DCE 21 4th DOCTORAL CONGRESS IN ENGINEERING

DOCTORAL CONGRESS IN ENGINEERING

Book of Abstracts

Symposium on

Occupational Safety and Health

U.PORTO
FEUP FACULDADE DE ENGENHARIA UNIVERSIDADE DO PORTO

DCE 21 4th DOCTORAL CONGRESS IN ENGINEERING

Book of Abstracts

of the

4th Symposium on Occupational Safety and Health

Editors:
Denisse Bustos
Felicidade Niquice
Jacqueline Castelo Branco
Joana Duarte
Maria Fernandes
Raquel Martins
Soraya Vasconcelos
Tatiana Teixeira

Porto

June 2021

This volume contains the abstracts presented at the Symposium on Occupational Safety and Health, within the 4th Doctoral Congress in Engineering – DCE21, held in Porto, between June 28th and 29th, 2021.

Title: Book of Abstracts of the 4th Symposium on Occupational Safety and Health

Editors

Denisse Bustos

Felicidade Niquice

Jacqueline Castelo Branco

Joana Duarte

Maria Fernandes

Raquel Martins

Soraya Vasconcelos

Tatiana Teixeira

Publisher

FEUP EDIÇÕES

Date: June 2021

ISBN 978-972-752-279-8

WELCOME

The Occupational Safety and Health Book of Abstracts is a collection of the most recent works in the field of occupational safety and health. The included works are focused on the specific topics:

- Occupational Health
- Ergonomics
- Occupational Safety and Hygiene
- Occupational Psychosociology

The abstracts included in this publication are a selection of contributions to the 4th Doctoral Congress in Engineering (DCE). All the included contributions were revised by at least 2 of the 25 international scientific committee members.

The Editors would like to thank all authors for their contributions to the DCE Occupational Safety and Health Symposium. They also thank to the Scientific Committee members who, on behalf of their institutions, contributed to the quality of this book: University of Porto, Institute of Public Health of the University of Porto (ISPUP), Institute of Science and Innovation in Mechanical and Industrial Engineering (INEGI), School of Health of the Polytechnic Institute of Porto (ESS.IPP), University of Algarve (UALG), University of Pernambuco (UPE), Federal Institute of Santa Catarina (IFSC), Federal University of Piauí (UFPI), Federal Rural University of the Semi-Arid Region (UFERSA), Faculty of Public Health of Burapha University, Thailand.

Porto, June 2021

Symposium Organizing Committee

CONTENTS

COMMITTEES

SCIENTIFIC COMMITTEE

Chair: Olívia Pinho | FCNAUP

João Santos Baptista | FEUP

Members

- Ana Raposo - University of Porto, Portugal
- Andrea Pereira - University of Porto, Portugal
- André Lucena - Federal Rural University of the Semi-Arid Region, Brazil
- António Sousa - University of Algarve, Portugal
- Denisse Bustos - University of Porto, Faculty of Engineering, Portugal
- Fernando Gonçalves - Federal Institute of Santa Catarina, Brazil
- Hélio Cavalcanti - Federal University of Piauí, Brazil
- Jacqueline Castelo Branco - University of Porto, Faculty of Engineering, Portugal
- Joana Duarte - University of Porto, Faculty of Engineering, Portugal
- Joana Guedes - University of Porto, Faculty of Engineering, Portugal
- Joana Madureira - University of Porto, Institute of Public Health, Portugal
- Joana Santos - Polytechnic Institute of Porto, School of Health, Portugal
- João Rufo - University of Porto, Institute of Public Health, Portugal
- João Santos Baptista - University of Porto, Faculty of Engineering, Portugal
- Liliana Silva - University of Porto, Portugal
- Maria Luísa Matos - University of Porto, Faculty of Engineering, Portugal
- Marko Cvetkovic - University of Porto, Portugal
- Maurilia Bastos - Federal Institute of Santa Catarina, Brazil
- Olívia Pinho - University of Porto, Faculty of Nutrition and Food Sciences, Portugal
- Raquel Martins - University of Porto, Faculty of Engineering, Portugal
- Susana Sousa - Institute of Science and Innovation in Mechanical and Industrial Engineering, Portugal
- Susel Rosário - University of Porto, Portugal
- Teerayut Sa-Ngiamsak - Burapha University, Faculty of Public Health, Thailand
- Tomi Zlatar - University of Pernambuco, Brazil
- Vanessa Silva - University of Porto, Portugal

ORGANIZING COMMITTEE

Members

- Denisse Bustos - University of Porto, Faculty of Engineering, Portugal
- Felicidade Niquice - University of Porto, Faculty of Engineering, Portugal
- Jacqueline Castelo Branco - University of Porto, Faculty of Engineering, Portugal
- Joana Duarte - University of Porto, Faculty of Engineering, Portugal
- Maria Fernandes - University of Porto, Faculty of Engineering, Portugal
- Raquel Martins - University of Porto, Faculty of Engineering, Portugal
- Soraya Vasconcelos - University of Porto, Faculty of Engineering, Portugal
- Tatiana Teixeira - University of Porto, Faculty of Engineering, Portugal

PROGRAMME

Symposium on Occupational Safety and Health

June 28th, Monday

Chair: Olívia Pinho and J. Santos Baptista

Session I (10.00am-1.00pm)

Opening (10.00am-10.10am)
Prof. J. Santos Baptista (Assistant Director of DemSSO)

Keynote Speaker (10.10am-10.30am)
Prof. Cristina Reis, University of Trás-os-Montes and Alto Douro (UTAD)
"Construction accidents analysis in Portugal"

Oral communications (10.45am-12.00pm)
Moderated by Joana Duarte

- **#257 - Short review on occupational noise exposure in the extractive industry and similar works**
  J. Duarte, J. Castelo Branco, Fernanda Rodrigues and J. Santos Baptista
- **#13 - Use of drone (UAV) as a tool for work safety inspection for roofing activities in civil construction: a systematic review**
  Gercica Macêdo, Tomi Zlatar and Beda Barkokebas Junior
- **#269 - Firefighters occupational exposure assessment: a systematic literature review**
  Tatiana Teixeira, Isabel Dias, J. C. Guedes and Joana Santos
- **#288 - A framework to implement Occupational health and safety innovation**
  Sara Shahedi, Alfredo Augusto Vieira Soeiro and Sarah Maheronnaghsh
- **#294 - Fatigue detection through physiological assessment during real-life occupational situations: Preliminary results**
  Denisse Bustos, J. C. Guedes, Mário Vaz, Ricardo Fernandes, José Torres Costa, Pedro Pratas and J. Santos Baptista

Poster Session (12.15pm-1.00pm)
Moderated by Felicidade Niquice

- **#295 - Dor lombar na operação em equipamentos pesados de carga e transporte, nas indústrias de mineração a céu-aberto e de construção – breve revisão**
  Jane Paula Souza, Tatiana Teixeira, J. C. Guedes, J. Castelo Branco and J. Santos Baptista
- **#296 - Acidentes ocupacionais em operações com equipamentos pesados de carga e transporte, nas indústrias de extração a céu aberto e de construção – breve revisão**
  Jane Paula Souza, Soraya Wingester Vasconcelos, J. Castelo Branco and J. Santos Baptista
- **#299 - Aspectos ergonômicos da adaptação de estudantes de engenharia ao regime remoto de ensino na pandemia de Covid-19**
  Nilberto Rocha Neto, André Lucena and Fabricia Oliveira
- **#301 - Análise das condições ergonômicas na atividade de execução de alvenaria utilizando o método RULA**
  Carolina Lemos, Fabricia Oliveira and André Lucena
- **#300 - Mainstreaming Occupational Safety and Health in Primary School: ChildOSH Project**
  Joana Santos, Artemisa Dores, Cristiana Ramos, Cristiana Silva, Rodrigo Silva and Sara Moreira

Lunch Break/Workshops (1.00pm-3.00pm)

Session II (4.00pm-6.00pm)

Keynote Speaker (4.00pm-4.20pm)
Prof. Antonio José Carpio de los Pinos, University of Castilla-La Mancha, Spain
"Safe behaviours, mathematical processes, and interpretation of zero risk"

Oral communications (4.30pm-5.45pm)
Moderated by Denisse Bustos

- **#54 -Noise promotes disengagement in dementia patients during non-invasive neurorehabilitation treatment**
  Aisha Animashaun and Gilberto Bernardes
- **#285 - Assessment of Potential Health Risks of Portuguese Wildland Firefighters' Occupational Exposure: Biomonitoring Approach**
  Filipa Esteves, Joana Madureira, João Paulo Teixeira and Solange Costa
- **#287 - The comfort parameters in indoor air of sports facilities with different ventilation regimes**
  Cátia Peixoto, Klara Slezakova, Maria do Carmo Pereira and Simone Morais
- **#297 - Work-related musculoskeletal disorder and its costs: a short review**
  Ana Sophia Rosado, J. Santos Baptista and J. C. Guedes
- **#302 - The occurrence of accidents and illnesses in mining shift worker influenced by food intake, a short review**
  Gentil Andaque, Olívia Pinho, J. Castelo Branco, Elizabete Nunes and J. Santos Baptista

Closing Session (5.45pm-6.00pm)
Prof. Olívia Pinho (Director of DemSSO)

ORAL PRESENTATIONS

USE OF DRONE (UAV) AS A TOOL FOR WORK SAFETY INSPECTION FOR ROOFING ACTIVITIES IN CIVIL CONSTRUCTION: A SYSTEMATIC REVIEW

G. C. G. Macêdo[1], T. Zlatar[2], B. Barkokébas Jr[3]

[1]Laboratory on Occupational Safety and Hygiene, Polytechnic School of the University of Pernambuco, Recife, BR, (gercica.macedo@gmail.com) https://orcid.org/0000-0001-6620-9091
[2]Laboratory on Occupational Safety and Hygiene, Polytechnic School of the University of Pernambuco, Recife, BR (tomi.zlatar@gmail.com) https://orcid.org/0000-0002-8915-908X
[3]Laboratory on Occupational Safety and Hygiene, Polytechnic School of the University of Pernambuco, Recife, BR (beda.jr@upe.br) https://orcid.org/0000-0003-3130-3277

Abstract

Introduction: Falls from heights represent one of the most frequent accidents in civil constructions, mainly caused by different roofing activities. The risks should be first evaluated by conducting safety inspections and then implementing adequate control measures to eliminate or reduce the risks of accidents. New technologies facilitate those inspections and make the processes much more efficient. The objective of this study was to do a systematic review to analyse works that used a drone as a visual tool for such safety inspection activities, systematize the main information needed to consider in developing future drone research in civil construction.

Methodology: The research was carried out on the Brazilian platform for scientific journals and conferences called *"CAPES Portal"* through the Preferred Report for Systematic Reviews and Meta-analyzes (PRISMA) methodology. Several keywords were used for searching, including: *"Construction", "Construction Safety", "Safety Inspection", "Safety Management", "Drone", "Unmanned Aerial Vehicles"*.

Results and Discussion: In total, 102 articles were identified through the search. After applying all the inclusion and exclusion criteria (published in the last ten years, published in English or Portuguese language), In addition, the articles were included only if related to the use of drones in civil construction and if they had some relationship with work safety inspection. A total number of 15 articles fulfilled the selection criteria's and were included in this review. The information about the analysed studies included information such as author/reference, the objective of the study, the country where the study was conducted, the activities which were analysed, conclusions, limitations and the type of drone which was used in the research. In total, 8 of the 15 studies were developed in the United States, representing 53% of the total, while other studies are from Germany (4), Brazil (2), Australia (1) and Spain (1). Most studies analysed the inspection of bridges and roofs. Conclusions: Studies have shown that there is evidence of the advantages of using drones to assist in safety inspections in civil construction, especially in bridges and roofs.

Keywords: Civil construction; Drone; UAV; Safety inspection; Work safety.

NOISE PROMOTES DISENGAGEMENT IN DEMENTIA PATIENTS DURING NON-INVASIVE NEUROREHABILITATION TREATMENT

Aisha Animashaun[1], Gilberto Bernardes[2]

[1]Faculty of Engineering, University of Porto, Portugal (up201909481@up.pt) https://orcid.org/0000-0002-7204-7452
[2]Faculty of Engineering, University of Porto, Portugal; Institute for Systems and Computer Engineering, Technology and Science, Porto, Portugal (gba@fe.up.pt), https://orcid.org/0000-0003-3884-2687

Abstract

Introduction: The lack of engagement and the shortage of motivation and drive, also referred to as apathy, negatively impacts the effectiveness and adherence to treatment and the general well-being of people with neurocognitive disorders (NCDs), such as dementia.

Methodology: The hypothesis raised states that the engagement of people with dementia during their non-invasive treatments for NCDs is affected by the noisy source levels and negative auditory stimuli present within environmental treatment settings. An online survey was conducted with the study objectives to assess 1) the engagement levels of dementia patients while interacting with others at home versus in therapy facilities, 2) the emotions perceived when interacting with people at home compared to therapy sessions, 3) the perceived loudness of the environment at home versus in therapy facilities, and 4) which source sounds negatively impact the patients at home and during therapy sessions. A purposive sampling (n=62) targeting relatives, friends, and caregivers of dementia patients was conducted via online community forums in the DACH region. Moreover, a recording session was conducted in a psychotherapist's office to verify the answer to the questionnaire on the noise sources perceived in therapy facilities.

Results and Discussion: The raised hypothesis that disruptive auditory stimuli and noise levels influence the engagement levels of demented individuals during treatment is confirmed as the engagement is affected by the perceived noise disruptions when comparing perceived noise levels and engagement at home to those in treatment facilities. Significant statistical results were found between the lower engagement of demented individuals when interacting with people during therapy sessions compared to higher engagement in-home interactions. Furthermore, negatively perceived sound sources can be found in both therapy facilities and home settings. The noise sound sources identified, such as human voices, household appliances and household noises, while recording in the psychotherapist's office align with the questionnaire responses received on this topic. The findings indicate that the perceived heightened noise levels in therapy facilities stand in correlation with the lowered engagement rate perceived during the therapy session

compared to the lower noise level and higher engagement encountered when demented individuals interact at home.

Conclusion: If the identified noise elements are masked or replaced by other auditory stimuli that promote a soothing soundscape, the original disturbances encountered during therapy, and the lack of engagement can possibly be minimized. Further studies need to be conducted in the prototyping of a noise intervention tool to analyze the impact on lack of engagement through noise disturbances.

Keywords: Noise; Engagement; Dementia; Therapy; Apathy.

SHORT REVIEW ON OCCUPATIONAL NOISE EXPOSURE IN THE EXTRACTIVE INDUSTRY AND SIMILAR WORKS

J. Duarte[1], J. Castelo Branco[2], Fernanda Rodrigues[3], J. Santos Baptista[4]

[1]Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal (jasduarte@fe.up.pt) http://orcid.org/0000-0002-5856-5317
[2]Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal (jcb@fe.up.pt) http://orcid.org/0000-0002-9254-4384
[3]RISCO, ANQIP, University of Aveiro, Portugal (mfrodrigues@ua.pt) http://orcid.org/0000-0001-9127-7766
[4]Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal, (jsbap@fe.up.pt) http://orcid.org/0000-0002-8524-5503

Abstract

Introduction: Occupational noise is still a matter within the industrial practice with nefarious consequences on the worker's health. Pulmonary diseases, cardiovascular problems, disturbances in sleep, fatigue, and, in the worst-case scenarios, hearing loss (this one with a permanent character) are some of the most common adverse effects reported in the literature. This issue covers itself in even more significant concern when analysing the mining industry context. Almost every operation works as a potential noise source, not only for the workers but also for the surrounding populations.

Objective: To identify the exposure setting to occupational noise in the extractive industry and similar works (i.e., earthworks), particularly related to tasks and equipment. Methodology – The Preferred reporting items for systematic reviews and meta-analyses (PRISMA) was used as a guideline to help conduct the research and report of this work. The most relevant keywords were selected and later combined in the selected databases and multidisciplinary academic journals in the first phase. After the articles were filtered with a set of exclusion criteria, to know: 1) Publication year, 2) Document type, 3) Source type, and 4) Language. The subsequent stage was to determine, within the remaining articles, the pertinence of each study and its later inclusion in the study. Each set of data was then classified according to the measurement context, and the results were analysed.

Results and discussion: In the records' identification phase, a total of 1148 papers were recovered. By applying the previously mentioned exclusion criteria, 547 were removed related to publication year, 146 due to document type, 12 related to source type and 25 because of language. Additionally, 360 records were excluded because they were not in accordance with the proposed objective, 25 were duplicate articles, and 7 had no full-text available. From the last analysis, 11 more papers were excluded, which lead to a final result of 15 included studies. According to the

occupational noise measurements set, the records were divided into four categories: activity, equipment, job category, and working area. Different equipment was associated with high noise levels: crusher – between 85.6 and 104 dB, trucks and bulldozes – above 100 dB, and shovel – 103 dB, whereas the only analysed activity was blasting, where studies concluded that increasing distance leads to lower noise measurement values.

Conclusions: Considering this research, although it was possible to identify the tasks and equipment usually associated with occupational noise in the extractive industry, a lot of work still needs to be done, especially data analysis. However, this research serves as a starting point for future study.

Keywords: Open pit mine; Earthworks; Equipment; Occupational noise.

FIREFIGHTERS' OCCUPATIONAL EXPOSURE ASSESSMENT: A SYSTEMATIC LITERATURE REVIEW

Tatiana Teixeira[1]; Isabel Dias[2]; Joana Santos[3]; D. Bustos[4]; J.C. Guedes[5]

[1]Faculty of Engineering, University of Porto, Portugal (tati.teixeira.30@gmail.com) http://orcid.org/0000-0001-5636-1030
[2]Department of Sociology, Faculty of Arts, University of Porto, Portugal; Sociology Institute of the University of Porto, Portugal (mdias@letras.up.pt) http://orcid.org/0000-0001-8688-4385
[3]Environmental Health Department, School of Health, Polytechnic of Porto, Portugal; Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal (jds@ess.ipp.pt) http://orcid.org/0000-0002-2777-3244
[4]Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal (ldbs@fe.up.pt) http://orcid.org/0000-0002-4942-7625
[5]Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal (jccg@fe.up.pt) http://orcid.org/0000-0003-2367-2187

Abstract

Introduction: Over the years, the evolution of forest fires has occurred as a result of the evolution of the human species. However, forest fires are still a major challenge for society, placing firefighters with greater occupational exposure. The present study has as main objective to carry out a systematic review of the literature on the main techniques and variables for assessing the occupational exposure of firefighters during the fight against forest fires.

Methodology: The systematic review utilised The Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement methodology. This methodology was applied in the Scopus, Web of Science, PubMed, and Academic Search Complete databases with different keywords. The review will include articles written in English only.

Results: In the present study, 34 articles were included, in which it was found that exposure to smoking is the most studied variable, and it was in 2019 that a greater evolution of studies in this area of research was observed. Regarding the variables, the studies were organised in groups. Hence, it was possible to check the different variables selected by the authors and the methods and equipment applied.

Discussion: The fact that firefighters carry out their tasks in diverse scenarios and extreme conditions have hindered the application of innovative equipment. It is necessary to combine different variables and equipment for the assessment of occupational exposure. However, it is not always possible to develop this type of equipment in order to be inserted from the user's perspective, from the perspective of the environment, where it will be applied, and from an economic perspective, making it difficult to effectively apply it in the field.

Conclusion: As future perspectives, it is recommended that new variables are introduced together in order to improve the assessment of occupational exposure, namely, through the use of carbon monoxide (CO) and lactate assessment.

Keywords: Occupational Innovation; Occupational Exposure; Extreme conditions; Firefighters.

ASSESSMENT OF POTENTIAL HEALTH RISKS OF PORTUGUESE WILDLAND FIREFIGHTERS' OCCUPATIONAL EXPOSURE: BIOMONITORING APPROACH

Filipa Esteves[1]; Joana Madureira[2]; João Paulo Teixeira[3], Solange Costa[4]

[1]Environmental Health Department, National Institute of Health, Porto, Portugal; EPIUnit - Institute of Public Health, University of Porto, Portugal; Laboratory for Integrative and Translational Research in Population Health (ITR), Porto, Portugal; Department of Public Health and Forensic Sciences, and Medical School, Faculty of Medicine, University of Porto, Portugal (filipa.esteves3@hotmail.com); https://orcid.org/0000-0001-9187-0279

[2] Environmental Health Department, National Institute of Health, Porto, Portugal; EPIUnit - Institute of Public Health, University of Porto, Portugal; Laboratory for Integrative and Translational Research in Population Health (ITR), Porto, Portugal (joana.madureira@insa.min-saude.pt); https://orcid.org/0000-0001-5279-877X

[3] Environmental Health Department, National Institute of Health, Porto, Portugal; EPIUnit - Institute of Public Health, University of Porto, Portugal; Laboratory for Integrative and Translational Research in Population Health (ITR), Porto, Portugal (solange.costa@insa.min-saude.pt); https://orcid.org/0000-0003-4201-1966

[4] Environmental Health Department, National Institute of Health, Porto, Portugal; EPIUnit - Institute of Public Health, University of Porto, Portugal; Laboratory for Integrative and Translational Research in Population Health (ITR), Porto, Portugal (joao.teixeira@insa.min-saude.pt); https://orcid.org/0000-0001-8693-5250

Abstract

Introduction: Worldwide, forest fires are among the most common forms of natural disasters. In the closing years of the last century, there was an increase in the burned area in some parts of the globe, including Europe. Portugal has been particularly affected by large forest fires and mega-fires, which have been occurred mainly in the central and northern regions. The proximity of firefighters to fire exposes them to high levels of toxic compounds making this occupation one of the most dangerous and leading International Agency for Research on Cancer to classified occupational firefighting activity as possibly carcinogenic to humans. Up to date, the existing studies are mainly focused on environmental monitoring, existing limited information regarding biomonitoring assessments during real scenarios of wildland fires combat. This study aims to evaluate the impact of firefighting occupational exposure at molecular and cellular levels, considering personal exposure levels. Early-effect biomarkers (e.g., micronucleus, DNA strand breaks and oxidative DNA damage) will be analyzed in order to understand the mechanisms of action through which woodsmoke may impact firefighters' health, including the risk of cancer.

Methodology: This ongoing prospective longitudinal study will comprise three different stages, specifically pre-exposure, exposure, and post-exposure to fire season. Around 200 wildland northern Portuguese firefighters will be involved in this study. Characterization of the study population will be conducted via questionnaires. Firefighters' personal exposure levels will be assessed by means of metabolites in exhaled breath, using an artificial olfactory system (e-nose technology). Buccal and urine samples will be used to measure genomic instability through a

micronucleus test in buccal epithelial cells and urothelial cells. DNA damage and oxidative DNA damage will be evaluated in peripheral blood lymphocytes using the comet assay. Statistical analysis will be performed to determine the relationship between personal exposure levels to toxic compounds and the early-effect biomarkers over the three different phases of the study.

Expected results: The obtained results will support a more accurate and comprehensive assessment of occupational risks among wildland firefighters, crucial to prevent/reduce the associated health impacts. This work will contribute to the establishment of recommendations/good practices to improve firefighters' working conditions, allowing better definitions of policies and prevention strategies highly needed in this sector.

Keywords: Biomonitoring; Occupational; Air pollution; Biomarkers; Wildland firefighter.

THE COMFORT PARAMETERS IN INDOOR AIR OF SPORTS FACILITIES WITH DIFFERENT VENTILATION REGIMES

Cátia Peixoto[1]; Klara Slezakova[2]; Maria do Carmo Pereira[3]; Simone Morais[4]

[1]REQUIMTE-LAQV, Instituto Superior de Engenharia do Porto, Instituto Politécnico do Porto, Portugal; LEPABE, Departamento de Engenharia Química, Faculdade de Engenharia, Universidade do Porto, Portugal (catia.peixoto@graq.isep.ipp.pt), https://orcid.org/0000-0002-2957-7458
[2]LEPABE, Departamento de Engenharia Química, Faculdade de Engenharia, Universidade do Porto, Portugal (slezakok@fe.up.pt), https://orcid.org/0000-0001-5265-4186
[3]LEPABE, Departamento de Engenharia Química, Faculdade de Engenharia, Universidade do Porto, Portugal (mcsp@fe.up.pt), https://orcid.org/0000-0001-8505-3432
[4]REQUIMTE-LAQV, Instituto Superior de Engenharia do Porto, Instituto Politécnico do Porto, Portugal (sbm@isep.ipp.pt), https://orcid.org/0000-0001-6433-5801

Abstract

Introduction: In Portugal, during the COVID19 pandemic, sport and fitness facilities were closed. When lockdown has been lifted, in order to prevent the spread of infection, indoor sports facilities were subject to specific regulations that limited indoor occupancy as well as the manner of air ventilation. This study aims to analyze the impacts of these ventilation restrictions on indoor air comfort parameters in sport fitness facilities.

Methodology: Temperature (T; ºC), relative humidity (RH; %), and carbon dioxide (CO2) were continuously monitored (41 days; spring and autumn) in four fitness centers situated in Oporto metropolitan area: two of them under normal ventilation conditions (i.e., before lockdown; NV1 and NV2) and two of them under temporary restrictions for indoor ventilation and occupancy (RV1 and RV2).

Results and Discussion: Under normal ventilation conditions, T in fitness centers slightly varied (in NV1:22-25 ºC; NV2: 20-23 ºC), but in both clubs, the comfort recommendations (18-25 ºC) were fulfilled. On the contrary, RH was below guideline values (55-75%) in NV1 (47-54%), whereas at NV2 (66-73%), it fulfilled the recommendations. When specific health regulations took place, mean T ranges were similar in both clubs (RV1: 21-23 ºC; RV2:21-23 ºC), but they both exceeded recommended comfort levels (16-21 ºC). Mean RH were in accordance with the legislative values, but the very high temporal maxima (up to 75 and 89%) indicate the possible discomforts those exercisers might have experienced. Concerning the CO2, the obtained results showed that indoor levels decreased when specific health restrictions were in force (11-121%), most likely due to imposed guidelines for human occupancy.

Conclusions: The restrictions for ventilation and human occupancy positively impacted indoor levels of CO2. However, T and RH were on several occasions outside the recommended comfort

levels, especially during group activity classes. As regular exercising in environmental conditions, such as elevated T and increased RH, can cause health discomforts, these parameters should be carefully maintained within the recommended ranges even under restricted ventilation scenarios.

Keywords: Indoor air quality (IAQ); Carbon dioxide (CO_2); Comfort parameters; Temperature (ºC); Relative humidity (%HR).

A FRAMEWORK TO IMPLEMENT OCCUPATIONAL HEALTH AND SAFETY INNOVATION

Sara Shahedi[1], Alfredo Augusto Vieira Soeiro[2], Sara Maheronnaghsh[3]

[1]Department of Mining Engineering, Faculty of Engineering, University of Porto, Portugal (s_shahedi@yahoo.com) https://orcid.org/0000-0001-5954-6209
[2]Department of Civil Engineering, Faculty of Engineering, University of Porto, Portugal (avsoeiro@fe.up.pt) https://orcid.org/0000-0003-4784-959X
[3]Department of Mining Engineering, Faculty of Engineering, University of Porto, Portugal (up201600476@fe.up.pt) https://orcid.org/0000-0002-4966-4292

Abstract

Background and objectives: Being able to compete in the market needs sustainable development. The occupational safety and health Innovation process are one of the most important procedures helping companies to achieve their goal and to win the competition as a radical change in the workers' environment, enhancing the profitability of companies. However, most research and discussion of innovations are focused on product development and/or process improvement, disregarding workplace and service innovation. This study will outline the general terms related to safety innovation and how the process can get managed using some techniques to implement a framework in a company. In this case, the objectives of the study are to introduce the innovation in OHS and to introduce a model including some techniques for industries to apply innovation in occupational safety and health.

Methodology: To apply Innovation in occupational safety and health, the first step is to indicate the importance of innovation. To do so, a major review of studies focusing on occupational safety and health and innovation was required. The second step in this part is to define a framework for innovation in safety and health by reviewing those introduced frameworks in both innovation and health and safety research.

Results and conclusions: As a result, the importance of innovation has been searched and emphasized. On the other hand, a 6-step framework has been introduced, and the details of applying the framework have been expanded. The framework employs six continuous steps starting with the TIPS technique, which is followed by JTBD. Based on the result, the framework can be applied. The introduced steps are as follow: Identifying Innovation Projects, Scoping and Focusing Innovation Projects, Leveraging Brainpower and Turbo-Charging Creativity, Selecting the Best Ideas for Further Development and Design, Evaluating How New Products/Services Perform Prior to Their Release, Problem Diagnosis and Improvement Prior to Commercialization. Following these steps as a framework may increase the efficiency of the company; however, there is a huge

need for several case studies in the long term to assess the result and to compare the efficiency of the introduced framework.

Keywords: Innovation; Innovation management; Occupational safety; Consequence analysis; Gas refinery.

FATIGUE DETECTION THROUGH PHYSIOLOGICAL ASSESSMENT DURING REAL-LIFE OCCUPATIONAL SITUATIONS: PRELIMINARY RESULTS

D. Bustos[1]; J.C. Guedes[2]; P. Pratas[3]; M.P. Vaz[4]; J.C. Torres Costa[5]; R.J. Fernandes[6]; J. Santos Baptista[7]

[1]Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal (ldbs@fe.up.pt) https://orcid.org/0000-0002-4942-7625
[2]Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal (jccg@fe.up.pt) https://orcid.org/0000-0003-2367-2187
[3]Faculty of Engineering, University of Porto, Portugal (up202003606@fe.up.pt) https://orcid.org/0000-0003-3380-5027
[4]Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal; Porto Biomechanics Laboratory, University of Porto, Portugal (gmavaz@fe.up.pt) https://orcid.org/0000-0002-6347-9608
[5]Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal (zecatoco@sapo.pt) https://orcid.org/0000-0003-3947-8688
[6]Porto Biomechanics Laboratory, University of Porto, Portugal; Center of Research, Education, Innovation and Intervention in Sport; Porto Biomechanics Laboratory, Faculty of Sport, University of Porto, Portugal (ricfer@fade.up.pt) https://orcid.org/0000-0002-5811-0443
[7]Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal (jsbap@fe.up.pt) https://orcid.org/0000-0002-8524-5503

Abstract

Background: Fatigue is a significant health and safety-related problem among workers. In general, it decreases performance and physical strength, causing incidents and accidents in operational situations. During military activities, soldiers often encounter severe conditions, which combined lead to fatigue manifestations affecting their health and performance. Continuous monitoring of their overall health status would prevent its adverse effects.

Objective: This work aimed to present the preliminary results of a retrospective assessment of military training physiological recordings using an alert-based fatigue detection algorithm to validate its accurate functioning.

Methods: Three case studies from soldiers participating in military training tests were recruited for evaluation. The referred algorithm was developed to manage fatigue through the combined assessment of physiological variables and determine different fatigue levels warnings to advise timely interventions and prevent potential health impact. Each examined case included the continuous recording of heart rate, breathing rate and core temperature. The algorithm translated physiological sensory data into minute alarms according to fatigue levels determined through the conjunction of normative and related research criteria.

Results and Discussion: Outcomes revealed that the algorithm could evidence the different stages of training and the resulting physical demands on soldiers using their physiological response throughout the exercises. Retrieved fatigue alarms showed the high physiological cost of military practices and helped to overview the impact of each training period. Finally, results also demonstrated the importance of individual and contextualised assessment for accurately characterise the subject's fatigue status.

Conclusions: It is concluded that the developed decision model can improve the management of real-time fatigue, allowing early detection of potential indicators of further physical impairments. Furthermore, it can lead to the enhancement of work-rest cycles, not only for tactical personnel but also for any safety-sensitive occupation. For future work, its validity will be tested through more participants, and other variables will be added to improve its accuracy.

Keywords: Performance; Physical exertion; Physiological monitoring; Sensors.

WORK-RELATED MUSCULOSKELETAL DISORDER AND ITS COSTS: A SHORT REVIEW

Ana Sophia Rosado[1]; J. Santos Baptista[2]; J.C. Guedes[3]

[1]Faculty of Engineering of the University of Porto, Portugal (anasgmr@yahoo.com.br) https://orcid.org/0000-0002-4935-4171
[2]Mining Engineering Department, Faculty of Engineering of the University of Porto, Portugal (jsbap@fe.up.pt) https://orcid.org/0000-0002-8524-5503
[3]Mining Engineering Department, Faculty of Engineering of the University of Porto, Portugal (jccg@fe.up.pt) https://orcid.org/0000-0003-2367-2187

Abstract

Introduction: Musculoskeletal disorder can result from extreme physical demands at work. It has risen, mainly due to high muscle demands and static postures and generates a significant economic burden to the companies.

Objective: This short review aims to point out the statistics of the most affected body partsby work-related musculoskeletal disorders, assess absenteeism and presenteeism costs, and evaluate the effectiveness of the interventions.

Methodology: According to the PRISMA Statement, the search was performed in 5 electronic databases (Scopus, Web of Science, Science Direct, PubMed). Article's selection was made by the title and abstract analysis, especially those aiming to explain and validate the subject. If the abstract fulfils the objective, the articles were read, and studies were considered that met the defined eligibility criteria. Were chosen articles that realised measurements or considered interventions in healthy human beings, especially in the working population, dated from 2015 to 2020.

Results and Discussion: The scrutinised articles were conclusive that the most affected part of the body is the upper limbs, the neck and the upper back. The statistics of the affected workers varied according to the country and analysed tasks, but they converge concerning the most affected body parts. It could be noted that women are more affected by musculoskeletal disorders than men, especially older women; the reason, however, is not clearly explained. Muscle injury can lead high economic burden, mostly due to absenteeism andpresenteeism. It was noted that the expenditure due to presenteeism is higher comparing to absenteeism in both developed and emergent countries.

Conclusions: Due to high costs, companies are deploying strategies to improve work conditions and aware workers of health and safety. Interventions have shown to be effective in reducing the risk of injuries. Work-related musculoskeletal disorders can be extremely damaging to the workers' health and are costly to thecompanies. Support supervisor interventions effectively

improve work conditions and reduce therisk of damaging outcomes, increasing workers' health, work ability, and, consequently, productivity.

Keywords: Injury; Absenteeism; Presenteeism; Strategies.

THE OCCURRENCE OF ACCIDENTS AND INJURY IN MINING SHIFT WORKER INFLUENCED BY FOOD INTAKE, A SHORT REVIEW

Gentil A. Andaque[1]; Olívia Pinho[2]; J. Santos Baptista[3]; J. Castelo Branco[4]; Elizabete Nunes[5]

[1]Faculty of Engineering, University of Porto, Portugal (gentilandaque@gmail.com) https://orcid.org/0000-0001-9882-8735

[2] Faculty of Nutrition and Food Sciences, University of Porto, Portugal; Associated Laboratory for Green Chemistry (LAQV/REQUIMTE), Laboratory of Bromatology and Hydrology, Faculty of Pharmacy, University of Porto, Portugal (oliviapinho@fcna.up.pt) http://orcid.org/0000-0001-9477-8638

[3]Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal, (jsbap@fe.up.pt) https://orcid.org/0000-0002-8524-5503

[4]Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal (jcb@fe.up.pt) http://orcid.org/0000-0002-9254-4384

[5]Faculty of Medicine, University Eduardo Mondlane, Moçambique (dra.elizabete.nunes@gmail.com) https://orcid.org/0000-0002-1736-1473

Abstract

Introduction: Identifying factors that contribute to occupational accidents has been a general concern of companies in the present millennium. One of the factors identified is the quality and quantity of food, as well as meals times. In this context, the present systematic review aimed to identify how food intake influences the occurrence of accidents in shift work, with some focus, although not exclusive, on the mining industry.

Methodology: The research-based literature was carried out in four electronic databases: Medline/PubMed, Science Direct, Scopus and Web of Science. Have been combined the following words "occupational accident" and "food intake"; "mining injury" and "food choice"; "meal timing" and "workplace"; "eating at night" and "mining injury"; "Circadian rhythm" and "diet shift"; "Food safety" and "Health risk"; "workplace accidents" and "food choice".

Results: It was possible to identify 24 articles related to food intake. To better understand the analysis, the results were organized into five groups: Author surname and year, Study type, Accidents/injury causes, risk factor, Conditions for accidents/injuries to occur. Through the groups of causes, it was possible to regrouped on three, which facilitated the discussion of the topic; food **choice** n=10 (42%) articles, **eating habits** n=9 (37.5%), and **emotional commitment** n=5 (20.5%), showed the relativity of food intake causes for the occurrence of accidents and illnesses in shift workers.

Discussion: The reviewed articles demonstrated that the materialisation of accidents was due to the relationship between food intake and consumption of nutrient-poor foods in shift work. That

can develop chronic diseases, metabolic disorders such as blood pressure abnormalities, blood sugar fluctuation (dyslipidaemia, dysglycemia), and obesity, neurobehavioral performance. Foods contain high content As, Cd, Cr, Hg, Fe, and Mn above the recommended standards by the FAO/WHO. Sleep disturbance during the 12-hour shift interferes with circadian rhythm and, consequently, with performance. These factors can be related to food and the precarious physical environment, increased workload, fatigue, and poor diet, especially at night.

Conclusion: In conclusion, the study demonstrated how food intake impacted workers' health on shifts but did not determine the causes or risk factors contributing to accidents/injuries. Further studies are needed to demonstrate a direct relationship which the risk factor of food intake and causes accidents/injuries.

Keywords: Food intake; Accidents; Shift work; Poor food.

POSTERS

DOR LOMBAR NA OPERAÇÃO EM EQUIPAMENTOS PESADOS DE CARGA E TRANSPORTE, NAS INDÚSTRIAS DE MINERAÇÃO A CÉU-ABERTO E DE CONSTRUÇÃO – BREVE REVISÃO

Jane Paula de Souza[1]; Tatiana Texeira[2]; J.C. Guedes[3]; J. Santos Baptista[4]; J. Castelo Branco[5]

[1]Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal (janepaulasouza@gmail.com) https://orcid.org/0000-0001-5455-7232
[2]Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal (tati.teixeira.30@gmail.com) https://orcid.org/0000-0001-5636-1030
[3] Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal (jccg@fe.up.pt) https://orcid.org/0000-0003-2367-2187
[4]Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal (jsbap@fe.up.pt) http://orcid.org/0000-0002-8524-5503
[5]Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal (jcb@fe.up.pt) http://orcid.org/0000-0002-9254-4384

Resumo

Introdução: Os operadores de equipamentos pesados de carga e transporte, nas indústrias de mineração e construção estão sujeitos a dores lombares, decorrentes da atividade profissional. Os operadores estão expostos a diferentes tipos de riscos ocupacionais, sendo considerado o de maior intensidade as vibrações de corpo inteiro, as quais podem causar diversos tipos de lesões musculoesqueléticas, em particular a dor lombar.

Objectivo: Este artigo objetiva apresentar uma revisão sobre a prevalência de dor lombar nos operadores. Pretende-se analisar os equipamentos de maior utilidade na indústria extrativa a céu aberto e de construção que produzem maior índice de vibração, a relação das atividades que intensificam a vibração, o ambiente e os fatores que contribuem de forma direta, assim como as ações preventivas que as empresas estão implementando para manter a integridade física dos operadores de máquinas e equipamentos móveis desses setores.

Metodologia: A presente revisão foi realizada de acordo com os pressupostos definidos pelo *Preferred Reporting Items for Systematic Reviews and MetaAnalyses*: The PRISMA *Statement*. Foram consultadas as seguintes bases de dados: "*Scopus*", "*Web of Science*", "*Engineering Village*", "*ScienceDirect*", "*Scielo*", "*CurrentContents*", "*Dimensions*", "*SpringerLink*" e "*Taylon&Francis*", onde foram aplicados os diferentes critérios de exclusão, tais como: intervalo de pesquisa, tipo de documento, tipo de fonte e idioma. Foram utilizadas 35 palavras-chave por meio de combinações.

Resultados e Discussões: Na totalidade da pesquisa realizada foram obtidos 591 artigos, tendo sido excluídos 580. Através da técnica da "*Snowballing*" foram acrescentados mais 7 artigos à

revisão sistemática, dado apresentarem informação relevante para o objetivo principal desse estudo, assim totalizando 18 artigos nesta revisão. Os principais resultados demonstraram que os equipamentos pesados de carga e transporte como os caminhões de transporte, basculantes, bulldozers, escavadeiras, pás niveladoras, motoniveladoras, carregadeiras, retroescavadeiras, perfuradoras, raspadores e tratores comumente utilizados nas indústrias da construção e mineração. Estes podem produzir níveis de vibração de corpo inteiro acima do valor limite de exposição, derivados de fatores como terrenos instáveis nas vias de circulação em minerações e construção, relatados em 27,78% dos estudos e 72,22% desses evidenciam a prevalência de dor lombar nos operadores.

Conclusão: A implementação de programas de treinamentos, ergonômicos, medidas de segurança, rotação de equipamentos, gestão do risco, manutenções e melhorias no projeto dos equipamentos podem atenuar a intensidade de vibração aos operadores, assim ajudando a conservar a integridade física destes profissionais.

Palavras-chave: Dor lombar; Equipamentos pesados de transporte; Mineração; Construção.

ACIDENTES OCUPACIONAIS EM OPERAÇÕES COM EQUIPAMENTOS PESADOS DE CARGA E TRANSPORTE, NAS INDÚSTRIAS DE EXTRAÇÃO A CÉU ABERTO E DE CONSTRUÇÃO – BREVE REVISÃO

Jane Paula de Souza[1]; Soraya Wingester Vasconcelos[2]; J. Santos Baptista[3]; J. Castelo Branco[4]

[1]Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal (janepaulasouza@gmail.com) https://orcid.org/0000-0001-5455-7232
[2]Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal (sorayawingester@gmail.com) https://orcid.org/0000-0003-2137-1591
[3]Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal (jsbap@fe.up.pt) http://orcid.org/0000-0002-8524-5503
[4]Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal (jcb@fe.up.pt) http://orcid.org/0000-0002-9254-4384

Resumo

Introdução: As operações nas indústrias extrativas a céu aberto e construção são reconhecidas pelos elevados índices de sinistralidade, devido às características dos próprios processos produtivos e em função da forte presença de máquinas e equipamentos pesados. Os trabalhos realizados ao ar livre, em condições meteorológicas adversas e vias de circulação inadequadas e com falta de manutenção, são alguns dos fatores que caracterizam os dois setores. As quedas foram identificadas como os principais fatores desencadeadores de risco de acidentes ou tipos de acidentes.

Objetivo: O presente artigo visa apresentar uma breve revisão sistemática sobre a ocorrência de acidentes ocupacionais na utilização de equipamentos pesados, nas indústrias de construção e mineração.

Metodologia: A revisão seguiu os requisitos do PRISMA *Statement*. Foram consultadas 7 bases de dados e utilizadas 33 palavras-chave. Foram aplicados vários critérios de exclusão, nomeadamente: intervalo de pesquisa, tipo de documento, tipo de fonte e idioma. Com critérios de elegibilidade foram considerados apenas os artigos que abordassem acidentes ocupacionais com equipamentos pesados de carga e transporte. Considerou-se ainda e a técnica de *Snowballing*, para a adição de outros artigos.

Resultados e Discussões: A partir dos 4.546 artigos originários das bases de dados e dos 6 por *Snowballing*, 16 foram incluídos nesta revisão. Os acidentes ocupacionais decorrentes da utilização de equipamentos móveis, nas indústrias de mineração e construção, estão relacionados com os processos produtivos. O setor de mineração a céu aberto se destacou com maior incidência de acidentes ocupacionais. As operações com caminhões de transporte, escavadeira, tratores, retroescavadeira, raspadores e carregadeira frontal evidenciaram a ocorrência de quedas,

atropelamento, capotamento e colisões, na indústria mineradora. 43,75% dos artigos apontaram que os operadores de máquinas móveis sofrem mais acidente ao entrar ou sair das cabines dos equipamentos, e que os fatores de risco mais importantes na ocorrência de escorregões, tropeções e quedas são os contaminantes nas escadas e os projetos inadequados de acesso às máquinas.

Conclusões: Medidas corretivas nas escadas que dão acesso aos equipamentos móveis das indústrias extrativa a céu aberto e na construção civil, bem como o melhoramento de acesso aos maquinários e manutenções frequentes, são essenciais para diminuir os acidentes ocupacionais nas atividades de ambas as indústrias, mantendo-se a integridade física do operador.

Palavras-chave: Acidentes; Equipamentos móveis; Mineração; Construção civil.

ASPECTOS ERGONÔMICOS DA ADAPTAÇÃO DE ESTUDANTES DE ENGENHARIA AO REGIME REMOTO DE ENSINO NA PANDEMIA DE COVID-19

Nilberto Rocha Neto[1]; André Duarte Lucena[2]; Fabrícia Nascimento de Oliveira[3]

[1]Departamento de Engenharia e Ciências Ambientais, Universidade Federal Rural do Semi-árido, Mossoró, Brasil (nilbertoneto-@hotmail.com) https://orcid.org/0000-0002-2121-5567
[2]Departamento de Engenharia e Ciências Ambientais, Universidade Federal Rural do Semi-árido, Mossoró, Brasil (andrelucena@ufersa.edu.br) https://orcid.org/0000-0003-0181-4260
[3]Universidade Federal Rural do Semi-árido, Mossoró, Brasil (fabricia@ufersa.edu.br) https://orcid.org/0000-0002-0333-0035

Resumo

Introdução: A pandemia de Covid-19 modificou várias atividades, dentre elas o ensino nas universidades. A adaptação das atividades dos professores para a modalidade de ensino remoto foi discutida e realizada intensa e sistematicamente por várias instituições. Mas as adaptações dos estudantes ao estudo remoto dependem das condições de cada indivíduo e estão sujeitas à autonomia de cada estudante.

Objetivo: O objetivo do presente artigo foi identificar aspetos ergonômicos das condições de estudo remoto de um grupo de estudantes de engenharia durante a pandemia de Covid-19.

Metodologia: Os dados da pesquisa foram coletados com um questionário enviado por email e respondido na internet por 22 dos 186 estudantes de engenharia de produção de uma universidade brasileira. As questões abordaram as posturas adotadas pelos alunos no momento de estudo; perceção sobre o nível de conforto em relação ao ruído, , cômodo adotado para estudar, temperatura, luminosidade, e adequação da mobília do local de estudo. Além disso, questionou-se sobre a carga horária de atividades e incorporou-se ao inquérito o Questionário Nórdico de Sintomas Osteomusculares.

Resultados e discussão: Os principais resultados mostram que pescoço, ombros, coluna, punhos e mãos são regiões com maior frequência de dores ou incômodos; sendo as regiões dorsal, lombar e do pescoço as indicadas com maior frequência de incapacitações e com maiores níveis de dor. Também foi identificado que uma parcela dos estudantes usa o quarto como principal cômodo e as posições sentada e deitada para estudar.

Conclusões: Longos períodos de estudo em telas, as dores e incômodos corporais, as restrições e incapacitações indicadas nas regiões do pescoço, ombros, punhos, mãos, dorso e lombar possivelmente têm relação com as posturas adotadas pelos estudantes para assistirem as aulas remotas e realizarem suas atividades acadêmicas. São necessárias ações ergonômicas educativas em relação a essa nova configuração de ensino e para o cenário pós-pandêmico.

Palavras-Chave: Ensino remoto; Adaptações ergonômicas; Estudantes; SARS-CoV-2.

MAINSTREAMING OCCUPATIONAL SAFETY AND HEALTH IN PRIMARY SCHOOL: CHILDOSH PROJECT

Joana Santos[1]; Artemisa Dores[2]; Cristiana Ramos[3]; Cristiana Silva[3]; Rodrigo Silva[3]; Sara Moreira[3]

[1]Environmental Health Department, School of Health, Polytechnic of Porto, Portugal; Associated Laboratory for Energy, Transports and Aeronautics - LAETA (PROA), Faculty of Engineering, University of Porto, Portugal (jds@ess.ipp.pt) http://orcid.org/0000-0002-2777-3244

[2]Center for Rehabilitation Research, School of Health, Polytechnic of Porto, Portugal (email) http://orcid.org/0000-0003-4595-9816

[3]Environmental Health Department, School of Health, Polytechnic of Porto, Portugal

Abstract

Introduction: The integration or 'mainstream' of occupational safety and health (OSH) into the school curriculum aims to promote a prevention culture from an early age. It is expected that children and young people with greater risks awareness might transform the environments around them into safer and healthier places and, consequently, they may have a safer working life in the future. The 2030 Agenda for Sustainable Development reinforces the importance of lifelong education and a "decent work for all" in the Goals 4 and 8 targets, respectively. Additionally, several European and national recommendations and programs have been developed to promote the acquisition of key skills for changes in the working world and the progressive integration of OSH at all levels of education. In 2020, a working group constituted by Portuguese institutions in the education, employment and health and safety at work areas had developed an "Education Reference for the World of Work". In this referential were identified generic learning themes with the respective objectives and performance indicators appropriate to different age levels, namely: b (1) The World of Work: Background and Evolution, (2) Decent work, (3) Safety and Health at Work, (4) Work, equal opportunities and non-discrimination, (5) Professional and organizational performance: determining factors and, (6) Integration in the World of Work. This paper describes the ChildOSH project.

Methodology: ChildOSH project considered the six steps recommended by EU-OSHA to mainstream OSH into school curriculums.

Results and Discussion: This project was designed for children at primary school and include relevant Occupational Safety and Health (OSH) themes, namely: Schools/home accident prevention, Road traffic accident prevention, Drowning accident prevention, Burn prevention, Poison Prevention, Falls Prevention, Choking and Suffocation Prevention, Electrocution Prevention, First aid, Emergency Response.

Conclusions: This project aims to boost the introduction of OSH themes in childhood, develop a culture of safety in future generations, and consequently prevent work accidents and occupational diseases. There are some barriers associated with the mainstreaming of OSH in the primary school curriculum, so it will be essential to monitoring the integration process and support teachers.

Keywords: Learning process; Education; Risk prevention; Hazards; Safe behavior.

ANÁLISE DAS CONDIÇÕES ERGONÔMICAS NA ATIVIDADE DE EXECUÇÃO DE ALVENARIA UTILIZANDO O MÉTODO RULA

Carolina Mendes Lemos[1], Fabrícia Nascimento de Oliveira[2], André Duarte Lucena[3]

[1]Universidade de Brasília, Brasil (carolinamendees@hotmail.com) http://orcid.org/0000-0002-1872-2226
[2]Departamento de Engenharia e Ciências Ambientais, Universidade Federal Rural do Semi-árido, Mossoró, Brasil (fabricia@ufersa.edu.br) http://orcid.org/0000-0003-0181-4260
[3]Departamento de Engenharia e Ciências Ambientais, Universidade Federal Rural do Semi-árido, Mossoró, Brasil (andrelucena@ufersa.edu.br) http://orcid.org/0000-0002-0333-0035

Resumo

Introdução: A atividade de execução de alvenaria está presente em praticamente todas as obras da construção civil, por isso, é importante conhecer os cuidados necessários para evitar futuros problemas ergonômicos com os colaboradores. Assim, várias técnicas ou métodos de avaliação postural tem sido empregados para analisar as situações de trabalho e identificar problemas musculoesqueléticos.

Objetivo: Este estudo teve como objetivo realizar análises ergonômicas das posturas dos trabalhadores na atividade de execução de parede de alvenaria, assim como identificar as etapas de maior grau de risco e elaborar recomendações ergonômicas para a melhoria das atividades estudadas.

Metodologia: Para a coleta de dados utilizou-se máquina fotográfica para registrar as fotos e fazer as filmagens. A partir dos dados coletados, realizou-se análise ergonômica com base nas posturas e movimentos adotados pelos trabalhadores durante à execução de alvenaria aplicando-se o método RULA. Participaram do estudo 14 funcionários envolvidos no processo produtivo de construção de alvenaria, sendo as etapas observadas: pegar areia para peneirar, peneirar areia, pegar areia peneirada, carregar areia peneirada, preparar argamassa, carregar argamassa, construir parede de alvenaria e chapiscar parede.

Resultados e Discussão: Observou-se que das oito etapas analisadas, três delas obtiveram pontuação máxima, que foram: pegar areia para peneirar, pegar areia peneirada e chapiscar parede. Sendo a pontuação máxima 7, com grau de risco 4, onde a intervenção é introduzir mudanças imediatamente. As demais etapas apresentaram pontuação 5 ou 6, onde o grau de risco é 3 e a intervenção é do tipo investigação e mudanças na postura ao realizar as atividades.

Conclusões: Para melhorar o ambiente de trabalho objeto desse estudo recomenda-se o revezamento de tarefas, pausas, prática de ginástica laboral, treinamentos e que as posturas e movimentos inadequados sejam corrigidos por meio de modificações no método de trabalho, com o intuito de adotar as posturas mais seguras, saudáveis e confortáveis para os trabalhadores

envolvidos na atividade de execução de alvenaria.

Palavras-chave: Construção civil; Ergonomia; Avaliação postural; Movimentos repetitivos.

AUTHORS INDEX

ISBN: 978-972-752-279-8

www.fe.up.pt/dce21
dce@fe.up.pt