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Patrick Waterson; Ken Eason. '1966 and all that' : Trends and developments in UK ergonomics during the 1960s. Pages 1323 – 1341.

The 1960s represents a key decade in the expansion of ergonomics within the UK. This paper reviews trends and developments that emerged out of the 1960s and compares these with ergonomics research and practice today. The focus in particular is on the expansion of ergonomics as a discipline within industry, as well as more specific topics, such as the emergence of areas of interest, for example, computers and technology, automation and systems ergonomics and consumer ergonomics. The account is illustrated with a detailed timeline of developments, a set of industrial case studies and the contents of important publications during the decade. A key aim of the paper is to provide the opportunity to reflect on the past and the implications this may have for future directions for ergonomics within the UK. The paper provides practitioners with an insight into the development of ergonomics in the UK during one of the most important decades of its history. This is especially relevant given the fact that in 2009 the Ergonomics Society celebrates its 60th anniversary.

- **Keywords:** general ergonomics; industrial ergonomics; human-machine systems; consumer ergonomics

Blavier; A. S. Nyssen. Influence of 2D and 3D view on performance and time estimation in minimal invasive surgery. Pages 1342 – 1349.

This study aimed to evaluate the impact of two-dimensional (2D) and three-dimensional (3D) images on time performance and time estimation during a surgical motor task. A total of 60 subjects without any surgical experience (nurses) and 20 expert surgeons performed a fine surgical task with a new laparoscopic technology (da Vinci robotic system). The 80 subjects were divided into two groups, one using 3D view option and the other using 2D view option. We measured time performance and asked subjects to verbally estimate their time performance. Our results showed faster performance in 3D than in 2D view for novice subjects while the performance in 2D and 3D was similar in the expert group. We obtained a significant interaction between time performance and time evaluation: in 2D condition, all subjects accurately estimated their time performance while they overestimated it in the 3D condition. Our results emphasise the role of 3D in improving performance and the contradictory feeling about time evaluation in 2D and 3D. This finding is discussed in regard with the retrospective paradigm and suggests that 2D and 3D images are differently processed and memorised.

- **Keywords:** 2D-3D images; time estimation; visuo-motor performance; new technology; minimal invasive surgery

Andreas Sonderegger; Juergen Bauer. *The influence of laboratory set-up in usability tests : effects on user performance, subjective ratings and physiological measures.* Pages 1350 – 1361.

This article examines the influences of situational factors on user behaviour in usability tests. Sixty participants carried out two tasks on a computer-simulated prototype of a mobile phone. Employing a 3 × 2 mixed experimental design, laboratory set-up was varied as a between-subjects variable (presence of facilitator and two non-interactive observers, presence of facilitator or no person present) while task difficulty was manipulated as a within-subjects variable (low vs. high). Performance data, subjective measures and physiological parameters (e.g. heart rate variability) were taken. The results showed that the presence of non-interactive observers during a usability test led to a physiological stress response, decreased performance on some measures and affected the emotional state of test participants. The presence of a facilitator (i.e. a participating observer) also influenced the emotional state of the test participant. Practitioners involved in usability testing need to be aware of undue influences of observers, in particular, if the observers are non-interactive. The findings presented in this paper have implications for the practice of usability testing. They indicated a considerable influence of observers on test participants (physiology and emotions) and on the outcomes of usability tests (performance measures). This should be considered when selecting the set-up of a usability testing procedure.

- **Keywords:** usability test; social facilitation; heart rate variability; usability laboratory; laboratory set-up

Hwa S. Jung; Hyung-Shik Jung. *Hand dominance and hand use behaviour reported in a survey of 2437 Koreans.* Pages 1362 – 1371.

Most tools, utensils, office equipment, home appliances, clothes, medical instruments, sporting goods, weapons and public facilities are made for people who are right-handed. Many left-handed people have to endure a certain amount of inconvenience or difficulty in carrying out daily activities in such an environment. In this study, 2437 Korean male and female participants were randomly selected to collect a variety of data on hand dominance and hand preference when handling diverse products and facilities. Their responses in a questionnaire survey revealed that 5.8% were left-handed and 7.9% were ambidextrous. The younger participants who were from teens to 39 years reported higher percentages of left-handedness than those over 40 years, with those in their thirties reporting the highest proportion of left-handedness (7.3-7.6%) for both men and women. A slightly higher percentage of the male participants (5.9%) said that they were left-handed than did the female participants (5.6%). However, the percentage who were ambidextrous varied with age group, but overall there was a higher percentage of women (8.3%) than of men (7.6%). The analysis of hand use behaviour revealed that the right-handed and ambidextrous people had a tendency to use their right hands more for actions that required accuracy than those that required force. The left-handed people had a strong tendency to use their left hands more often when making a forceful action than for one that required accuracy. Derived from these results, the conclusion is that, depending on their hand dominance, people seem to use their hands differently when they handle objects or use facilities, which should be considered in the design of hand-controlled devices. Depending on which hand is the dominant one, people seem to use their hands differently when they handle objects or use facilities. The left-handed tend to use their left hands more with force-required motions than with accuracy-required motions, while ambidextrous and right-handed people use their right hands more with accuracy-required motions than with force-required motions. Designers of products and

facilities will find the results of this study useful for developing hand-controlled devices and systems.

- **Keywords:** handedness; hand dominance; dominant hand; left-handed; right-handed; ambidextrous

A. H. S. Chan; J. C. Y. So. *Task factor usability ratings for different age groups writing Chinese. Pages 1372 – 1385.*

This study evaluated how different task factors affect performance and user subjective preferences for three different age groups of Chinese subjects (6-11, 20-23, 65-70 years) when hand writing Chinese characters. The subjects copied Chinese character sentences with different settings for the task factors of writing plane angle (horizontal 0°, slanted 15°), writing direction (horizontal, vertical), and line spacing (5 mm, 7 mm and no lines). Writing speed was measured and subjective preferences (effectiveness and satisfaction) were assessed for each of the task factor settings. The result showed that there was a conflict between writing speed and personal preference for the line spacing factor; 5 mm line spacing increased writing speed but it was the least preferred. It was also found that: vertical and horizontal writing directions and a slanted work surface suited school-aged children; a horizontal work surface and horizontal writing direction suited university students; and a horizontal writing direction with either a horizontal or slanted work surface suited the older adults.

- **Keywords:** Chinese writing; usability; subjective preference; writing speed

L. Straker; C. Pollock; B. Maslen. *Principles for the wise use of computers by children. Pages 1386 – 1401.*

Computer use by children at home and school is now common in many countries. Child computer exposure varies with the type of computer technology available and the child's age, gender and social group. This paper reviews the current exposure data and the evidence for positive and negative effects of computer use by children. Potential positive effects of computer use by children include enhanced cognitive development and school achievement, reduced barriers to social interaction, enhanced fine motor skills and visual processing and effective rehabilitation. Potential negative effects include threats to child safety, inappropriate content, exposure to violence, bullying, Internet 'addiction', displacement of moderate/vigorous physical activity, exposure to junk food advertising, sleep displacement, vision problems and musculoskeletal problems. The case for child specific evidence-based guidelines for wise use of computers is presented based on children using computers differently to adults, being physically, cognitively and socially different to adults, being in a state of change and development and the potential to impact on later adult risk. Progress towards child-specific guidelines is reported. Finally, a set of guideline principles is presented as the basis for more detailed guidelines on the physical, cognitive and social impact of computer use by children. The principles cover computer literacy, technology safety, child safety and privacy and appropriate social, cognitive and physical development. The majority of children in affluent communities now have substantial exposure to computers. This is likely to have significant effects on child physical, cognitive and social development. Ergonomics can provide and promote guidelines for wise use of computers by children and by doing so promote the positive effects and reduce the negative effects of computer-child, and subsequent computer-adult, interaction.

- **Keywords:** children; computers; guidelines

F. Tissot; K. Messing; S. Stock. *Studying the relationship between low back pain and working postures among those who stand and those who sit most of the working day. Pages 1402 – 1418.*

A relationship between low back pain (LBP) and prolonged standing or prolonged sitting at work has not been clearly shown, despite its biological plausibility. Because sitting and standing postures vary as to duration and freedom to alternate postures, and standing postures vary as to mobility, associations between specific working postures and LBP were explored using multiple logistic regression. Associations between work factors and self-reported LBP during the previous 12 months that interfered with usual activities were examined among 4493 standing workers and 3237 sitting workers interviewed in the 1998 Quebec Health and Social Survey; 24.5% reported significant LBP. Since the same conditions can correspond to different physiological demands for sitting compared with standing workers, analyses were performed separately for the two groups. Standing without freedom to sit was associated with LBP. Different occupational physical and psychosocial factors were associated with LBP in sitting compared with standing populations.

- **Keywords:** low back pain; working postures; prolonged standing; work-related musculoskeletal disorders; gender-based analysis

Merete Labriola; Helene Fèveile; Karl B. Christensen; Jesper Strøyer; Thomas Lund. *The impact of ergonomic work environment exposures on the risk of disability pension : Prospective results from DWECS/DREAM. Pages 1419 – 1422.*

The objectives were to identify the impact of ergonomic work environment exposures on the risk of disability pension. A representative sample of 8475 employees of the total working population in Denmark were interviewed regarding work environment exposures and followed in a national register with data on granted disability pension. For women, approximately 34% of the disability pension cases were attributable to ergonomic work environment exposures. For men, 21% of the disability pension cases were attributable to ergonomic work environment. Ergonomic work environment, especially physically demanding work, working with hands lifted and repetitive work, are areas of intervention at the workplace that can facilitate and prolong labour market participation. The study provides estimates for the association between ergonomic exposures at work and administrative, cost-related measures of work disability in a large population-based longitudinal cohort study over 14 years. Approximately 21% for men and 34% for women of the disability pension cases were attributable to ergonomic work environment exposures.

- **Keywords:** disability pension; ergonomics; work environment

A. Kaarlela-Tuomaala; R. Helenius; E. Keskinen; V. Hongisto. *Effects of acoustic environment on work in private office rooms and open-plan offices : longitudinal study during relocation. Pages 1423 – 1444.*

The aim was to determine how the perceived work environment, especially acoustic environment, and its effects differed in private office rooms and in open-plan offices. The subjects consisted of 31 workers who moved from private office rooms to open-plan offices and who answered the questionnaire before and after the relocation. Private office rooms were occupied only by one person while open-plan offices were occupied by more than 20 persons. Room acoustical descriptors showed a significant reduction in speech privacy after relocation. The noise level averaged over the whole work day did not change but the variability of noise level reduced significantly. Negative effects of acoustic environment increased significantly, including increased distraction, reduced privacy, increased concentration difficulties and increased use of coping strategies. Self-rated loss of work performance because of noise doubled. Cognitively demanding work and phone conversations were most distracted by noise. The benefits that are often associated with open-plan offices did not appear: cooperation became less pleasant and direct and

information flow did not change. Nowadays, most office workers, independent of job type, are located in open-plan offices without the individual needs of privacy, concentration and interaction being analysed. This intervention study consisted of professional workers. Their work tasks mainly required individual efforts, and interaction between other workers was not of primary concern, although necessary. The results suggest that the open-plan office is not recommended for professional workers. Similar intervention studies should also be made for other job types.

- **Keywords:** open-plan offices; landscaped offices; private office rooms; work performance; indoor environment; productivity; speech; office noise; acoustics; office satisfaction; speech intelligibility; irrelevant speech effect

J. Mikhail Kellawan; Lynneth A. Stuart-Hill; Stewart R. Petersen. *The effects of caffeine during exercise in fire protective ensemble.* Pages 1445 – 1454.

To examine the effects of caffeine during exercise in fire protective ensemble (FPE), 10 healthy males completed 3 × 10 min bouts of treadmill exercise on two separate days. Sixty minutes prior to exercise either 6 mg/kg of caffeine (CAFF) or dextrose placebo (PLA) capsules were ingested (randomly assigned, double blind). End-exercise gastrointestinal temperature (T_{gi}) was higher in CAFF compared to PLA ($38.80 \pm 0.08^\circ\text{C}$ vs. $38.43 \pm 0.11^\circ\text{C}$, $p \leq 0.01$). Ventilation (\dot{V}_E) and tidal volume (V_t) were also significantly higher in CAFF, which resulted in higher consumption of air from the self-contained breathing apparatus. While perceived exertion in the caffeine condition was decreased ($p \leq 0.05$) compared to placebo, the higher T_{gi} values increased calculated physiological strain index in CAFF ($p \leq 0.01$). Caffeine appears to alter the physiological and psycho-physical responses to exercise in FPE and may influence factors related to work tolerance in firefighting. These findings are relevant to occupations such as firefighting where workers are encapsulated during exposure to heavy physical work and/or environmental heat. The results indicate that workers may be more susceptible to heat-related fatigue, illness or injury with ingestion of significant amounts of caffeine. To the authors' knowledge this is the first study involving humans and exercise to detect an increase in body temperature with caffeine ingestion.

- **Keywords:** firefighters; caffeine; self-contained breathing apparatus; heat stress