried out by electrogoniometry and a locally perceived discomfort (LPD) scale. **Results.** The application of design principles to the new holder resulted in an improvement of wrist posture and comfort. Wrist angles in extension, flexion, radial deviation and ulnar deviation were lower with utilization of the new holder. The severity of discomfort based on the LPD method in the two modes of work with and without the new holder was reported with values of 1.3 and 1.8, respectively ($p < 0.05$). **Conclusion.** Overall, this study indicated that applying ergonomics design principles was effective in minimizing wrist deviation and increasing comfort while working with the new holder.

- **Keywords:** ergonomic design, electrogoniometry, work-related musculoskeletal disorders, ultrasound transducer, discomfort

Teimour Allahyari, Ali Sahraneshin Samani & Hamid-Reza Khalkhali. *Validity of the Microsoft Kinect for measurement of neck angle: comparison with electrogoniometry*. Pages: 524-532.

Introduction. Considering the importance of evaluating working postures, many techniques and tools have been developed to identify and eliminate awkward postures and prevent musculoskeletal disorders (MSDs). The introduction of the Microsoft Kinect sensor, which is a low-cost, easy to set up and markerless motion capture system, offers promising possibilities for postural studies. **Objectives.** Considering the Kinect's special ability in head-pose and facial-expression tracking and complexity of cervical spine movements, this study aimed to assess concurrent validity of the Microsoft Kinect against an electrogoniometer for neck angle measurements. **Methods.** A special software program was developed to calculate the neck angle based on Kinect skeleton tracking data. Neck angles were measured simultaneously by electrogoniometer and the developed software program in 10 volunteers. The results were recorded in degrees and the time required for each method was also measured. **Results.** The Kinect's ability to identify body joints was reliable and precise. There was moderate to excellent agreement between the Kinect-based method and the electrogoniometer (paired-sample t test, $p \geq 0.25$; intraclass correlation for test-retest reliability, ≥ 0.75). **Conclusion.** Kinect-based measurement was much faster and required less equipment, but accurate measurement with Microsoft Kinect was only possible if the participant was in its field of view.

- **Keywords:** neck angle, Microsoft Kinect sensor, markerless motion capture, electrogoniometry

David N. Katona, Charlie R. Bennett, Michael McKoryk, Andre L. Brisson & Carolyn J. Sparrey. *Effects of weld damage on the dynamics of energy-absorbing lanyards*. Pages: 533-543.

Manufacturers recommend removing fall protection system components from service for any indication of weld spatter or tool damage; however, little is known about the specific effects of lanyard damage on fall arrest dynamics. Thirty-two energy-absorbing lanyards

were drop tested after being damaged with weld spatter, plasma torches and cutting tools and compared with new, undamaged lanyards. Two lanyards damaged with a plasma torch failed completely without deploying the energy absorber while weld spatter damage and tool cuts, up to two-thirds through the width of the webbing, had no effect on fall arrest dynamics. The results highlight the catastrophic implications of high-temperature damage to lanyard webbing resulting from plasma torches – which require immediate removal from service. In addition, the integrated energy absorber design in bungee-style lanyards makes them more susceptible to damage anywhere along the length. We therefore recommended against bungee lanyards for ironworkers and welders.

- **Keywords:** fall protection, compliance, equipment, replacement, weld damage

Sara Viotti, Mara Martini & Daniela Converso. *Are there any job resources capable of moderating the effect of physical demands on work ability? A study among kindergarten teachers. Pages: 544-552.*

Background. It is recognized that teaching in a preschool context is physically demanding. Despite this, the consequences of physical demands on psychophysical health (including work ability) are significantly understudied among kindergarten teachers. **Objectives.** The aim of the present study is to examine (a) the association between physical demands and work ability and (b) whether psychosocial job resources buffer the negative impact of physical demands among kindergarten teachers. **Method.** A total of 426 kindergarten teachers employed in the municipal educational services of a city in northwest Italy filled out a self-reported questionnaire. **Results.** High association was found between physical demand and work ability. Moderated hierarchical regressions showed that decision authority, skill discretion, reward and meaning of work buffer the hampering effect of physical demands and work ability. No buffering effects were observed for support from superiors and colleagues. **Conclusion.** The present study has relevant, practical implications, highlighting the importance of investing in interventions encompassing a holistic perspective (e.g., psychosocial and ergonomic) in order to effectively combat the hampering effect of physical demands on work ability.

- **Keywords:** physical demands, job resources, work ability, kindergarten teachers

Grzegorz Juszczak, Aleksandra Czerw, Tomasz Tatara, Aneta Duda-Zalewska, Joanna Walusiak-Skorupa, Robert Słoniewski, Anna Staniszevska, Dominik Olejniczak & Urszula Religioni. *Cost intensity of identifying contraindications to driving a company car through psychological tests on the basis of real-world data in Poland. Pages: 553-557.*

Objective. The study objective was to determine the cost intensity of identifying contraindications to fleet car driving in preventive care. **Background.** The objective of a psychological examination is to identify impaired psychomotor function as well as any intellectual, cognitive or emotional incapacities, which may seriously impede safety. **Method.** Real-world data were collected from the healthcare provider in Poland. A total of 8111 anonymous records from psychomotor tests performed between January 1 and December 31, 2012 were analysed. **Results.** The number needed to screen to identify one person with contraindications to driving was 737. An individual examination costs PLN 150, thus the estimated cost of identifying one case was PLN 110,550 (EUR 25,000). The average number of tests in a small enterprise with 20–50 fleet cars was estimated at 5–25 in a 5-year period and their cost at PLN 3750 (PLN 750 annually). **Conclusion.** Health check-ups include ophthalmological and neurological consultations; therefore, psychological examination of fleet car drivers may be considered excessive due to cost and limited preventive value. High costs may be burdensome mainly to larger companies.

Application. A final decision regarding necessity of psychological testing should be preceded by medical assessment of the risk of work accidents.

- **Keywords:** automobile driving, psychomotor performance, employer health costs

Harish Chander, Chip Wade, John C. Garner & Adam C. Knight. *Slip initiation in alternative and slip-resistant footwear. Pages: 558-569.*

Slips occur as a result of failure of normal locomotion. The purpose of this study is to analyze the impact of alternative footwear (Crocs™, flip-flops) and an industry standard low-top slip-resistant shoe (SRS) under multiple gait trials (normal dry, unexpected slip, alert slip and expected slip) on lower extremity joint kinematics, kinetics and muscle activity. Eighteen healthy male participants (age: 22.28 ± 2.2 years; height: 177.66 ± 6.9 cm; mass: 79.27 ± 7.6 kg) completed the study. Kinematic, kinetic and muscle activity variables were analyzed using a 3(footwear) \times 4(gait trials) repeated-measures analysis of variance at $p = 0.05$. Greater plantar flexion angles, lower ground reaction forces and greater muscle activity were seen on slip trials with the alternative footwear. During slip events, SRS closely resembled normal dry biomechanics, suggesting it to be a safer footwear choice compared with alternative footwear.

- **Keywords:** slip initiation, slip biomechanics, alternative footwear, slip-resistant footwear

Hamid Reza Seifi Azad Mard, Ali Estiri, Parinaz Hadadi & Mahshid Seifi Azad Mard. *Occupational risk assessment in the construction industry in Iran. Pages: 570-577.*

Occupational accidents in the construction industry are more common compared with other fields and these accidents are more severe compared with the global average in developing countries, especially in Iran. Studies which lead to the source of these accidents and suggest solutions for them are therefore valuable. In this study a combination of the failure mode and effects analysis method and fuzzy theory is used as a semi-qualitative-quantitative method for analyzing risks and failure modes. The main causes of occupational accidents in this field were identified and analyzed based on three factors; severity, detection and occurrence. Based on whether the risks are high or low priority, modifying actions were suggested to reduce the occupational risks. Finally, the results showed that high priority risks had a 40% decrease due to these actions.

- **Keywords:** occupational accident, construction industry, failure mode and effects analysis, fuzzy theory

Uttama Barua & Mehedi Ahmed Ansary. *Workplace safety in Bangladesh ready-made garment sector: 3 years after the Rana Plaza collapse. Pages: 578-583.*

Workplace safety is one of the most important issues in industries worldwide, and is endangered by industrial accidents. Different industrial disasters have resulted in several initiatives worldwide to protect human life and reduce material damage, both nationally and internationally. In Bangladesh, the ready-made garment (RMG) industry is one of the most important export-oriented business sectors, which is facing challenges to ensure workplace safety. The Rana Plaza collapse in Bangladesh is the consequence of such non-compliance. The accident resulted in different local and global initiatives to address the challenges. This article reviews progress and achievement of the initiatives to reduce vulnerability in the Bangladesh RMG industry within 3 years after the deadly accident. In the long run, the challenge is to maintain momentum already created for achieving

sustainability in the RMG sector in Bangladesh and maintaining compliance even after the end of support from external partners.

- **Keywords:** manmade disaster, Bangladesh ready-made garment sector, Rana Plaza collapse, workplace safety, labour standard, labour right

Yukun Wang, Shuifen Zhan, Yan Liu & Yan Li. *Occupational hazards to health of port workers.* Pages: 584-588.

Objectives. The aim of this article is to reduce the risk of occupational hazards and improve safety conditions by enhancing hazard knowledge and identification as well as improving safety behavior for freight port enterprises. **Methods.** In the article, occupational hazards to health and their prevention measures of freight port enterprises have been summarized through a lot of occupational health evaluation work, experience and understanding. **Results.** Workers of freight port enterprises confront an equally wide variety of chemical, physical and psychological hazards in production technology, production environment and the course of labor. Such health hazards have been identified, the risks evaluated, the dangers to health notified and effective prevention measures which should be put in place to ensure the health of the port workers summarized. **Discussion.** There is still a long way to go for the freight port enterprises to prevent and control the occupational hazards. Except for occupational hazards and their prevention measures, other factors that influence the health of port workers should also be paid attention to, such as age, work history, gender, contraindication and even the occurrence and development rules of occupational hazards in current production conditions.

- **Keywords:** freight port, occupational hazards, prevention facilities

Maxime Gignon, Carole Amsallem & Christine Ammirati. *Moving a hospital: a way to co-produce safety healthcare facilities.* Pages: 589-591.

Moving a hospital is a critical period for quality and safety of healthcare. Change is very stressful for professionals. Workers who have experienced relocation of their place of work report deterioration in health status. Building a new hospital or restructuring a unit could provide an opportunity for improving safety and value in healthcare and for ensuring better quality of worklife for the staff. We used in situ simulation to promote experiential learning by training healthcare workers in the workplace in which they are expected to use their skills. In situ simulation was a way to design, plan, assess and implement a new healthcare environment before opening its doors for patient care. We can envisage that simulation will soon be used formally to identify potential problems in healthcare delivery and in staff quality of worklife in new healthcare facilities. Simulation is a way to co-produce a safe and valuable healthcare facility.

- **Keywords:** health facility move, health personnel, patient safety, patient simulation