

DCE
19

3rd DOCTORAL
CONGRESS
IN ENGINEERING

**DOCTORAL CONGRESS
in ENGINEERING**

Book of Abstracts



3rd Symposium on
Occupational Safety and Health



3rd DOCTORAL
CONGRESS
IN ENGINEERING

Book of Abstracts
of the
**3rd Symposium on
Occupational Safety and
Health**

Editors:

Jacqueline Castelo Branco

Joana Duarte

Raquel Martins

Porto
June 2019

This volume contains the abstracts presented at the Symposium on Occupational Safety and Health, within the 3rd Doctoral Congress in Engineering - DCE19, held in Porto, between June 27th and 28th, 2019.

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Edited by

Jacqueline Castelo Branco

Joana Duarte

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WELCOME

The Occupational Safety and Health book of abstracts is a compilation of the most recent works of students, researchers and professors within the domain of occupational safety and health. The included works are focused on selected topics regarding ergonomics, safety, and health.

This book of abstracts represents the state of the art and it is mainly based on research carried out at Universities and other research institutions, as well as some case studies. In its scope, this book contains useful and up-to-date information, giving visibility to emerging issues and presenting new solutions in the field of occupational safety and health.

The book of abstracts is based on selected contributions from the 3rd Doctoral Congress in Engineering, held on the 27th and 28th of June, at Faculty of Engineering of University of Porto, in Porto, Portugal. All the included contributions were revised by, at least, 2 of the 31 international scientific committee members.

The Editors would like to take this opportunity to thank all the authors for their contribution, to all Faculties of the University of Porto that supported the Symposium on Occupational Safety and Health of the Doctoral Engineering Congress, as well as all members of the Scientific Committee on behalf of following institutions: Institute of Science and Innovation in Mechanical and Industrial Engineering (INEGI), Polytechnic Institute of Porto, Institute of Public Health of the University of Porto, University of Lisbon, University of Minho, University of Algarve, University of Pernambuco, Federal University of Paraíba, Federal University of Pernambuco, Federal University of Santa Maria, and Federal University of Technology – Paraná.

Porto, June 2019
Symposium Organizing Committee

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PROGRAMME

Symposium on Occupational Safety and Health

Location: B028

June 28th, Friday

Registration 8:30h-9:00h

Opening Session (9:00h-9:10h)

Prof. J. Santos Baptista (Assistant Director of DemSSO)

Invited Speaker (9:10h-9:40h)

Eng.º Pedro Bastardo (BOSCH) - "What's an innovation? Is it random?"

Session I - Occupational Health (9:40h-10:30h)

Moderated by Rui Santiago

- **Instrumentation used in randomised controlled trials to assess pain in the osteopathic intervention: A systematic review**
Rui Santiago, António Torres Marques, J. Santos Baptista and José Torres Costa
- **Chitosan nerve guidance channels with different geometries and their numerical analysis**
Joana Gomes, Jorge Belinha and Renato Natal Jorge
- **Assessment of firefighters' occupational exposure to polycyclic aromatic hydrocarbons by biomonitoring**
Marta Oliveira, Klara Slezakova, João Paulo Teixeira, Adília Fernandes, Cristina Delerue-Matos, Maria Do Carmo Pereira and Simone Morais
- **A comparison of energy expenditure equations for basal-equivalent activities**
Denisse Bustos, Andre Lucena and J. C. Guedes

Coffee-Break & Poster Session (10:30h-11:30h)

- **Exposure levels of health-relevant pollutants and importance of biomonitoring studies at preschools**
Marta Oliveira, Klara Slezakova, Cristina Delerue-Matos, Maria Do Carmo Pereira and Simone Morais
- **OWAS method analysis applied on a slaughterhouse company**
Ana Sophia Rosado, Carolina Garreto and J. Duarte
- **Prevalence of Occupational Diseases in Women in Universities: Review Article**

Maria Inez Santos, Marcelo M. Ribeiro and Radigande Silva

- **Suicide and Work, Sociological View. Review article**

Marcelo M. Ribeiro, Maria Inez Santos, Radigande Silva and Trajano Silva

- **Analysis of the nutritional composition of the typical meals of the rural workers in the Muanza District in Sofala – Mozambique**

Arminda Uachisso, Patrícia Padrão, Susana Carvalho, Daniel Agostinho and Olivia Pinho

- **The Posted Workers and their difficulties in European Union**

Antonio Dickson Sobrinho e Mário Vaz

- **Food in the occupational environment and its benefits in worker health**

Pablo Monteiro, J. Duarte, Olívia Pinho, J. Santos Baptista, João Ferraz and Amanda Santana

- **Hand tools characteristics in slave labour**

Gairo Garreto, J. Santos Baptista, Antônia Mota and António Torres Marques

- **Thematic review on the slaves' feeding in colonial and imperial Brazil**

Gairo Garreto, J. Santos Baptista, Antônia Mota and Mário Vaz

- **Predicting thermal sensation through local body skin temperatures to assess thermal comfort: a short systematic review**

R. P. Martins, Daniele Costa and J. C. Guedes

- **The sound aesthetic of servicescape: influence in the aesthetic experience of employees**

Humberto Costa and Trajano Silva

- **Geographic information Systems enforced to Occupational Health and Safety Practices: A short literature review**

Carolina Garreto, J. Duarte, Jacqueline Castelo Branco and J. C. Guedes

- **Work accidents with biological material with health professionals in Brazilian hospitals**

Trajano Silva, Humberto Costa and Marcelo Ribeiro

- **Ergonomic analysis of cleaning professionals: pilot study**

Solange dos Santos, J. Duarte, André Lucena and J. C. Guedes

Session II - Occupational Safety and Hygiene (11:30h-13:00h)

Moderated by Joana Duarte

- **Occupational exposure to dust in the mining industry context – a short review**

J. Duarte, Mário Vaz, José Torres Costa and J. Santos Baptista

- **Specific Risks associated with the Manufacture of Airplanes**

Niels Bumann

- **Virtual Reality And The Future Of Construction**

Adeeb Sidani, J. Duarte, Fábio Dinis, Luís Sanhudo, J. Santos Baptista, João Poças Martins and Alfredo Soeiro

- **Quantitative Risk Analysis and Consequence Modeling the Explosion of Methane Storage Tanks in a Gas Refinery**

Sara Shahedi Ali Abadi, Mojtaba Shekarestan and Iraj Mohammad Fam

Lunch (13:00h-14:00h)

Session III - Ergonomics (14:00h-14:45h)

Moderated by Sara Maheronnaghsh

- **Factors influencing workplace physical activity interventions: a short review**

Sara Maheronnaghsh, Joana Santos and Mário Vaz

- **Analysis of a chicken wing cut sector using the OWAS method**

Ana Sophia Rosado, Carolina Garreto and J. Duarte

- **A short review on physiological monitoring during working activities**

Denisse Bustos, J. C. Guedes and José Torres Costa

Closing Session 14:45h-15:00h

Prof. Olívia Pinho (Director of DemSSO)

Awards Ceremony (auditorium 15:30h)

DCE Closing Session (auditorium 16:30h)

ORAL PRESENTATIONS

Analysis of the instrumentation used in randomized controlled trials to assess pain in the osteopathic intervention: A short review

Rui José Santiago¹, António Torres Marques¹, J. Santos Baptista¹,
J. Torres Costa²

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Abstract

Introduction: Osteopathy is an emergent health-care profession, present in most of the developed world and since 2013, regulated in Portugal. Osteopaths intervene in a range of health issues in which pain is a very common aspect. Pain is a worldwide problem, affecting all aspects of society. Measurement of pain objectively is yet not possible; even considered unreliable in many circumstances, the standard is self-reported questionnaires. A variety of different scales were used to measure the intensity of pain in Osteopathic research; however, the criteria of the options are not always clear or reported. This review aims to analyze and critically compare the different characteristics of the most used questionnaires by osteopathic researchers for assessing the intensity of pain in randomized controlled trials (RCT). **Methodology:** A literature search was conducted using seven electronic databases. This search was conducted for RCT articles studying the efficacy/effectiveness of the osteopathic manipulative treatment (OMT) intervention in pain. The findings followed the PRISMA statement. Included studies were assessed for the risk of bias (RoB) using the Jadad score. **Results and Discussion:** 123 studies were identified, and after removal of duplicates and application of the eligibility criteria, 21 articles were included for this review. Nine studies used the Visual Analogue Scale (VAS) 10cm scale, seven the Numeric Rating Scale (NRS) 11 points scale, the remaining used other options. Although similar, there are differences in these two scales that may affect the outcomes. Justification of the choice of the evaluation instrument was not always present and not associated with the methodology and the target population. The overall quality of the studies, in terms of RoB, was considered good. **Conclusion:** Visual Analogue Scale and Numeric Rating Scale are the choices of most authors. Authors in Osteopathy, or other health care professions should be very clear about the reasons behind the choices for measuring the intensity of pain; these should fit the objectives and study design.

Author Keywords. Osteopathic intervention, Pain scales, Assessment of pain.

Analysis of a chicken wing cut sector using the OWAS method

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Abstract

Introduction: The Industrial Revolution has encouraged consumption and, consequently, the competitiveness of the market. Historically, it can be perceived as the evolution of the industrial process. However, despite the implementation of automation, many industrial activities continue to be repetitive and monotonous, such as the first industries in which maximum production was required at the lowest cost. The still persistent production model can cause physical stress by the uninterrupted repetition of movements and force requirement, and psychological stress due to monotony and overloads. Despite the improvements in working conditions and awareness about the importance of occupational health and safety, there is too much charge about the goal, productivity and product quality, factors that cause stress physical and psychological to the worker. The physical stress tends to favor the development of musculoskeletal injuries that, when occurring in the workplace, are called occupational diseases. The objective of this research was to observe the work position especially the posture adopted by the workers in a chicken wing cut sector. **Methodology:** The observation allowed the ergonomic analysis with the use of the OWAS method and subsequent comparison of the results obtained to the reality experienced by the workers, namely, the index of musculoskeletal injuries in the sector. For the research, the observation in situ of the activities was performed and the ergonomic risk was evaluated by the *Ovako Working Posture Analyzing System (OWAS)* method to assess the ergonomic risks of the postures based on the position of the back, arms, and legs in an industrial sector which activity is exclusively the cut of the chicken wing. **Results and discussion:** The analysis of the times and methods, as well as the medical records of all the workers of the sector, were registered and assessed. For statistical analysis, workers were divided into a) uptime, b) workers who had already exercised demanding work activity of physical exertion and/or repetition of movements and the form of removal (with medical low or without medical low) and, c) by gender. It was observed the ergonomic risk of activity by the OWAS method and the percentage of injured workers, which was possible by analyzing the medical records. There was disagreement between the result of the ergonomic method and the number of injured workers. It is believed that this happened since the method does not consider the repetition of movements that is exhaustive in the activity. **Conclusions:** It was also found that the same activity performed in identical conditions tends to be more harmful to females. Since the ergonomic analysis is performed using several tools, it is believed that the result is reliable, given the dissonances that may exist between methods and means of analysis.

Author Keywords. Occupational disease, Work-related musculoskeletal disorders, Posture.

Chitosan nerve guidance channels with different geometries and their numerical analysis

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Abstract

Introduction: Peripheral nerve injuries are a major cause of permanent disabilities and have a negative impact on the quality of life of patients. The consequences of these injuries affect their daily living and work activities. Approximately 3% of trauma patients worldwide are affected by these injuries which are commonly attributed to direct mechanical trauma and to surgical resection. Although the knowledge about the pathophysiology of these injuries has been progressing, they still present as a challenge to surgeons. The most severe type of nerve injury is known as neurotmesis, which in the most extreme case results in a completely transected nerve. This originates a nerve gap, with total interruption of the structural integrity of the support structure of the nerve. There are different strategies that can be used to repair a peripheral nerve injury, being that both surgical and non-surgical approaches can be implemented. Whenever tensionless suture across the nerve gap is not possible, surgeons resort to the gold-standard technique which is the use of autologous nerve grafts (autografts). To overcome the disadvantages associated to this technique, nerve guidance channels (NGCs) made of biomaterials have been viewed as an alternative approach. One of the biomaterials that has been considered as a preferable candidate for peripheral nerve regeneration is chitosan. **Methodology:** In order to understand how these chitosan NGCs mechanically behave after being implanted at an injury site, discrete models of the NGCs containing a segment of a peripheral nerve were built using numerical methods to analyze them such as the finite element method (FEM) and the radial point interpolation method (RPIM). The discrete models had variable geometrical parameters: the length of the NGC and its wall thickness. The elastic constants considered were the Poisson's coefficient and the Young's modulus. **Results and Discussion:** Stress and displacement fields were obtained in order to comprehend the structural response of the NGCs when subjected to external forces. With the obtained results concerning stress and displacement distributions, it was possible to understand how the NGCs mechanically behave and which structural features are more indicated for their use. **Conclusions:** Although many advances have been made in the past decades, there is still the need to evolve and improve the different approaches to repair injuries in the peripheral nervous system. Numerical methods such as FEM and RPIM can numerically simulate the mechanical behavior of the chitosan NGCs and help to understand how they can be mechanically improved.

Author Keywords. Peripheral nerve, Chitosan, Finite element method, Meshless methods.

Occupational exposure to dust in the mining industry context – a short review

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Abstract

Introduction: The exposure to breathable particulates pose a significant threat to human health globally. Several occupational activities can contribute to this problem, being mining one of them. The dust generated from mining activities such: as drilling, crushing, loading, and unloading can reach the alveolar region of the lung, representing an occupational hazard. Miners are considered a high-risk group for respiratory morbidity and premature death since workers usually stay for an extended period of time on the mining front, for instance. The main objective of this systematic review was to characterise the occupational exposure to dust in the mining context, determining the main exposure values, occurrence circumstances, leading occupational diseases and their prevalence. **Methodology:** The PRISMA Statement guidelines were used in order to conduct the research. Engineering and health databases and journals were screened and the combinations of the following keywords were used in the first phase: “dust” and “particulate”, “open pit”, “open cast”, “quarry”, “mining industry”, “underground mining” and “extractive industry”. Later, the keywords “pneumoconiosis”, “silicosis” and “respiratory impairment” were added to the study. The prior defined exclusion criteria were date (only papers published after 2015 were considered), type of document (scientific papers and articles in press), type of source (journals and trade publications), language (English only) and a first screening was performed through the titles and abstracts in order to determine the scope. The included articles would have to be related to the main objective and reporting any outcome related to dust occupational exposure. **Results:** A total of 4,430 records were identified. After applying the exclusion criteria, only 17 remained. The references of the included studies were screened so to add other relevant articles, in the known snowballing technique process, where six more results were found. From those 23 final studies, 18 focused on dust collection processes and data, while five studied the occupational diseases related to the topic. **Discussion:** The interaction between the different variables – place, equipment, and activity – determine and influence the dust generation and spreading. However, the breathable dust concentration tends to be higher in the milling processes (crushing, concentration and pelletizing), than in the non-milling processes (mining, shop, and office or control rooms). The prevalence of diseases such as silicosis tend to increase with increasing age and may be highest among former smokers. The duration of exposure was also associated with an increase in the prevalence rate; for each additional year of silica exposure, this ratio increase was of about 4%. **Conclusions:** Mining activities are severely associated with the dust generation process. The overall objectives of the systematic review were achieved: the actual exposure values to dust were collected, and the circumstances in which it occurs were addressed. This study provided data to be considered in a dust mitigation process.

Author Keywords. Breathable particulates, Mining activity, Occupational disease.

Virtual Reality and the future of construction

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Abstract

Introduction: Despite the recent trends in technology, construction projects are becoming increasingly challenging, which, in the result, brings in more complex and dynamic construction environments. In fact, traditional management and monitoring methods are currently unable to keep up with the industry's quick development, leading to several problems in task efficiency and transfer of information between stakeholders. As a result, the Architecture Engineering Construction and Operations (AECO) sector is making use of the digitalization in order to improve project management, assist trade-crews and achieve a more proficient working environment. The adoption of Building Information Modelling (BIM) embodies a paradigm shift from the traditional approaches towards a collaborative and integrated working process. Though BIM is improving the aforesaid issues, not every construction entity can easily adapt and use it successfully. Therefore, supportive tools to assist BIM in achieving its full potential are in high demand. The current research objective is to provide a review of previous works in the field of BIM-based Virtual Reality (VR), in order to establish a clear view of this research field. This work provides the primary data on such goals. **Methodology:** In order to conduct the research, the PRISMA Statement strategy was used. The selected primary keywords were "construction", "virtual reality" and "building information modelling" and their variants. The research was carried out in the main engineering databases and journals, being Scopus, Science Direct and IEEE Xplore some examples. **Results:** After the identification of 2,950 records, exclusion criteria were applied: year of publication, type of document, type of source and de-duplication. The titles and abstracts of the publications were screened in order to determine the scope of the papers, leaving for full-text analysis just 75 studies. After going through the eligibility criteria, only 14 papers remained. Using the snowballing technique, two more papers were added to the study, resulting in 16 included papers. Most of the papers focused on the Construction Design, Construction Management, and Construction Safety fields, being "design" the most occurring construction stage. The highlighted target groups for the virtual reality interfaces were Engineers, Architects and Workers. Most system architectures comprise, at least, three layers regarding a BIM software tool, a visual enhancement module and a game engine to provide the virtual environment and interaction functionalities. However, some studies referred to a fourth layer (database). **Conclusions:** The BIM-VR relation addressed in the articles was mainly focused on the model's geometric information since BIM provides an accurate display of building geometry. Most VR interfaces do not possess a database component to provide access to BIM parametric information, leading to the conclusion that BIM is not achieving its full potential with VR tools.

Author Keywords. Construction, Digitalization, Interface, Virtual Reality, BIM.

Specific risks associated with the manufacture of airplanes

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Abstract

Introduction: The aviation industry is growing fast, Boeing and Airbus are the biggest manufacturers in this area. The production and manufacture in the Aviation sector contain specific risks and hazards especially according to the size of the different parts of the airplane. This paper reviews and summarizes some special risks about this production chain, based on the manufacture line of an airbus aircraft. **Methodology:** The methodology used for this paper is a literature research. Different journal databases and library catalogues have been searched. Qualitative and quantitative studies have been included. **Results and discussion:** Production of aircrafts dangles multiple dangers. The specific risks are mostly according to the size of the parts of the airplane, also the scale and level of the different operations are very complex. One big risk factor in the production of an Airbus airplane, is transportation. Airbus produces its parts all over Europe. The transportation to different locations is complicated and executed by different vehicles, ranged from special trucks to Beluga airplanes. To be highlighted here are the wings, which are produced in the United Kingdom and have to be maneuvered through small towns and streets, which are not designed to carry these big transports. This action contains multiple dangers, for the traffic, for the infrastructure and for the people involved in this process. Another specific risk, associated with the manufacture of an airplane is the size of the whole production area. In the size of small towns with big buildings to store and contain all parts of the airplanes, risks and dangers can fast be overlooked. Due to the size of the parts, many operations must be performed at great height. Operators face the risks of falling down the structure or dropping tools onto other people. The fact, that even a small risk that has not been adequately addressed poses a danger to hundreds of people who could later crash in this aircraft, highlights the aircraft industry of others. **Conclusions:** Problems in this area are known, lots of different approaches were made in the past to identify all the risks and dangers, from the detailed approach of checking and analysing every single part, to the approach of including the bigger picture, containing risk scores based on ubiquity and geopolitical risks as well as ERP approaches in the whole manufacturing process.

Author Keywords. Aviation, Manufacture, Transportation, Aircraft, Airplane.

A short review on physiological monitoring during working activities

D. Bustos¹, J. C. Guedes¹, J. Torres Costa²

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Abstract

Introduction: Temperature extremes, load carriage, inadequate sleep, information overload, dehydration, and impaired nutrition, are common risks associated with many occupational activities, including those for whom optimal functioning is critical at all times. These safety-sensitive occupations include firefighters, first responders, police officers, physicians, airline pilots, soldiers, and those operating heavy machinery. In any of these cases, the resulting interaction between occupational stress and individual susceptibility to illness demands careful management. This represents a dual challenge to organizations responsible for the well-being of personnel who engage in strenuous tasks, imposing requirements to be vigilant for or, even, curtail situations that result in high physiological strain. The emergence of wearable physiological monitoring technologies could prove advantageous in this regard. To our knowledge, no review gathering the applicability of these systems within occupational groups has been conducted. Therefore, this review aims to summarize current progress in the development of wearable physiological monitoring systems for occupational applications. **Methodology:** Five databases were accessed (SCOPUS, PubMed, Science Direct, Academic Search Complete and Web of Science) and a total of 12 keywords were combined to develop a search on journal articles from January 2014 to January 2019. Study eligibility based on active workers participants and assessment methods not interfering with normal tasks development and involving harmless procedures. Furthermore, investigations conducted with prognostic health-related goals were filtered. **Results and Discussion:** Nineteen studies were analyzed in this review. In general, their goals were directed to quantifying the impact of specific physically demanding tasks or validating newly proposed methods for classifying the effects of different levels and workloads of occupational tasks based on workers' physiology. Identified occupational groups mostly included construction workers, drivers, and firefighters. Retrieved papers highlighted the importance of field monitoring to provide a chance to timely detect any abnormal condition in the worker's physiology that might be affected by working conditions or environmental stresses. **Conclusions:** Wearable sensors proved to be a valid tool for assessing physiological status in simulated and real working environments. Future research perspectives should be focused on validation of standardized procedures within bigger samples and involving a variety of safety-sensitive professions. Finally, based on physiology and novel computational techniques, it was observed that further developments should be concentrated in the algorithms that allow low-cost sensors to be used in operational settings to provide the continuous subjects' status promoting to sustain their given tasks in a safer and healthier way.

Author Keywords. Physiological monitoring, Occupational health, Review.

A comparison of energy expenditure equations for basal-equivalent activities

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Abstract

Introduction: Resting energy expenditure (REE) represents the largest component of total energy expenditure and is a major contributor to energy balance. Over the past several decades, numerous REE equations have been developed targeted to different population groups. However, the generation of standardized equations for predicting energy expenditure, to be applied to every healthy individual, is still subject to research. This study aims to test existing predictive equations for basal energy requirements and based on a comparison of their results and measured values, to determine the most appropriate to the characteristics of the studied group. **Methodology:** Thirty participants (age $30,37 \pm 5,50$) performed a sequence of five activities chosen to represent basal, light and moderate intensities. The included three basal-equivalent tasks were analyzed in this study. During each trial, oxygen consumption was measured by a portable metabolic system (K_4b^2). From a previously developed literature research, equations were selected to estimate energy requirements. Calculations and values obtained from oximetry were compared. **Results and Discussion:** Retrieved predictive equations were filtered to 21 relevant equations from 15 authors. When observing general results, most participants showed the equation proposed by Korth (based on weight, height, sex, and age) to be the one predicting values with a better approximation to K_4b^2 , followed by the Haaf&Weijs' equation, based on fat-free mass (FFM). From the individual analysis, Korth's equation proved to work well for men in most cases and poorly for women. Correspondingly, Haaf&Weijs equation gave better results for females. Specifically, better approximations were obtained within males participants. Finally, the associated deviations from measured values indicate more reliable results than a Level 1 (two with better accuracy than a Level 2) of the assessment approaches, for energy consumption while working, referred in the ISO 8996:2004 standard. **Conclusions:** Through this study, Korth (based on weight, height, sex, and age) and Haaf&Weijs (based on FFM) equations proved to be the most accurate. As a result, since body composition measurement is not always possible, the equation of Korth is advised for use in a young subjects' sample with similar overall characteristics to the sample hereby presented. Future studies should be developed to test equations within bigger samples and propose a new regression model that better adapts to the studied population.

Author Keywords. Resting energy expenditure, Energy requirements, Energy expenditure estimations.

Quantitative risk analysis and consequence modeling the explosion of methane storage tanks in a gas refinery

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Abstract

Introduction: The major and high quality fossil fuels (oil and gas) have been widely used in various industries such as refineries. It is even though there are very high potentials for hazards in refineries and in the methane gas process, in particular, causing human and financial losses as a result of hazards leading to accidents. This study was aimed to quantitatively analyze the explosion risk of methane gas tanks in a refinery by analyzing the risk, and modeling and evaluating the related consequences. **Methodology:** Hazard analysis by PHA (Primarily Hazard analysis) was used to choose the worst-case scenario. Then, the causes of the scenario and its probability were determined by FTA (fault tree analysis) Finally, PHAST (Process Hazard Analysis Software Tool) software package was employed to model and analyze the consequences. **Results:** Based on the results concluded by the preliminary hazard analysis, the explosion of methane gas tank (V-100) was selected as the worst-case scenario at the refinery. The qualitative fault tree showed three factors including mechanical, process, and human failures contribute to gas leakage. The leakage size and weather conditions were effective on the distance of explosion overpressure. Using the consequence modeling, including the discharge, dispersion, and scenario consequence modeling, vapor cloud explosion (VCE) was considered as the major consequence of the accident. Finally, to evaluate the consequence, probit equations were used to quantify losses and the percentage of fatalities due to the methane gas leakage and explosion occurrence. The maximum number of fatalities caused by explosion was 16 persons. **Conclusions:** In conclusion, the methane gas vessel in the refinery can be considered as the main source of hazard, therefore elimination of the mechanical failures, blast proofing against the explosions, implementation of the safety rules and procedures and personal protection equipment are proposed for decreasing the probable losses and fatalities.

Author Keywords. Explosion, Gas refinery, Consequence modeling, Risk analysis, Methan, FTA, Phast, Probit.

Factors influencing workplace physical activity interventions: a short review

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Abstract

Introduction: Many occupations are characterized by sedentary behavior (SB) and lack of physical activity (PA). There is growing evidence that prolonged sitting is associated with multiple health risks, including musculoskeletal disorders, biomarkers of increased cardiovascular diseases, some forms of cancer. There is an increasing interest in changing the work environment by implementing various interventions to reduce barriers and promote physical activity. The aim of this short review is to identify factors that affected workers' SB and/or PA to design appropriate interventions. **Methodology:** The search was performed based on PRISMA statement methodology and was conducted in Scopus for articles and reviews published in scientific journals from 2010 until 2019 in English, using a set of root keywords as "sedentary work," "physical activity" and "effectiveness intervention". **Results and discussion:** the review included 12 studies describing effective factors on PA in three categories: organizational factor, individual factor, and social factor. The main organizational factors found were: supportive workplace policies and resources, time for involvement in intervention, paying for activity, management support, work environment factors, and job type (passive jobs, and high-strain jobs). Interpersonal factors, knowledge include (educational level and information about physical activity guidelines) and some sociodemographic factors as individual factors associated with the physical work activity. Furthermore, social factors like social support and social norm have a significant effect on willing to do physical activity in workers. Some studies used "behavior change techniques" to find effective factors on physical activity for identifying the most appropriate interventions. **Conclusion:** Current evidence demonstrates that some individual, organizational and social factors influence work physical activity; therefore, they need to be considered in each population specifically, before choosing the intervention type. It can contribute to the increasing effectiveness of interventions intended to improve physical activity. Future research in this area should consider the association of various factors identified to enhance the effectiveness of interventions.

Author Keywords. Sedentary work, Effectiveness of intervention, Sociodemographic factors.

POSTERS

Exposure levels of health-relevant pollutants and importance of biomonitoring studies at preschools

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Abstract

Introduction: Children, one of the most susceptible groups to air pollution, spend most of their day-time at schools. Due to their underdeveloped biological systems, children are at a higher risk to suffer from the potential health risks that may be aggravated and/or induced by indoor air pollution. This study evaluated the airborne levels of total suspended particulate matter (PM), ozone (O₃), carbon monoxide (CO), total volatile organic compounds (TVOCs), formaldehyde, particulate-bound and gaseous polycyclic aromatic hydrocarbons (PAHs) in the indoor air of classrooms and simultaneously assessed the total internal dose of six PAH metabolites in the urine of preschool children. **Methodology:** Sampling was performed during thirty consecutive days at classrooms from two preschools situated in the districts of Porto and Chaves (North of Portugal). Gaseous pollutants were monitored with portable sensors and PM was collected with constant flow samplers. PM levels were gravimetrically determined while PAHs and metabolites were determined by liquid chromatography. **Results and discussion:** Levels of PM varied between 14.6-46.2 µg/m³ (mean 27.9 µg/m³), while O₃ and CO values ranged from 19.7-230 µg/m³ (mean 85.6 µg/m³) and 120-2730 µg/m³ (mean 540 µg/m³), respectively; values were within the available national and international guidelines (25 µg/m³, 200 µg/m³ and 10 mg/m³, respectively). Concentrations of TVOCs and formaldehyde varied between 0.03-3.91 mg/m³ (mean 2.06 mg/m³) and from 0.01-0.09 mg/m³ (0.03 mg/m³), respectively. Levels of TVOCs were up to 12 times higher than the European guideline of 0.2 mg/m³ while formaldehyde concentrations were below the limit of 0.100 mg/m³. Levels of total PAHs (ΣPAHs) in the total indoor air ranged between 26.1-150 ng/m³, being naphthalene, phenanthrene, and fluorene the most abundant compounds (93% of ΣPAHs). Urinary levels of 1OHNap and 1OHAce (0.05-14.4 µmol/mol creatinine) and 2OHFlu (0.013-1.34 µmol/mol creatinine) were the most predominant biomarkers (86-95% of total OHPAHs), followed by 1OHPhe and 1OHPy; 3OHBaP was not detected. Moderate to strong Spearman correlations were found between airborne ΣPAHs levels at classrooms with the urinary concentrations of total OHPAHs and between airborne naphthalene and acenaphthene with urinary levels of 1OHNap and 1OHAce. **Conclusions:** Indoor air quality at preschools was acceptable, except for TVOCs. Results suggest that exposure levels of PAHs at classrooms have a direct impact on the urinary levels of PAH metabolites. More studies are needed to evaluate the impact of classrooms' indoor air quality on preschool children.

Author Keywords. Children exposure, Schools, Indoor air quality, Particulate matter, Polycyclic aromatic hydrocarbons, Biomarkers of exposure.

OWAS method analysis applied to a slaughterhouse company

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Abstract

Introduction: The Industrial Revolution was a milestone in world development, but as every innovative process, it has also brought adverse situations, especially to the health of the worker. The beginning of the industrial process was marked by the repetitiveness of movements and monotony at work. Subsequently, the automation developed and modified the form of production. However, despite the improvements in the industry, the same effort is still noted, characterized by the exhaustive repetition of movements, the requirement of the same muscular group daily and monotony, factors that cause stress, musculoskeletal injuries and occupational accidents. The objective of this research was to assess the index of workers with musculoskeletal injuries. **Methodology:** The study was developed in two sectors of a slaughterhouse located in the south of Brazil: chicken's wing cut sector and platform sector. The observation, *in situ*, allowed the ergonomic analysis through the *Ovako Working Posture Analyzing System (OWAS)* method to assess the ergonomic risks of the postures based on the position of the back, arms, and legs of the workers. Time and methods were analyzed, as well as the medical records of all workers, which were registered and assessed. For the statistical analysis, workers were divided into a) uptime, b) workers who had already exercised demanding work activity of physical exertion and/or repetition of movements and the form of removal (with medical low or without medical low) and, c) by gender. **Results and discussion:** Through the use of the OWAS method, it was verified that workers from both sectors are not exposed to ergonomic risk. Therefore, hypothetically, they would not be subjected to musculoskeletal injuries. These results were then compared with the medical records and there was disagreement between the result of the ergonomic method and the number of injured workers. Women were the most affected by the musculoskeletal injuries. Regarding the male universe, the majority of mean suffering from musculoskeletal injuries were those who had previously worked with the activities that required force and/or repetition of movements. **Conclusions:** It was determined that the index of injured workers were 25% of women in the wing cut, and 17% of men in the platform sector, which was not coherent with the application of the *Ovako Working Posture Analyzing System* method. It is believed the main reason is that the method does not consider the movements repetitiveness which characterises the activity. Therefore, it would be helpful for the analysis that the ergonomic study is performed using several tools, so that the result is reliable, given the dissonances that may exist between methods and means of analysis.

Author Keywords. Occupational disease, Ergonomics, Fatigue, OWAS method.

Prevalence of occupational diseases in women in Universities: Review Article

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Abstract

Introduction: The research hereby presented is about the disease process of the working woman, understood from a socio-historical perspective of the worker. When talking about workers, specifically about women, various factors influence their entry into the job market. It can be perceived that the work division by gender contributes to the inequalities between women and men in several ways, particularly when it comes to health. When not dealing with the existing differences between social gender conditions, these can affect in the comprehension of work for women, in their working conditions and consequently, in matters related to the health prevention at work. To identify the prevalence of occupational diseases within women in universities.

Methodology: This systematic review was elaborated taking as a basis the PRISMA Statement methodology, retrieving articles from the Scopus and Web of Science electronic databases, and associating the prevalence of occupational diseases within women in universities. The obtained information was analyzed along with the official data provided by the International Labour Organization-ILO and the World Health Organization-WHO.

Results and discussion: Searches provided outcomes about the evidence on the technologies, benefits and even discussions on how the working conditions particularly affect women and represent potential causes of diseases that can negatively impact the quality of life at work, and therefore, prove the need of comprehensive data collection with the aim of contributing to modify that reality. Within studies, initial considerations promote the possibility of deepening knowledge with new searches.

Conclusions: Results demonstrate the importance of perceiving the diseases within specific professional categories, hereby represented by the health professionals, professors, and administrative technicians. The article brought the contribution of studies that prove the importance of perceiving the female worker's profile, considering besides age, the associated diseases as well as the diseases that despite not being declared as occupational, perturb the work environment and need to be deepened as such. From the studied articles, this work proves the need for extending the searches oriented to perceive the factors that cause the highest percentages of diseases within women.

Author Keywords. Prevalence, Occupational diseases, Women, Universities.

Suicide and work, sociological view. Review article

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Abstract

Introduction: For more than a century, the sociological study of suicide is due to Durkheim's classic *Suicide*. Essentially, there are two central principles: that the structure of suicide rates in a society is a function of the structure of social relations and that vary in terms of integration and/or regulation. Suicide occurs predominantly among the group with the highest levels of social, political and religious solidarity. However, when Durkheim's theory is extended, and extension in the micro level is integrated. When individuals do not feel integrated into society, they can commit selfish suicide in the ultimate analysis; higher levels of suicide in modern societies would reach equilibrium due to the stabilizing forces related to mutual interdependence and social mobility. This study aimed to characterize the studies produced in the last 5 years that address suicide and its main causes. **Methodology:** a systematic review that followed the reporting guidelines of PRISMA methodology to obtain relevant to the subject data was performed. The review was based on relevant articles published in three databases (SCOPUS, Science Direct and Web of Science). The keywords used were Suicide, Sociology and Military. The eligibility criteria of the articles contemplated only articles published and peer reviewed, published from 2014 to 2019, and written in English. **Results and Discussion:** 149 articles were selected, of which eight studies were included, after applying the date criteria (period 2014 to 2019); document type criteria (only research articles) and the language criteria (articles in English). Laboring suicide, disclosed ways of investigation for the prevention, taking into account two basic types: suicide and self-inflicted injury. Due to the nature of the results, it was well established that suicide is a multi-causal phenomenon and may be associated with determinants of the most varied shades. The possibilities for the motivation to commit the suicide proposed by the authors, give a good measure of this diversity. **Conclusions:** It is worth mentioning that little change has occurred in existing social theories, however, society is evolving, is the interpersonal mechanism at work or family. Such relationships between friends, the influences of mourning, require special attention.

Author Keywords. Suicide, Sociology, Work.

Analysis of the nutritional composition of the typical meals of the rural workers in the Muanza District in Sofala - Mozambique

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Abstract

Introduction: Muanza district is located in Sofala province in central Mozambique, one of the poorest districts in the country. Here agriculture is the basis for the livelihood of many families, and their eating habits are based on products from their fields, especially cereals and tubers. The main objective was to characterize the dietary habits and the average nutritional intake of the peasants of Muanza and to propose adaptations to the habitual food in order to improve the adequacy of the nutritional intake of the population. **Methodology:** The information about the usual dietary intake of the adult community living in Muanza was collected by observation for 3 days, typifying the 3 most frequent days in terms of dietary intake in the community. Foods were weighed and the mean values of energy and macronutrients expressed in grams and contribution to the total energy value (TEV) were calculated using the Mozambican Food Composition Table. The nutritional composition of the "Nhakaka" (*Dioscorea cayennensis*) and "Minhanha" (*Dioscorea rotundata*) tubers was estimated by bromatological analysis. After analyzing the farmers food nutritional composition, it was proposed improvements in their diet. **Results:** The structure of the daily dietary intake includes two meals per day. On day 1, one of the meals was composed of Yam (*Dioscorea* sp) and tea and the other included Xima (prepared meal of sorghum) and dried fish. On day 2, one of the meals was composed by *Dioscorea cayennensis* and tea and another included Xima and okra (*Abelmoschus esculentus*). On day 3, one of the meals was composed of *Dioscorea rotundata* and tea and the other included Xima and Nhemba beans (*Vigna unguiculata*). The average daily intake of energy was 1352 Kcal, the carbohydrate intake was 937 g (69.3% for TEV), fat was 100g (7.3% of TEV) and protein was 316g (23.4% of TEV). When we increased the diet with seeds and fruits, daily energy would increase to 2125 Kcal, carbohydrates 1121g (52.7% for TEV), protein 423g (20% for TEV), fat 582 g (27.3% for TEV). **Conclusions:** Muanza peasants had a low energy intake considering their pattern of physical activity, with a predominance of carbohydrates and very low fat. The average daily energy intake as well as the fat intake increases with the inclusion of seeds and fruits.

Author Keywords. Nutritional composition, *Dioscorea cayennensis*, *Dioscorea rotundata*, Rural workers

The posted workers and their difficulties in European Union

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Abstract

The present European Union (EU) society is divided into several economic classes that share the same goal and ensure their well-being through funds obtained from their work. Then, the man must perform work, independently or for his employer, and be economically compensated for it. For this reason, the man moves to regions where there is a demand for labor and preferably where it is well remunerated. We are dealing here with a special class of displaced workers, a population mostly made up of people with no greater qualifications or skills. These people need work to be able to guarantee their livelihood and that of their families. Having at work their only wealth these people seek to meet the need for EU mobility of workers becoming vulnerable to employers without respect for labor laws and Occupational Safety and Health (OSH) rules. It is important to know that a posted worker is an employee who is sent by his / her employer to work temporarily in another country to provide a cross-border service. This is not the same as a long-term mobile worker, who lives and works for an indefinite period in another Member State, or a cross-border worker, who lives in Member State A but works in Member State B. Introduction: Behind the designation of "displaced worker" there is a disregard of labor and economic legislation in many EU countries. Methodology: Systematic review in Science Direct and Web of Science databases, using Prisma P tool, and data Parliament and European Commission and EU-OSHA. Results: Research, studies, and articles point to disrespect by Unions, industry and entrepreneurs of Labor legislation, Occupational Safety and Health of Posted Workers. Conclusion: The analysis resulted in a very real picture of the condition of the worker posted in the EU. Better protection for several categories of workers were taken by the European Parliament: the new rules will apply to temporary agency workers and workers in chain posting to ensure also for them the principle of equal pay for equal work at the same place. Workers in non-genuine posting will be protected too. Member States will have 2 years to implement the new rules into their national legislation. They will then have to apply and start enforcing the rules.

Author Keywords. Temporary work, Work conditions, Construction Industry

Food in the occupational environment and its benefits in worker health

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Abstract

Introduction: The food universe is very broad and has a lot to do with the culture of each region. However, the macronutrients' constitution: proteins, carbohydrates, and lipids can be adjusted in any diet, thus allowing food to be a way to promote health and quality of life and to lower the risk of work accidents by improving sleep quality. **Objective:** To amplify and update a non-labor diet application, aiming to indicate, among the existing diets, the one that allows greater work capacity, better performance and more health through the metabolic control. **Methodology:** The PRISMA methodology was applied in the bibliographic review. Scientific articles, indexed in international journals were searched in the following databases: Medline (searched via PMC – PUBMED Central) and Scopus and through JISSN. Using the keywords diets, "position stand", timing, nutrients, work performance, sleep, consensus and protein, combined three by three, as well as their respective variations. **Results and discussion:** 247 articles were found. After applying the eligibility criteria, only articles published in the last 5 years in journals, cross-sectional studies (in humans) with consent, and published in English were accepted. Duplicate articles were removed. Articles which were not related to the theme were excluded after reading the title and abstract, excluding 206 papers. In this study were included 41 papers. Out of the 41, 13 articles were added by cross-reference. In the MEDLINE search, the [SECT] filters - referring to the research section and [TW] were inserted for words present in the articles when searching composite words. Initially, the compositions of the several diets were addressed: Hypocaloric - LED and VLED, Low Fat - LFD, Low Carbohydrate - LCD, Ketogenic – KD, and Hypercaloric – HPD. Their main strengths and their main characteristics were fully addressed. **Conclusion:** It was concluded that the HPD, from all the diets, was the one that had the greatest practical relevance in work environment, once its results in the maintenance of a lean body mass, through its high ingestion frequency. The improvement of the health markers and the nocturnal vigil period reduction, reveal the effectiveness in improving working performance.

Author Keywords. Diet, Work performance, Nutrient, Sleep, Consensus, Protein.

Hand tools characteristics in slave labour

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Abstract

Introduction: The Brazilian economy was based on slave labour, particularly in rural areas, until the end of the nineteenth century. Traditionally, the developed studies regarding this period present a historical or sociological perspective on this subject. Based on analyses of historical descriptive studies, this work aimed to make an objective investigation of the slaves' safety conditions, concerning the use of equipment and tools, and accidents with an injury resulting from such use. **Methodology:** The selected databases to conduct the research were: Science Direct, Scopus, Web of Science, Criminal Justice, EBSCO, Business Source Complete, as well as original historical documents. Regarding the selection process, descriptive studies involving the rural work of the slaves in colonial and imperial Brazil were considered without language restrictions. The tools' safety conditions, as well as the work performed by them, were evaluated. **Results:** The searches in the six databases provided, initially, 36,355 references. After applying the exclusion criteria, 9 were selected to full-text reading. By applying the snowballing technique, 19 more papers were added, resulting in a total of 28 works. Once applied the eligibility criteria, 20 papers were included in the systematic review: 8 papers, 3 books, and 9 rare books. The tools used by the slaves ranged from simple wooden rods to cutting hand tools such as hoes, axes, and scythes, made of metal alloys. All of them had great relevance, and their use was widespread in rural properties. **Discussion:** Compared with the hand tools used in the twenty-first century, those considered ideal in the nineteenth century tended to have greater mass and larger wooden cables. The shapes and dimensions of the metal tools did not change significantly in this period. **Conclusions:** The assessed studies indicated the existence of similar tools in all Brazilian regions, which suggest that accidents with injuries occurred similarly among slaves. Regarding energy expenditure, these values are smaller with the tools of the XXI Century, due to the decrease of the mass and the length of the cable (smaller momentum values - Nm).

Author Keywords. Slavery, Modern slavery, Hand Tools, Injuries, Review.

Thematic review on the slaves' feeding in colonial and imperial Brazil

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Abstract

Introduction: Until the end of the nineteenth century, the Brazilian economy was based on slave work. In a historical period of incipient mechanization, the main sources of energy used from the transportation to the activation of the available rudimentary equipment, were of animal origin, among them the Man. The enslaved workers spent their energy performing tasks using, in most cases, only hand tools, such as axes, scythes and hoes. Human strength was the only source of available energy for the more elaborated activities that could not be done by animals. These activities ranged from deforestation to digging, from planting to weeding or harvesting. This research aimed to obtain a detailed and descriptive framework of energy replacement conditions of slave labour, through a review of historical sources and contemporary studies. **Methodology:** Six databases were searched with timeframe after 2014, as well as original historical documents. A snowballing approach allowed finding references before 2014. The studies were selected without language restrictions. The quantification of energy recovery was done based on quantity, quality and type of served food; the energy value of those foods; and the average of slaves' energy expenditure in rural activities. **Results:** The searches in the six databases provided initially 36,355 articles. After screening and analysing all this information, 16 were included: 6 articles, 5 books and 5 rare books. **Discussion:** The selected studies classified slaves' feeding as insufficient to energy replacement, of low quality and classified as bulk feed by the researchers, that is, it consisted of low-quality foods and its preparation was carried out carelessly as regards hygiene, ways of cooking or seasoning. This diet was repeated daily, leading to the occurrence of digestive system diseases. The difference between the average daily energy expenditure and the replacement of this energy using the supply provided by the slave owners, was also significant. The reduction of this difference was fundamental to human labour and was supplied in different ways. A rather usual one was an increase in the regular supply of alcoholic beverages. **Conclusions:** The analysed studies suggest the existence of precarious and similar energy replacement conditions, among the slaves in the different regions of Brazil.

Author Keywords. Slavery, Modern slavery, Caloric supply, Caloric expenditure, Occupational safety and health; Review.

Predicting thermal sensation through local body skin temperatures to assess thermal comfort: a short systematic review

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Abstract

Introduction: The skin plays a substantive role in the thermoregulatory process. The maintenance of a constant internal body temperature by the thermoregulatory system, partially achieved by vasoconstriction and vasodilation, makes the skin temperature an important mechanism to indicate the thermal state of the comfort of a given subject. However, this parameter is still little considered in studies that evaluate thermal comfort. Therefore, this work aims to investigate the use of skin temperatures as a predictor of thermal sensation to assess thermal comfort. **Methodology:** A short systematic review based on Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) was performed to assess scientific publications that evaluated thermal comfort considering the skin temperature as a predictor. The review search strategy considered the use of "thermal comfort" and "skin temperature" as keywords in the 'Web of Science', 'Scopus', 'PubMed', and 'Academic Search Ultimate', 'Taylor and Francis' and 'Sage Journals' databases. Eligibility criteria considered articles that conducted experiments under steady-state environmental conditions and that considered skin temperature measurements in the assessment of thermal comfort. **Results and Discussion:** The search resulted in the identification of 73 articles, from which five were considered suitable for the systematic review. Skin temperatures were measured at a variety of measurement points throughout the reviewed articles. Overall, the mean skin temperature of female subjects was lower than the mean skin temperature of male subjects at each experimental temperature, at the same level of thermal comfort. Forehead, chest and abdomen were evidenced as the best measuring points and presented the highest correlation between thermal sensation and skin temperature. **Conclusion:** The systematic review has shown that the comparison between the selected articles is hampered by the lack of uniformity in the adopted experimental procedures. There seems to be a relationship between thermal sensation and skin temperature responses. Future studies should consider more uniform experimental procedures. Besides, there is the need of increasing the size of the experimental sample and to consider different target groups (such as children or the elderly) to verify if the prediction of thermal comfort based on skin temperature exhibits the same trends when compared to healthy adults.

Author Keywords. Skin temperature, Thermal comfort, Thermal sensation vote, Systematic review.

The sound aesthetic of servicescape: influence in the aesthetic experience of employees

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Abstract

Introduction: This research deals with the influence of the soundscape of the servicescape along to collaborators, according to the service design perspective. It is understood that Service Design (SD) covers the design of the entire service experience, as well as the design of the process and the strategies for delivering it. Some elements that are included in this process include the provider, developers, servicescape, products, clients, etc. The central point of the SD is to understand the value and nature of relationships between people and people, between people and things, between people and organizations, and between organizations of various kinds. In the scope of SD, the Aesthetic dimension assumes a higher level of complexity, since the relational aspects between human beings (employees and clients) are added, elements that often determine the quality of the experience of service as a whole. In order for the customer to receive an excellent service, it is essential to pay attention to the condition of the employees who provide the service. In this respect, an aesthetic approach has the potential to diagnose and enable innovative solutions to be better explored. The problem was questioned: how does sound aesthetics influence the aesthetic experience of collaborators in servicescape? The objective was to demonstrate how sound aesthetics influence the aesthetic experience of employees in a servicescape. **Methodology:** To answer the research question, a bibliographic review was carried out, and a survey was undertaken in a shopping mall in the city of Curitiba / Brazil. The RPE-Audição tool was used to collect the data. The survey counted on the participation of employees who work in the servicescape of the company that provides the service. **Results and Discussion:** The results showed that the soundscape of servicescape influences the creation and maintenance of the mood state and can directly impact the health of the employees. The soundscape of the analyzed servicescape evokes positive emotions in the collaborators. In a servicescape focused on hedonic consumption, it is essential that positive emotions are evoked and reinforced, as they can create or reinforce positive moods as well. Such a scenario can bring better working conditions to employees, impact on the quality of life, health, potentiate consumption and interfere in the creation of a positive image about the establishment. **Conclusions:** As a suggestion for future work, it is recommended to conduct research involving other hedonic service environments in order to deepen the knowledge about the influence of the sound landscape on the aesthetic experience of the collaborators.

Author Keywords. Sound aesthetics; Aesthetic experience; Servicescape; Service design; Sound landscape.

Geographic Information Systems enforced to occupational health and safety practices: a short literature review

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Abstract

Introduction: Risk assessment methods are commonly used in health and safety and require rapid response tools that allow an analysis of multiple scenarios in order to reduce the loss of life, environmental and materials damages. This work is a systematic review of the available literature of Geographic Information Systems (GIS), addressing issues related to the occupational sciences of Health and Safety and/or Emergency. **Methodology:** The method used for the review was based on the PRISMA-Statement. It was developed through 4 databases (Web of Science, Scopus, Springer Link, and Science Direct). The keywords used followed the logic (Occupational OR work) AND (hygiene OR health OR safety) AND (GIS). The applied databases filters were: document type limited to Article (research) and Article in the press, Journals source, and English and Portuguese languages. **Results:** It was identified a total of 667 items, 21 of which were selected for full-text reading. As a result, five articles were selected, and the other two were identified through their reference screening. The articles comprise the years 2009 to 2017, with authors of 9 nationalities and the use of monitoring being the most present method. ArcGIS (ESRI) software was the most frequently used. Information on the risk management methods, and the GIS as a platform, were obtained in mining, construction, industry, mainly, and addressed security issues (one article), emergency (two articles) and occupational hygiene (four articles). **Discussion:** The results of the identified articles helped on issues such as decision making, escape routes, gas concentration information records, dust and fumes, temperature monitoring, humidity, identifying areas with exposure to ionizing radiation, noise, spots identification diseases and visualization of medical complaints conditions for the workplace. It also identified the evolution of the use of GIS information platform with other technologies allowing expansion of new types of evaluation. **Conclusions:** The developed search identified addressing issues in the areas of analysis and management of risks and emergencies, even those that are not exactly worked in safety and occupational hygiene, although it can be seen that the use of the experience is feasible, information and existing approaches to develop the concept of an integrated risk analysis and dynamics within the GIS.

Author Keywords. Geographic Information System, Occupational hazards, Risk management, Emergencies.

Work accidents with biological material with health professionals in Brazilian hospitals

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Abstract

Introduction: The occupational accident (OA) can be characterized as an accident resulting from the exercise of work in the service of a public or private institution, which can cause permanent or temporary physical injury or permanent disability, with consequent loss or reduction of the capacity for work. Biological risk is the main form of exposure of the professional, and the main form of exposure of the health professional to biological risks occurs when there is direct or indirect manipulation of biological material (BM), which can contribute to the transmission of pathogens and, in this way, bring several problems to the contaminated individuals. This study aimed to characterize the national studies produced in the last 5 years that address accidents and exposure to biological material in a hospital environment. **Methodology:** A narrative literature review was carried out in a 5 years period, excluding articles that did not address the topic, articles written in a language other than Portuguese, studies conducted outside the Brazilian context, and any publication that was not peer-reviewed. **Results and Discussion:** The articles analyzed exposed the Brazilian reality, showing that the exposure to biological material is, in most cases, by contact with blood and biological accidents are related, in most cases, to the manipulation of puncturing materials. Re-encapsulation of needles was the main type of action that resulted in accidents. In relation to professionals, negligence, fatigue and distraction on the part of the professional, as well as the inappropriate use of personal protective equipment and work overload were the most cited points. **Conclusion:** The work environments involved in the studies were generally described as unfavorable to workers' health, mainly because they added innumerable intervening factors, such as the technological gap and the lack of maintenance of the instruments of work, precarious ways of organizing work, lack personal protective equipment in adequate quantity and quality. The training is, in general, performed, but it is important to develop the initial training program and continuing education institutions and taxation of companies that do not comply with regulatory mandates for the prevention of occupational accidents. Adequate working conditions, personal protective equipment in adequate quantity and quality are also important factors that must be demanded from health institutions.

Author Keywords. Occupational accident, Exposure to biological agents, Worker's health, Occupational hazards.

Ergonomic analysis of cleaning professionals: pilot study

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Abstract

Introduction: The cleaning activity is characterized by being an occupational activity performed mostly standing, adopting excessive bending of the lower back postures, high positioning of the arms, squatting, the repetitiveness of movements and use of non-ergonomic working tools that demand a high physical profile and agility of the worker. The physical, ergonomic, psychosocial and organizational factors are work-related risks for the emergence of musculoskeletal disorders. Being extremely demanding for the worker's musculoskeletal structure, the ergonomic analysis is fundamental. This pilot study aimed to assess the risk of musculoskeletal lesion of a professional cleaning worker due to the movements and task performance along the activity. **Methodology:** A cleaning professional was selected, observations *in loco* were made, and video/photos were collected, as well as anthropometric data and job-related information. The Nordic questionnaire was applied, and complemented by the REBA method. To determine the energy expenditure and prevent the appearance of injury it was performed an analysis with ActiGraph wGT3X-BT. In order to analyze the adopted postures, Microsoft Excel[®] and Actilife[®] software were used for data processing. **Results and discussion:** The results indicate that the worker has a high prevalence of painful symptomatology in the exposed regions due to the adopted postures, which may be indicative of musculoskeletal injuries. The study allowed to analyze the most affected body regions were the neck, hips/thighs, knees and ankles/feet. The ergonomic analysis revealed the working postures used during the activity constitute a high risk of musculoskeletal injury. **Conclusions:** The results are consistent with the existing literature and provide information that allows characterizing the working activity through the body segments: neck, shoulder, elbow, wrist / hand, chest area, lower back, hips / thighs, knees and ankles / feet according with the positions adopted by effectively working over the 8h of work. With the results, it is possible to know the risks ergonomic that the worker is exposed, as well as improvements and/or changes in the form of execution of the activity.

Author Keywords. Ergonomic analysis, Professional cleaning, Actigraphy, Repetitive movements, Posture assessment.

AWARDS

The following submissions have been awarded as:

- Best Poster – Solange dos Santos, J. Duarte, André Lucena and J. C. Guedes. Ergonomic analysis of cleaning professionals: pilot study. #242.
- Best Oral communication – J. Duarte, Mário Vaz, José Torres Costa and J. Santos Baptista. Occupational exposure to dust in the mining industry context – a short review. #177.

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