

Ergonomics– rok 2022, ročník 65

Číslo 5



Brett Pollard, Gordon McDonald, Fabian Held & Lina Engelen. *Stop motion: using high resolution spatiotemporal data to estimate and locate stationary and movement behaviour in an office workplace.* Pages: 675-690.

Prolonged periods of stationary behaviour, a common occurrence in many office workplaces, are linked with a range of physical disorders. Investigating the physical context of this behaviour may be a key to developing effective interventions. This study aimed to estimate and locate the stationary and movement behaviours of office workers ($n = 10$) by segmenting spatiotemporal data collected over 5 days in an office work-based setting. The segmentation method achieved a balanced accuracy $\geq 85.5\%$ for observation classification and $\geq 90\%$ for bout classification when compared to reference data. The results show the workers spent the majority of their time stationary (Mean = 86.4%) and had on average, 28.4 stationary and 25.9 moving bouts per hour. While these findings accord with other studies, the segmented data was also visualised, revealing that the workers were stationary for periods ≥ 5 min at multiple locations and these locations changed across time. **Practitioner Summary:** This study applied a data segmentation method to classify stationary and moving behaviours from spatiotemporal data collected in an office workplace. The segmented data revealed not only what behaviours occurred but also their location, duration, and time. Segmenting spatiotemporal data may add valuable physical context to aid workplace research.

- **Keywords:** Office, physical inactivity, sensors, localization, accelerometer

Xiaolu Zhang, Peijin Yu, Yuejuan Li, Yi Qiu, Chao Sun, Zunming Wang & Chi Liu. *Dynamic interaction between the human body and the seat during vertical vibration: effect of inclination of the seat pan and the backrest on seat transmissibilities.* Pages: 691-703

Seat inclinations at the seat pan and backrest may affect the sitting comfort. This study was designed to quantify the effect of inclination of a seat pan (0° , 10° , and 20°) and backrest (0° , 15° , and 30°), either foamed or rigid, on the transmissibilities measured at the seat pan and backrest. Seat transmissibilities were measured with fifteen subjects

exposed to vertical random vibration between 1 and 15 Hz at 0.5 ms⁻² r.m.s. It was found the resonance frequencies in transmissibilities measured at the seat pan and backrest increased with increasing the backrest inclination but were not affected by the seat pan angle. Increasing the foamed backrest inclination increased the peak transmissibilities. Inclination of the rigid seat pan or the rigid backrest reduced the transmissibilities measured at the backrest or the seat pan, respectively. Transmissibilities were more significantly affected by the backrest inclination than the seat pan inclination. **Practitioner summary:** Seat inclinations may alter the human-seat dynamic interaction and hence the riding discomfort. This study was designed to quantify the effect of inclined seats, either foamed or rigid, on the transmissibilities. It was found the backrest angle affected the transmissibilities more strongly than the seat pan angle.

- **Keywords:** Vibration, seat transmissibility, inclination, cross-axis effect

Zahara Batool, Muhammad Waqas Younis, Ammar Yasir, Atteq Ur Rehman, Mudassar Dilawar, Mazhar Yasin, Muhammad Hamza, Saqib Shahzad, Muhammad Sarmad Ali, Arslan Jamil & Muhammad Haris Asghar Khan. *Effects of safety pattern, cabin ergonomics, and sleep on work-related stress and burnout of city and transit bus drivers in Lahore, Pakistan. Pages: 704-718.*

The health and working environment of bus drivers is compromised in low-middle-income countries like Pakistan which leads to burnout and excessive Road Traffic Crashes. Hence, this study delves into factors affecting their safe operations from health and work environment perspectives and measures their associated stress and Burnout level. In a study of four hundred and ninety-nine (499), 86% city and 14% transit bus drivers are surveyed through a questionnaire. Stress is estimated for city and transit bus drivers, using the Effort/Reward Imbalance Model (ERI) of Siegrist, and burnout is calculated using the Copenhagen Burnout Inventory (CBI). For the determination of important determinants, descriptive and regression analyses are conducted. Findings show that stress has emerged as a negative factor for the physical and psychological health of city and transit bus drivers. Results based on bus drivers' responses suggest that organisational awareness and emphasis on health and safety levels can significantly reduce driver stress and burnout. **Practitioner Summary:** This study explores burnout and work-related stress of bus drivers in Lahore (Pakistan). City and transit bus drivers were interviewed through a questionnaire, containing three sections, using different subjective ratings based upon their past reliability. Results indicate that stress in bus drivers emerged as a physical and psychological health-damaging factor.

- **Keywords:** Bus drivers, burn out, BMI, cabin ergonomics, Lahore

S. J. Baltrusch, F. Krause, A. W. de Vries, W. van Dijk & M. P. de Looze. *What about the human in human robot collaboration? A literature review on HRC's effects on aspects of job quality. Pages: 719-740.*

In this review we address the human in human robot collaboration (HRC). Although there are different hypotheses on potential effects of HRC on job quality, defined as the quality of the working environment and its effect on the employee's well-being, a comprehensive theory is still lacking. How does HRC influence job quality on an individual level and how can we adapt HRC to boost positivity at work? We identified four job quality related factors that are of relevance in HRC: (1) Cognitive Workload, (2) Collaboration Fluency, (3) Trust, and (4) Acceptance and Satisfaction. Increasing awareness and being able to adapt the robot to the individual operator are crucial to improve the aforementioned factors. Implementing predictable robots, that offer a clear advantage to the human and take into account operators' preferences, will bring us closer to a human-centered collaboration. **Practitioner Summary:** The effect of human robot collaboration (HRC) on

job quality is still under debate. Design characteristics of HRC, such as collaboration design, robot design, and workplace design affect job quality related factors. Using a participatory design approach, as to align robot capabilities to end-users' preferences, will enhance HRC and improve job quality.

- **Keywords:** Collaborative robots, work conditions, human perspective, acceptance

Ana Alaminos-Torres, Manuela Martinez-Lorca, Ignacio Sifre De Sola, Noemí López-Ejeda & María Dolores Marrodán. [Psychological distress in Spanish airline pilots during the aviation crisis caused by the COVID-19 pandemic and psychometric analysis of the 12-item general health questionnaire](#). Pages: 741-752.

The aim of this study was to evaluate the psychological distress of Spanish airline pilots, a group of professionals undergoing an unprecedented work situation as a result of the Covid-19 pandemic. To do so, we administered the General Health Questionnaire-12 (GHQ-12). A total of 342 questionnaires were obtained, with the largest respondent age group being 41–50 years. The psychometric properties of the instrument were also evaluated, with an exploratory factor analysis revealing a unidimensional structure that explained 59.23% of the variance. The total score on the standard GHQ-12 was 4.54 ± 3.31 very close to the cut-off point established to determine psychological distress. The score increased among those unemployed and was also higher among pilots on furlough compared to those whose work situation was relatively normal. Furthermore, the reliability measured by the total Cronbach's alpha was above 0.8 of each across all employment status considered. These results show the desirability of conducting periodic psychological distress assessments of pilots so that effective measures can be implemented to ensure their psychological and socio-emotional well-being. **Practitioner summary:** This article evaluates psychological distress in a group of professionals that has received scant attention in the field. Moreover, it does so against the background of an atypical situation, evaluating the psychological distress suffered by pilots in different employment categories during the current severe crisis in the aviation sector.

- **Keywords:** Psychological distress, Spanish aviation pilots, GHQ-12 questionnaire, factor analysis

Chiron A. T. Oderkerk & Sofie Beier. [Fonts of wider letter shapes improve letter recognition in parafovea and periphery](#). Pages: 753-761.

Most text on modern electronic displays is set in fonts of regular letter width. Little is known about whether this is the optimal font width for letter recognition. We tested three variants of the font family Helvetica Neue (Condensed, Standard, and Extended). We ran two separate experiments at different distances and different retinal locations. In Experiment 1, the stimuli were presented in the parafovea at 2° eccentricity; in Experiment 2, the stimuli were presented in the periphery at 9° eccentricity. In both experiments, we employed a short-exposure single-report trigram paradigm in which a string of three letters was presented left or right off-centre. Participants were instructed to report the middle letter while maintaining fixation on the fixation cross. Wider fonts resulted in better recognition and fewer misreadings for neighbouring letters than narrower fonts, which demonstrated that wider letter shapes improve recognition at glance reading in the peripheral visual view. **Practitioner summary:** Most of the text is set in fonts of regular letter width. In two single-target trigram letter recognition experiments, we showed that wider letter shapes facilitate better recognition than narrower letter shapes. This indicates that when letter identification is a priority, it is beneficial to choose fonts of wider letter shapes.

- **Keywords:** Parafoveal processing, reading, letter width, letter recognition, font

Federico Arippa, Bruno Leban, Paolo Fadda, Gianfranco Fancello & Massimiliano Pau. *Trunk sway changes in professional bus drivers during actual shifts on long-distance routes*. Pages: 762-774.

Although professional bus drivers are required to perform their task while adopting a prolonged constrained sitting posture, existence of possible effects in terms of postural strategies has been scarcely investigated under actual working conditions. This study aimed to characterise modifications of trunk sway in 14 professional bus drivers during regular shifts performed on non-urban routes using a pressure-sensitive mat placed on the seat. Centre-of-pressure (COP) time series were extracted from body-seat pressure data to calculate sway parameters (i.e. sway area, COP path length, COP displacements and velocities). Results show generalised increase in trunk sway as driving progresses, which becomes statistically significant after approximately 70–100 minutes of continuous driving. This may indicate the adoption of specific strategies to cope with discomfort onset or a fatigue-induced alteration of postural features. Trunk sway monitoring of bus drivers may be useful in detecting postural behaviours potentially associated with deteriorating performance and discomfort onset. **Practitioner summary:** Professional bus drivers operate in sitting position for prolonged time. Such constrained posture may induce discomfort and fatigue. We investigated trunk sway during actual shifts using pressure-sensitive mats. Significant increase of sway was detected after 70 min of continuous driving. Body-seat pressure data could be used as discomfort and fatigue markers.

- **Keywords:** Sitting posture, trunk postural sway, prolonged driving, bus drivers

Patrizia Marti, Oronzo Parlangeli, Annamaria Recupero, Stefano Guidi & Matteo Sirizzotti. *Mid-air haptics for shape recognition of virtual objects*. Pages: 775-793.

This paper presents an experiment in which participants had to discriminate three mid-air haptic shapes (circle, square, point) by reporting whether the haptic stimulus (e.g. circle on the palm of the hand) was compatible with an image (e.g. a circle) or a word (e.g. 'circle') displayed on a screen. Results indicate that only the 'point' stimulus was appreciably recognised and discriminated in terms of accuracy and time needed for the identification. Accuracy increased with repetition, and response time decreased, suggesting a learning effect. The comparison between visual and textual labels shows that for the haptic point stimulus there is no significant difference but a tendency to have greater accuracy with images than with texts, while the opposite result is found for the circle stimulus. This outcome suggests the need for new experiments focussed on the effect of visual/textual labels to make the recognition/discrimination tasks of haptic stimuli easier. **Practitioner Summary:** Three haptic shapes were presented with images or texts, matching or not the stimuli. The point was easy to recognise, while the circle and the square were difficult to discriminate against each other. Visual/textual labels bring contradictory results for different shapes.

- **Keywords:** Haptic stimuli, mid-air haptic technology, shape recognition, shape discrimination, ultrasound haptics