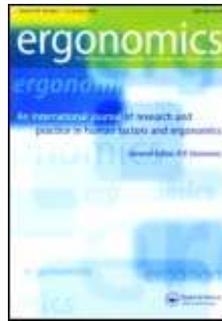


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Číslo 3



H. S. Jung; H. -S. Jung. *Design of liquid container handles in accordance with user preferences.* S. 247 – 260.

In this study, a prototype liquid container combined with auxiliary handles was designed to increase the safety of manual handling and to protect users of these containers from hand contamination. A Likert summated rating method as well as a pairwise ranking test was applied to evaluate the user preferences for handles provided for the container under the conditions of different shapes and positions. The results show that the participants preferred perpendicular orientation of the handle on the top of the liquid container while carrying the containers and the crosswise position of the handle at the side of the container while pouring the liquid. In order to satisfy both conditions, the container needs to be designed with handles in perpendicular as well as crosswise positions for selective application. A prototype liquid container with provided auxiliary handles was developed based on the results of the evaluation. It is recommended that a liquid container provides extra handles to reduce musculoskeletal stress and in turn increase user satisfaction.

- **Keywords:** Handles; Liquid Container; User Preferences; Manual materials handling

R. R. D. Oudejans. *Reality-based practice under pressure improves handgun shooting performance of police officers.* S. 261 – 273.

The current study examined whether reality-based practice under pressure may help in preventing degradation of handgun shooting performance under pressure for police officers. Using a pre-post-test design, one group of nine police officers practised handgun shooting under pressure evoked by an opponent who also fired back using marking (coloured soap) cartridges. The control group (n = 8) practised handgun shooting on standard cardboard targets instead of real opponents. Within a fortnight after the pre-test, both groups received three training sessions of 1 h, in which each person fired a total of 72 rounds. During the pre- and post test each participant took 30 shots without pressure (cardboard targets) and 30 shots under additional pressure (with an opponent firing back). While during the pre-test both groups performed worse in front of an opponent firing back compared to the cardboard targets, after the training sessions shooting performance of the experimental group no longer deteriorated with an opponent while performance of the control group was equally harmed as during the pre-test. These results indicate that training exercises involving increased pressure can acclimatize shooting performance of ordinary police officers to those situations with elevated pressure that they may encounter during their police work.

- **Keywords:** Acclimatization; Anxiety; Choking under pressure; Reality-based training

J. Qin; M. Marshall; J. Mozrall; M. Marschark. *Effects of pace and stress on upper extremity kinematic responses in sign language interpreters.* S. 274 – 289.

Sign language interpreters suffer from high levels of upper extremity disorders and burnout due to the physical and cognitive demands of interpreting. The objective of this research was to quantify the wrist kinematics of interpreting and to assess how speaker pace and psychosocial stress influence wrist kinematics. Professional interpreters interpreted a pre-recorded lecture, while the speaking pace of the lecture varied. One group of subjects was exposed to environmental conditions intended to induce stress. Several wrist kinematic variables of interpreting exceeded previously established high risk benchmarks for development of upper extremity disorders in industrial tasks. Wrist velocity and acceleration increased significantly with pace, with increases ranging from 10.7-18.6%. Increased psychosocial stress resulted in significant increase of left hand (non-dominant) wrist velocity and acceleration, with increases ranging from 14.8-19.5%. These results provide an objective assessment of the biomechanical demands of interpreting and support earlier research into different types of work, which found deleterious effects of psychosocial stress on the biomechanical responses of the lower back.

- **Keywords:** Sign language interpreting; Repetitive motion; Pace; Psychosocial stress

C. G. Drury; Y. L. Hsiao; C. Joseph; S. Joshi; J. Lapp; P. R. Pennathur. *Posture and performance: sitting vs. standing for security screening.* S. 290 – 307.

A classification of the literature on the effects of workplace posture on performance of different mental tasks showed few consistent patterns. A parallel classification of the complementary effect of performance on postural variables gave similar results. Because of a lack of data for signal detection tasks, an experiment was performed using 12 experienced security operators performing an X-ray baggage-screening task with three different workplace arrangements. The current workplace, sitting on a high chair viewing a screen placed on top of the X-ray machine, was compared to a standing workplace and a conventional desk-sitting workplace. No performance effects of workplace posture were found, although the experiment was able to measure performance effects of learning and body part discomfort effects of workplace posture. There are implications for the classification of posture and performance and for the justification of ergonomics improvements based on performance increases.

- **Keywords:** Posture; Performance; Security; Airport

O. O. Okunribido; M. Magnusson; M. H. Pope. *The role of whole body vibration, posture and manual materials handling as risk factors for low back pain in occupational drivers.* S. 308 – 329.

It seems evident that occupational drivers have an increased risk of developing back pain. Not only are they exposed to whole body vibration (vibration), their work often includes exposure to several other risk factors for low back pain (LBP), particularly the seated posture (posture) and manual materials handling (MMH). Excessive demands on posture are likely to be aggravated by vibration and vice versa, and the risks may be further compounded when MMH is performed. This study investigated the relative role of vibration, posture and MMH as risk factors for LBP and the stated hypothesis was that the

risks for LBP in drivers are the combined effect of vibration, posture and/or MMH. The findings showed that interaction effects due to posture and one or both of vibration and MMH, rather than the individual exposure effects, are the main contributors for precipitation of LBP.

- **Keywords:** Vibration; Drivers; Posture; LBP; MMH; Risk factors

S. D. Choi; T. K. Fredericks. *Surface slope effects on shingling frequency and postural balance in a simulated roofing task.* S. 330 – 344.

The purpose of this study was to investigate the influence of surface slopes (18°, 26°, 34°) on the maximum acceptable roof shingling frequency for males performing a simulated roof-shingling task. The psychophysical roof shingling frequency was also compared to the postural sway and trunk motion values. The maximum acceptable roof shingling frequency and selected trunk motion decreased significantly with an increase in slope. Postural sway however increased significantly with an increase in slope. The study also revealed that workers were experiencing a greater postural sway at the earlier phase of task on the steeper surface. This suggests that there might be an adaptation period associated with working on a slope and the body's ability to compensate for a loss of balance. Therefore, more emphasis should be given to the workers in this adaptation period, with additional monitoring and cautionary measures. Collectively, the findings of the study could be utilized for improving work practices on roofs, while reducing the potential risks of falls in roofing construction.

- **Keywords:** Slope; Postural balance; Falls; Roofing; Psychophysical approach

S. -p. Wu; C. -p. Ho; H. -C. Chi. *Ergonomic study of a vertical rope-pulling task from a scaffolding.* S. 345 – 354.

The purpose of this study is to explore and assess manual material handling problems involving a vertical rope-pulling task from a scaffold (VRPS). Twenty-five young male Chinese subjects were recruited to participate in this study. The psychophysical method was used to investigate the effects of the rope material (nylon and hemp), rope diameter (6/8" and 4/8"), object size (bucket diameter 28 cm and 36 cm), operating with and without gloves on the maximum acceptable rope-pulling weight (MAWR), rating of perceived exertion (RPE) and heart rate, respectively. The results showed that the maximum acceptable rope-pulling weights were significantly affected by the rope material, rope diameter, object size and wearing or not wearing gloves. The MAWR for the hemp rope, coarse rope, small object size and without gloves was significantly greater than that for the nylon rope, fine rope, large object size and with gloves, respectively. However, the effect of the rope material, rope diameter, object size and with and without gloves on heart rate was not significant. The mean RPE response was significantly influenced by the rope material, object size and wearing or not wearing gloves. The most stressed body parts were the arms, fingers and wrists. The interaction effect between the rope material and wearing or not wearing gloves was significant. Generally, the VRPS for workers using hemp rope without gloves or using nylon rope without gloves was better than that for the other combinations.

- **Keywords:** Manual materials handling; Vertical rope-pulling task from a scaffold; Maximum acceptable weight of rope-pulling

H. F. Van Der Molen; P. P. F. M. Kuijer; P. P. W. Hopmans; A. G. Houweling; G. S. Faber; M. J. M. Hoozemans; M. H. W. Frings-Dresen. *Effect of block weight on work demands and physical workload during masonry work.* S. 355 – 366. The effect of block weight on work demands and physical workload was determined for masons who laid sandstone building blocks over

the course of a full work day. Three groups of five sandstone block masons participated. Each group worked with a different block weight: 11 kg, 14 kg or 16 kg. Productivity and durations of tasks and activities were assessed through real time observations at the work site. Energetic workload was also assessed through monitoring the heart rate and oxygen consumption at the work site. Spinal load of the low back was estimated by calculating the cumulated elastic energy stored in the lumbar spine using durations of activities and previous data on corresponding compression forces. Block weight had no effect on productivity, duration or frequency of tasks and activities, energetic workload or cumulative spinal load. Working with any of the block weights exceeded exposure guidelines for work demands and physical workload. This implies that, regardless of block weight in the range of 11 to 16 kg, mechanical lifting equipment or devices to adjust work height should be implemented to substantially lower the risk of low back injuries.

- **Keywords:** Effect study; Manual materials handling; Physical workload; Low back; Construction work

P. M. Salmon; N. A. Stanton; G. H. Walker; D. Jenkins; C. Baber; R. McMaster. *Representing situation awareness in collaborative systems : a case study in the energy distribution domain.* S. 367 – 384.

The concept of distributed situation awareness (DSA) is currently receiving increasing attention from the human factors community. This article investigates DSA in a collaborative real-world industrial setting by discussing the results derived from a recent naturalistic study undertaken within the UK energy distribution domain. The results describe the DSA-related information used by the networks of agents involved in the scenarios analysed, the sharing of this information between the agents and the salience of different information elements used. Thus, the structure, quality and content of each network's DSA is discussed, along with the implications for DSA theory. The findings reinforce the notion that when viewing situation awareness (SA) in collaborative systems, it is useful to focus on the coordinated behaviour of the system itself, rather than on the individual as the unit of analysis and suggest that the findings from such assessments can potentially be used to inform system, procedure and training design. SA is a critical commodity for teams working in industrial systems and systems, procedures and training programmes should be designed to facilitate efficient system SA acquisition and maintenance. This article presents approaches for describing and understanding SA during real-world collaborative tasks, the outputs from which can potentially be used to inform system, training programmes and procedure design.

- **Keywords:** Distributed situation awareness; Teamwork; Propositional networks; Energy distribution

A. Toet; S. E. M. Jansen; N. J. Delleman. *Effects of field-of-view restriction on manoeuvring in a 3-D environment.* S. 385 – 394.

Field-of-view (FOV) restrictions are known to affect human behaviour and to degrade performance for a range of different tasks. However, the relationship between human locomotion performance in complex environments and FOV size is currently not fully known. This paper examined the effects of FOV restrictions on the performance of participants manoeuvring through an obstacle course with horizontal and vertical barriers. All FOV restrictions tested (the horizontal FOV was either 30°, 75° or 120°, while the vertical FOV was always 48°) significantly reduced performance compared to the unrestricted condition. Both the time and the number of footsteps needed to traverse the entire obstacle course increased with a decreasing FOV size. The relationship between FOV restriction and manoeuvring performance that was determined can be used to formulate requirements for FOV restricting devices that are deployed to perform time-limited human locomotion tasks in complex structured environments, such as night-vision goggles and head-mounted displays used in training and entertainment systems.

- **Keywords:** Field-of-view; Manoeuvring; Obstacles; Complex environments

J. Yang; T. Sinokrot; K. Abdel-Malek; S. Beck; K. Nebel. *Workspace zone differentiation and visualization for virtual humans*. S. 395 – 413.

Human performance measures such as discomfort and joint displacement play an important role in product design. The virtual human Santos™, a new generation of virtual humans developed at the University of Iowa, goes directly to the computer-aided design model to evaluate a design, saving time and money. This paper presents an optimization-based workspace zone differentiation and visualization. Around the workspace of virtual humans, a volume is discretized to small zones and the posture prediction on each central point of the zone will determine whether the points are outside the workspace as well as the values of different objective functions. Visualization of zone differentiation is accomplished by showing different colours based on values of human performance measures on points that are located inside the workspace. The proposed method can subsequently help ergonomic design. For example, in a vehicle's interior, the controls should not only lie inside the workspace, but also in the zone that encloses the most comfortable points. Using the palette of colours inside the workspace as a visual guide, a designer can obtain a reading of the discomfort level of product users.

- **Keywords:** Virtual humans; Optimization-based method; Human performance measures; Workspace; Zone differentiation