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Číslo 1

PROTECTION OF HUMAN IN THE WORKING ENVIRONMENT

Chris Andrzejczak, Waldemar Karwowski & William Thompson. *The Identification of Factors Contributing to Self-Reported Anomalies in Civil Aviation.* S. 3-18.

The main objective of this study was to analyze anomalies voluntarily reported by pilots in civil aviation sector and identify factors leading to such anomalies. Experimental data were obtained from the NASA aviation safety reporting system (ASRS) database. These data contained a range of text records spanning 30 years of civilian aviation, both commercial (airline operations) and general aviation (private aircraft). Narrative data as well as categorical data were used. The associations between incident contributing factors and selfreported anomalies were investigated using data mining and correspondence analysis. The results revealed that a broadly defined human factors category and weather conditions were the main contributors to selfreported civil aviation anomalies. New associations between identified factors and reported anomaly conditions were also reported.

Linda J. Bellamy, Henk Jan Manuel & Joy I.H. Oh. *Investigated Serious Occupational Accidents in The Netherlands, 1998–2009.* S. 19-32.

Since 2003, a project has been underway to analyse the most serious occupational accidents in The Netherlands. All the serious occupational accidents investigated by the Dutch Labour Inspectorate for the 12 years of 1998−2009 inclusive have been entered into a database, a total of 20 030 investigations. This database uses a model of safety barriers supported by barrier tasks and management delivery systems such that, when combined with sector and year information, trends in the data can be analysed for their underlying causes. The trend analyses show that while the number of victims of serious reportable accidents is significantly decreasing, this is due to specific sectors, hazards and underlying causes. The significant results could not easily be directly associated with any specific regulation or action undertaken in The Netherlands although there have been many different approaches to reducing accidents during the period analysed, which could be contributing to the effect.

Simon D. Carlton & Robin M. Orr. *The Impact of Occupational Load Carriage on Carrier Mobility: A Critical Review of the Literature.* S. 33-41.

Military personnel and firefighters are required to carry occupational loads and complete tasks in hostile and unpredictable environments where a lack of mobility may risk lives. This review critically examines the literature investigating the impacts of load carriage on the mobility of these specialist personnel. Several literature databases, reference lists, and subject matter experts were employed to identify relevant studies. Studies meeting the inclusion criteria were critiqued using the Downs and Black protocol. Inter-rater agreement was determined by Cohen's κ. Twelve original research studies, which included male and female participants from military and firefighting occupations, were critiqued (κ = .81). A review of these papers found that as the carried load weight increased, carrier mobility during aerobic tasks (like road marching) and anaerobic tasks(like obstacle course negotiation) decreased. As such, it can be concluded that the load carried by some specialist personnel may increase their occupational risk by reducing their mobility.

Kai Way Li, Fanxing Meng & Wei Zhang. *Friction Between Footwear and Floor Covered With Solid Particles Under Dry and Wet Conditions.* S. 43-53.

Solid particles on the floor, both dry and wet, are common but their effects on the friction on the floor were seldom discussed in the literature. In this study, friction measurements were conducted to test the effects of particle size of solid contaminants on the friction coefficient on the floor under footwear, floor, and surface conditions. The results supported the hypothesis that particle size of solids affected the friction coefficient and the effects depended on footwear, floor, and surface conditions. On dry surfaces, solid particles resulted in friction loss when the Neolite footwear pad was used. On the other hand, solid particles provided additional friction when measured with the ethylene vinyl acetate (EVA) footwear pad. On wet surfaces, introducing solid particles made the floors more slip-resistant and such effects depended on particle size. This study provides information for better understanding of the mechanism of slipping when solid contaminants are present.

Isabel Moreira-Silva, Rute Santos, Sandra Abreu & Jorge Mota. *The Effect of a Physical Activity Program on Decreasing Physical Disability Indicated by Musculoskeletal Pain and Related Symptoms Among Workers: A Pilot Study.* S. 55-64.

The aim of this study was to verify the effect of a physical activity (PA) program on musculoskeletal pain and related symptoms in different body regions among workers. **Methods.** The intervention study lasted 6 months. The training sessions were given during work time. The intervention group (TOI) (n = 39) participated in 10–15 min of physical exercise training 3 times a week and focused on stretching exercises and general strength. The reference group (TOR) (n = 31) were asked to continue their daily activities. Musculoskeletal pain was assessed with the standardized Nordic questionnaires for analyzing musculoskeletal symptoms. Evaluations were performed at baseline and at the end of the intervention. **Results.**After the intervention, the TOI obtained some significant results regarding a decrease in the intensity of pain in some of the body regions evaluated, such as elbow (p = .03) and dorsal region (p = .015). In comparing the TOR and TOI after the 6 months of the PA program, we can verify that in the elbow and in the thigh/hip regions, the pain intensity decreased significantly; additionally, there is some evidence to suggest statistically significant results in the neck region (p = .063).**Conclusion.** Our intervention seems to have reduced musculoskeletal pain and related symptoms in factory workers.

Paula Aleksandrowicz, Hanna Zieschang, Dietmar Bräunig & Frauke Jahn. *Horizontal Career Changes as an Alternative to Premature Exit From Work.* S. 65-76.

Certain workplaces are called jobs with limited tenure. Due to physical or psychosocial risk factors, often coupled with qualification mismatches, workers cannot grow old in them. That may lead to premature exit into retirement, to a period of drawing a work incapacity pension or to a long spell of unemployment. A horizontal career change, which enables the worker to move on to a less burdening workplace while preserving social status, is a possible solution. The objective of the "Horizontal career change—a new job opportunity for older employees" project is to develop a model of career changes for workers employed in jobs with limited tenure and to implement it in the form of an information- and communication technology-based tool. Possible applications range from individual career planning, through institutionalized vocational reintegration, to personnel development in small and medium-sized enterprises.

Kun-Hsi Liao. *Experimental Study on Gender Differences in Hands and Sequence of Force Application on Grip and Hand-Grip Control.* S. 77-90.

The purpose of this study was to examine how gender of young adults in Taiwan affected the ability of their hands to apply force regarding the use of the left or right hand and the varying sequences of force application. Maximal voluntary contraction of grip (MVC_q) and hand-grip control ($HGC_{50\%}$) of 200 participants was measured. The study discovered that gender showed significant differences in the scale of MVC_q, whereas there were no significant differences in $HGC_{50\%}$. Left hand versus right hand resulted in significant differences in the scale of MVC_q, whereas there were no significant differences in the scale of $HGC_{50\%}$. The 5 levels of the sequence of force application showed no significant differences in either MVC_q or $HGC_{50\%}$. The interactive effects of the 3 factors (gender, hand, and sequence of force application) showed no significant differences. The results of the study can serve as a reference in designing tools.

Kyung-Sun Lee & Myung-Chul Jung. *Flexion and Extension Angles of Resting Fingers and Wrist*. S. 91-101.

This study determined flexion and extension angles of resting fingers and wrist in terms of forearm posture(neutral, pronation and supination) and shoulder flexion (0°, 45°, 90° and 135°). The participants participated in 12 angle measurements for 16 finger joints and wrist. The finger joints flexed more in supination than in neutral posture and pronation and the thumb flexed more than the other fingers because of the gravity and skin tension. This phenomenon became more apparent as the shoulder flexed. The carpometacarpal joint had the largest flexion angle in the thumb joints, whereas the proximal interphalangeal joints had the largest flexion angles in the other finger joints. The resting posture of the wrist extended of ~16° in any forearm postures when the shoulder was at 0°. The results of this study could be useful for rehabilitation tool and product designs.

PROTECTION OF HUMAN AT THE WORKSTATION

Andrzej Grabowski, Jarosław Jankowski, Marek Dźwiarek & Robert A. Kosiński. *Stereovision Safety System for Identifying Workers' Presence: Results of Tests.* S. 103-109.

This article presents the results of extensive tests of a stereovision safety system performed using real and artificial images. A vision based protective device (VBPD) analyses images from 2 cameras to calculate the position of a worker and moving parts of a machine (e.g., an industrial robot's arm). Experiments show that the stereovision safety system works properly in real time even when subjected to rapid changes in illumination level. Experiments performed with a functional model of an industrial robot

indicate that this safety system can be used to detect dangerous situations at workstations equipped with a robot, in human–robot cooperation. Computer-generated artificial images of a workplace simplify and accelerate testing procedures, and make it possible to compare the effectiveness of VBPDs and other protective devices at no additional cost.

Yahya Khosravi, Hassan Asilian-Mahabadi, Ebrahim Hajizadeh, Narmin Hassanzadeh-Rangi, Hamid Bastani & Amir H. Behzadan. *Factors Influencing Unsafe Behaviors and Accidents on Construction Sites: A Review.* S. 111-125.

Objective. Construction is a hazardous occupation due to the unique nature of activities involved and the repetitiveness of several field behaviors. The aim of this methodological and theoretical review is to explore the empirical factors influencing unsafe behaviors and accidents on construction sites. **Methods.** In this work, results and findings from 56 related previous studies were investigated. These studies were categorized based on their design, type, methods of data collection, analytical methods, variables, and key findings. A qualitative content analysis procedure was used to extract variables, themes, and factors. In addition, all studies were reviewed to determine the quality rating and to evaluate the strength of provided evidence. **Results.** The content analysis identified 8 main categories: (a) society, (b) organization, (c) project management, (d) supervision,(e) contractor, (f) site condition, (g) work group, and (h) individual characteristics. The review highlighted the importance of more distal factors, e.g., society and organization, and project management, that may contribute to reducing the likelihood of unsafe behaviors and accidents through the promotion of site condition and individual features (as proximal factors). **Conclusion.** Further research is necessary to provide a better understanding of the links between unsafe behavior theories and empirical findings, challenge theoretical assumptions, develop new applied theories, and make stronger recommendations.

Alicia Belbeck, Alan C. Cudlip & Clark R. Dickerson. *Assessing the Interplay Between the Shoulders and Low Back During Manual Patient Handling Techniques in a Nursing Setting.* S. 127-137.

The purpose of this research was to quantify shoulder demands during freestyle manual patient handling(MPH) tasks and determine whether approaches intended to prevent low back injury increased shoulder demands. Twenty females completed 5 MPH tasks found commonly in hospital settings before and after a training session using current workplace MPH guidelines. Most normalized muscle activity indices and ratings of perceived exertion decreased following training at both the low back and shoulders, but were more pronounced at the low back. There was little evidence to suggest that mechanical demands were transferred from the low back to the shoulders following the training session. The study generally supports continued use of the recommended MPH techniques, but indicates that several tasks generate high muscular demands and should be avoided if possible.

Jonas Rønningsdalen Kunst, Gøril Kvamme Løset, Daniel Hosøy, Bjørn Bjorvatn, Bente E. Moen, Nils Magerøy & Ståle Pallesen. *The Relationship Between Shift Work Schedules and Spillover in a Sample of Nurses.* S. 139-147.

The aim of the present study was to estimate spillover effects between the work and the family sphere in a sample of nurses (N = 2058). Hierarchical regression analyses investigated whether shift work schedules were associated with negative or positive spillover, both from family to work and vice versa, controlling for demographic factors,

job demands and decision latitude. With daytime work as a reference group, all types of shift work (day and evening shift, night shift only and rotating 3 shift) were associated with higher negative work–to–family spillover. Night work was associated with significantly less negative family–to–work spillover. None of the different shift work schedules were related to any type of positive spillover. The results indicate that working outside of daytime hours is less compatible with workers' family lives, compared to working ordinary day shifts. On the other hand, working night shifts only was associated with reduced negative family–to–work spillover.

Moon-Hee Jung. *Development of PAOT Tool Kit for Work Improvements in Clinical Nursing.* S. 149-158.

The aim of this study was to develop an action checklist for educational training of clinical nurses. The study used qualitative and quantitative methods. Questionnaire items were extracted through in-depth interviews and a questionnaire survey. PASW version 19 and AMOS version 19 were used for data analyses. Reliability and validity were tested with both exploratory and confirmative factor analysis. The levels of the indicators related to goodness-of-fit were acceptable. Thus, a model kit of work improvements in clinical nursing was developed. It comprises 5 domains (16 action points): health promotion (5 action points), work management(3 action points), ergonomic work methods (3 action points), managerial policies and mutual support among staff members (3 action points), and welfare in the work area (2 action points).

Saeed Raeisi, Mohamad Namvar, Majid Golabadi & Mirsaeed Attarchi. *Combined Effects of Physical Demands and Shift Working on Low Back Disorders Among Nursing Personnel.* S. 159-166.

The aim of this study was to investigate the synergistic effects of physical demands and shift working on low back disorders (LBDs) among nursing personnel. The study used 2 questionnaires: a self-administered questionnaire composed of parts of Nordic musculoskeletal questionnaire to assess LBDs and job content questionnaire to assess physical demands. The participants were divided into 4 groups: from group 1 (low physical demands day workers) to group 4 (high physical demands shift workers). In regression analysis, high physical demands were associated with the prevalence of LBDs independently (OR 4.4, 95% CI [2.40, 8.00] and $p < .05$), but there was no association between shift working and LBDs ($p > .05$). Odds ratio in high physical demands shift workers was 9.33 compared to the reference group ($p < .001$). Calculated synergistic index was 7.37. Simultaneous impacts of shift working and high physical demands may increase the prevalence of LBDs among nursing personnel.

Toivo Niskanen, Jouni Lehtelä & Riina Länsikallio. *Application of a Screening Method in Assessing Occupational Safety and Health of Computer Workstations.* S. 167-174.

Employers and workers need concrete guidance to plan and implement changes in the ergonomics of computer workstations. The Näppärä method is a screening tool for identifying problems requiring further assessment and corrective actions. The aim of this study was to assess the work of occupational safety and health (OSH) government inspectors who used Näppärä as part of their OSH enforcement inspections (430 assessments) related to computer work. The modifications in workstation ergonomics involved mainly adjustments to the screen, mouse, keyboard, forearm supports, and chair. One output of the assessment is an index indicating the percentage of compliance items. This method can be considered as exposure assessment and ergonomics intervention used as a benchmark for the level of ergonomics. Future research can examine whether the effectiveness of participatory ergonomics interventions should be investigated with Näppärä.

Teimour Allahyari, Narmin Hassanzadeh Rangi, Hamidreza Khalkhali & Yahya Khosravi. *Occupational Cognitive Failures and Safety Performance in the Workplace.* S. 175-180.

Introduction. The majority of industrial accidents occur because of human errors. Human error has different causes, however, in all cases cognitive abilities and limitations of human play an important role. Occupational cognitive failures are cognitively-based human errors that occur at work. The aim of this study was to examine the relationship between occupational cognitive failures and safety consequences. **Method.** Personnel of a large industrial company in Iran filled out an occupational cognitive failure questionnaire (OCFQ) and answered questions on accidents. Univariate and multiple logistic regression analysis were used to determine the relationship between cognitive failures and safety consequences.**Results.** According to developed regression models, personnel with a high rate of cognitive failure, in comparison to low rate, have a high risk of minor injury involvement (OR 5.1, 95% CI [2.62, 10.3]); similar results were for major injury and near miss. **Discussion.** The results of this study revealed usefulness of the OCFQ as a tool of predicting safety-related consequences and planning preventive actions.

Vern Putz Anderson & Heekyoung Chun. *Workplace Hazards and Prevention Options From a Nonrandom Sample of Retail Trade Businesses.* 181-195.

Employer commitment is a key factor in an effective safety program, yet limited research has focused on the safety priorities of retail store managers. To address this, the U.S. National Institute for Occupational Safety and Health recruited 4 experienced ergonomists, who met and interviewed 9 retailers in different parts of the eastern USA. The reports from the 9 interviews were used to document the hazards facing retailers and the interventions they attempted. Those interviewed were managers/owners of establishments that ranged from a small bakery with 11 employees to a supermarket with 85 or more employees. The main hazards across all establishments included overexertion, contact with-objects, and falls-to-the-same-level. We also compared the retailers' perceptions of safety hazards with injuries from actual hazards as supplied by the U.S. Bureau of Labor Statistics. This report provides insight into the retailers' perceptions of safety hazards as well as their commitment to the prevention of workplace injuries.