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BOOK OF ABSTRACTS

11th INTERNATIONAL ERGONOMICS CONFERENCE

ERGONOMICS 2026

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ERGONOMICS 2026

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Preface to the Book of abstracts

Dear colleagues and dear friends,

It is our great pleasure to welcome you to the **11th International Ergonomics Conference – ERGONOMICS 2026**, organized by the Croatian Ergonomics Society (CrES) and held in Dubrovnik, Croatia, from 1st to 3rd October 2026.

ERGONOMICS 2026 continues the international conference series organized by CrES since 2001 with the aim of promoting ergonomics and human factors, encouraging scientific and professional exchange, and strengthening cooperation among researchers and practitioners worldwide.
The conference is co-organized by the University of Zagreb Faculty of Forestry and Wood Technology, Faculty of Graphic Arts, Faculty of Mechanical Engineering and Naval Architecture, Faculty of Textile Technology, Faculty of Transport and Traffic Sciences, Poznan University of Technology – Faculty of Engineering Management, and the Latvian Ergonomics Society.

We are honored that ERGONOMICS 2026 is held under the auspices of the Croatian Ministry of Labour, Pension System, Family and Social Policy and the Croatian Academy of Engineering. The conference is endorsed by the International Ergonomics Association (IEA), Federation of the European Ergonomics Societies (FEES), and Acoustical Society of Croatia (ASC), with the support of several international ergonomics societies and organizations.

Over the years, this conference has brought together researchers, professionals, practitioners, and friends of ergonomics from Croatia and many other countries. We are especially pleased that our international ergonomics community continues to grow and that the conference provides an opportunity both to meet long-standing colleagues and to establish new collaborations.

The abstracts included in this Book of Abstracts have been reviewed and accepted for presentation at ERGONOMICS 2026. Accepted full papers that successfully complete the peer-review process will be published in the Springer Proceedings of the 11th International Ergonomics Conference – ERGONOMICS 2026, while selected high-quality papers will be considered for publication in partner journals.

As President of the Croatian Ergonomics Society and President of the Organizing Committee, I sincerely thank all members of the conference committees, co-organizers, supporting organizations, reviewers, authors, and participants for their contribution to making ERGONOMICS 2026 possible.
We hope that the conference will provide valuable scientific and professional experiences, new ideas, and opportunities for future cooperation, while also allowing you to enjoy the unique atmosphere and hospitality of Dubrovnik.

Welcome to **ERGONOMICS 2026!**

Sincerely,



Asst. Prof. Jasna Leder Horina, PhD
President of the Croatian Ergonomics Society
President of the Organizing Committee
Ergonomics 2026 Conference President

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From Computational Ergonomics to Inverse Comfort Design: evolving Comfort Prediction into Design for Perception (DfP)

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Extended Abstract. Predictive modelling of Human-Artefact interaction has been the foundation of research, development and innovation in industrial design since the advent of CAxx (Computer Aided everything) methods in the late 20th century. Digital Human Modelling (DHM) and Computer Aided Human-Centred Design have allowed designers, over the last quarter of a century, to analyze potential interaction characteristics in the early stages of product development, improving user experience before physical prototypes are built and validated through a "human-in-the-loop" approach. Among human perceptions, the intrinsic subjectivity of (dis)comfort makes the predictive evaluation a demanding and time-intensive activity that often fails to produce usable solutions capable of addressing a wider variability of user capabilities and usage scenarios. The advent of user-aware systems has enabled the creation of systems and artefacts able to personalize the experience through real-time analysis of the user and, where possible, adaptation of the system to the user rather than vice versa — a direction consistent with the recent expansion of digital-twin-based approaches in ergonomics and human factors. Despite these advances, current design paradigms still start with product-characteristics development, targeting the optimization of specific functional requirements that fulfil defined user needs, as formalized in Suh's Axiomatic Design approach. Computational ergonomics provides designers with tools to model system behavior, simulate user interaction and system characteristics to optimize macro-parameters that give direct feedback to the ergonomic evaluation — i.e. RULA being one of the most used and the first developed and applied computational-ergonomics method. Over the past fifteen years, following the benchmark comfort/discomfort frameworks established by Vink and Hallbeck, ergonomic research has focused on quantifying interface metrics —such as contact pressure mapping, peak pressure, and force distribution in seating and bedding systems— to infer perceived comfort, and on the increasing use of machine-learning predictors (e.g., support-vector and deep-learning models for seat and automotive comfort) trained on pressure-distribution and physiological data. However, a key limitation of this forward-evaluative approach is the lack of a formalized engineering workflow capable of translating product specifications into the human perceptual state. To bridge this gap, Naddeo et al. formulated a seminal descriptive perceptual framework that correlates physical body effects with self-reported perceptions through statistical-empirical formulations. While this framework successfully quantified multi-factorial comfort/discomfort phenomena, its application remained restricted to forward-analytical workflows, requiring prior knowledge of product parameters to evaluate perceived performance. To overcome these historical limitations, this study introduces a novel Human-Centered Design paradigm: Inverse Comfort Design. The approach fundamentally inverts the traditional workflow by positioning a spatially resolved representation of human perception as the primary design input, while deriving product specifications as the synthesis output. This direction extends recent proposals to evolve Digital Human Modelling into Human Digital Twin capable of real-time, personalized, bidirectional interaction with the user. At the core of this methodology is the idea to develop a high-fidelity Human-Centered Digital Twin (HCDT), conceived to integrate real-time biomechanical, physiological, and subjective perceptual data as design drivers rather than post-evaluation metrics. In practical terms, the approach represents the human–product interaction as a spatial map of the body regions involved in an interaction with a product and, starting from the desired "local" perception, drives the designer towards the "local" characteristics of the product. This can be regarded as an inverse comfort design method whose input is the human perception and whose output is the mapping of volumetric or surface characteristics of the part of the product interacting with the user; conceptually, it represents the evolution of inverse-design paradigms increasingly applied in AI-driven materials and manufacturing engineering, where target properties, rather than structures, are the starting point of the design process. The output can be conceptually represented by an interaction-response function, analogous in spirit to electrical impedance, linking localized product properties (i.e. mechanical characteristics of a surface) and interaction conditions (i.e. posture and duration) to the resulting human perceptual state (i.e. the human response to the interaction). The technical execution of this inverse pipeline leverages advanced Machine Learning (ML) algorithms and Finite Element Method (FEM) simulations to establish multi-variable non-linear correlations between localized structural properties and perceived (dis)comfort; AI-based models can then be used to learn the inverse mapping from desired human perceptual states to feasible design specifications so enabling the automated inverse design of the best feasible material distributions. Inverse Comfort Design reverses the conventional ergonomics workflow: rather than predicting human (dis)comfort from a predefined product, it

starts from a desired, spatially resolved human perceptual state and computationally derives the physical characteristics that an artefact should possess to elicit that state; The foundational research question driving this inquiry is: *How can the inverse mapping between spatially resolved human perceptual states and product characteristics be formally represented, computationally solved, and experimentally validated?* In other words: *How can design workflows be systematically structured to operationalize the Inverse Comfort Design framework for next-generation product development?* To address this, we propose a strategic theoretical and operational framework that establishes a transformative paradigm in human-centered engineering, by inverting the direction of the workflow, leveraging AI, ML, and HCDTs to have, as input, the localized/spatially resolved perception and obtaining, as output, the user-conditioned product characteristics. Comfort will be the outcome domain, with human perception as the primary design variable.

Keywords: *Inverse Comfort Design, Human Centred Digital Twin, Human Perception Mapping, Design for Perception.*

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Humanity-Centred Human Factors and Ergonomics: Technology, AI, and Sustainability

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Abstract. The current trend in human factors and ergonomics is to talk about human-centred design (HCD). HCD emphasizes the importance of addressing human goals, meaning, and interests in the design of products, services, and systems. The underlying assumption is that there is no necessity for design unless there is a human user. However, there are dangers in adopting an HCD approach. Not all human goals, interests, or needs are inherently benevolent or sustainable. Often the stated aims, goals, and needs of designers and producers don't reflect the hidden goals (e.g., the stated goals of AI producers don't always match their hidden goals of AI model dominance). An emerging way of thinking about design is known as humanity-centred design (Goonetilleke et al., 2026). A humanity-centred design approach emphasises considering all people (those living and those still to be born), other living things, and the entire natural environment into consideration. Humanity-centred design therefore emphasises participation and empathy, equity and inclusion, and sustainability and resilience (Goonetilleke et al., 2026). The important consideration in humanity-centred design is the design's ethicality, which includes environmental and social sustainability. In a recent paper by Karwowski et al. (2025) a group of prominent human factors and ergonomics professionals from around the world presented the six grand challenges for human factors and ergonomics: (1) future of human activity in the context of advancing technology; (2) future of personalized health; (3) future of education and training; (4) life in the metaverse; (5) evolution in societal thinking; and (6) climate change and sustainability. In this presentation I will give a critical reflection of these grand challenges from a humanity-centered perspective.

Keywords: *Humanity-Centred Design, Sustainability, Ergonomics, AI.*

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Human Nature: The Root of HFE for AI

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Abstract. AI is booming in recent years, which made technology development speeding up tremendously. It has been evolving so fast that the impacts of HFE design for AI becomes one of the critical issues among others. Uncontrollable disasters could happen while many AI users were enjoying the power of AI without doubting about the correctness of the outcomes it generated. Other AI incidents have happened but it is expected that many other adverse events have also happened without publicized. Many of the problems are due to the complicated and mystery "black boxes" existing with the design of AI algorisms and the explicitness of the information involved. To solve the problem, it is essential to recap the human nature, or more precisely, the mother nature, as the ancient Chinese wisdom of the "Harmonic connection of Heaven and Human".

Keywords: *AI, Human Nature, HFE.*

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Smarter Work or Weaker Thinking? The Role of Ergonomics in the AI-Driven Industry 5.0

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Abstract. Artificial intelligence (AI) is changing how work is allocated, performed and supervised, while Industry 5.0 requires these changes to re-main human center, sustainable and resilient. This structured literature review examines the dual effect of AI on work: its capacity to reduce hazardous exposure, physical strain and information-processing demands, and its potential to encourage cognitive offloading automation prejudice, over-reliance and loss of professional judgement. A targeted review of peer-reviewed studies and authoritative occupational safety and health reports was organized around four themes: AI-enabled ergonomic support; cognitive consequences of delegation to AI; trust, transparency and human control; and ergonomic design principles for human-AI systems. The evidence indicates that AI can improve risk prediction, posture assessment, fatigue monitoring, decision support and task adaptation. However, these benefits are conditional rather than automatic. Reduced opportunities to practice difficult skills and algorithmically intensified work may transfer rather than eliminate risk. The paper proposes an ergonomic augmentation framework built on meaningful human control, calibrated trust, cognitive ergonomics, including neuroergonomics, worker participation and continuous evaluation. The main conclusion is that AI should not merely minimize human effort, but it should redistribute effort so that technology absorbs hazardous, and routine demands while workers retain active understanding, critical evaluation, creativity and responsibility.

Keywords: *Artificial Intelligence, Cognitive Ergonomics, Neuroergonomics, Human-AI Collaboration, Industry 5.0, Critical Thinking.*

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Solar Heat Radiation Protective Vest

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Abstract. Exposure to solar infrared heat radiation represents a significant occupational health and safety challenge for outdoor construction workers and agricultural workers worldwide. Solar IR exposure can increase total body heat load which contributes to dehydration, heat exhaustion, heat stroke, and even death, particularly during prolonged high level of physically demanding work. Climate change and rising global temperatures are expected to further increase occupational heat stress problems. This study evaluated cotton, polyester, nylon, silk, and Mylar garment samples under laboratory conditions to identify potential use in the development of a prototype solar heat radiation protective vest capable of reducing worker IR heat radiation exposures. An infrared radiation test platform was used to measure infrared heat radiation penetration through the five fabric materials. A thermal manikin was used to quantify the impact of IR radiation on skin temperature and total body heat gain. Based on the results, a prototype vest was constructed which exhibited excellent infrared radiation attenuation characteristics. Mylar was selected for use in the prototype which provided a 97% IR radiation attenuation level. Additionally, the thermal manikin tests showed a corresponding 26% reduction in average skin temperature.

Keywords: *Occupational Heat Stress, Outdoor Workers, Solar IR Heat Radiation, Protective Vest.*

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Psychological, Lifestyle and Health Consequences of Night Shift Work Among Young Adults: Evidence from a Latvian Cross-Sectional Study

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Abstract. Night shift work has become an integral component of modern society due to the increasing demand for continuous services and around-the-clock operations. Despite its economic importance, growing evidence indicates that night work may negatively affect physical health, psychological well-being, lifestyle habits, and social functioning. The aim of this study was to investigate the relationship between night shift work and sleep quality, lifestyle choices, social health, work–study–life balance, and physical and mental health among young adults in Latvia. A retrospective cross-sectional study was conducted using an anonymous online survey comprising 32 Likert-scale questions distributed across five domains. Data from 102 participants aged 18–30 years were analyzed, including 57- night shift workers and 45 daytime workers. Statistical analysis was performed using the Mann–Whitney U test. Significant associations were found between night shift work and poor sleep quality, including irregular sleep duration, prolonged sleep initiation, nightmares, daytime sleepiness, and sleep disturbances. Night shift workers also demonstrated poorer dietary habits, increased alcohol and nicotine consumption, reduced academic performance, limited free time, increased stress levels, poorer self-rated health, more frequent illnesses, and higher prevalence of anxiety, depressive symptoms, and obsessive-compulsive tendencies. No significant association was identified between night shift work and attention deficit symptoms. The findings suggest that night shift work substantially affects several dimensions of health and well-being among young adults and highlights the need for targeted occupational health interventions.

Keywords: *Night Shift Work, Sleep Quality, Mental Health, Occupational Health, Lifestyle Habits, Young Adults.*

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The redistribution of cognitive load in academic work supported by generative artificial intelligence – an ergonomic study of university staff in Romania

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Abstract. Research into generative artificial intelligence (GenAI) generally emphasizes the benefits associated with streamlining academic activities and reducing the effort required of users. The present study proposes a different interpretation, based on the hypothesis that the use of GenAI does not eliminate cognitive demand, but rather alters its structure. Thus, the reduction in the effort required to generate and organize information is accompanied by an intensification of the processes of verification, validation, critical analysis and the assumption of academic responsibility. This hypothesis was investigated through a cross-sectional study conducted on a sample of 80 academic staff from eight Romanian universities, based on a questionnaire that combined an adaptation of the NASA-TLX instrument with indicators relating to AI use, perceived productivity, confidence levels and cognitive risks. The use of GenAI is positively associated with perceived productivity, but shows no relationship with overall mental workload, which remains at a moderate-to-high level, with an average level of mental demand. Almost three-quarters of respondents systematically check the generated results, and two-thirds consider this checking to be time-consuming. Another conclusion drawn from the study shows that perceived productivity is explained primarily by calibrated trust in the tool, rather than by the intensity of use. The results support an ergonomic perspective whereby GenAI does not diminish academic activity, but rather rearranges its cognitive topography, shifting the effort from the generative phase to the evaluative phase.

Keywords: *Generative Artificial Intelligence, Cognitive Ergonomics, Mental Workload, NASA-TLX, Higher Education, Human Factors.*

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Human-Centric Circular Economy: Integrating Ergonomics and Wellbeing for Sustainable Systems

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Abstract. The systematic literature review examines the emerging intersection of circular economy, wellbeing and ergonomics, exploring how these three do-mains converge to create sustainable systems that benefit both people and the planet. The review (based on PRISMA 2020 approach) synthesizes evidence from 90 peer-reviewed papers across three thematic areas (from a total of 224): CE and wellbeing (30 papers), ergonomics interventions and wellbeing (30 pa-pers), and the integration of CE with ergonomics and human factors (30 pa-pers). Key findings reveal that CE practices generate significant economic, social and environmental benefits, with potential to create $4.5 trillion in global economic growth by 2030. Ergonomic intervention demonstrates substantial impacts on worker wellbeing, reducing musculoskeletal disorders by 35-85% and improving productivity by 18-28%. The integration of human-centric de-sign principles with CE frameworks represents an emerging paradigm shift toward Industry 5.0, emphasizing the critical role of human factors in achieving sustainable development goals. This review identifies critical gaps in current re-search and proposes directions for future investigation, particularly regarding the systematic integration of ergonomics principles into CE business models and the measurement of wellbeing outcomes across economic, social, and environmental dimensions.

Keywords: *Ergonomics, Circular Economy (CE), Wellbeing, Human-Centric Circular Economy, Industry 5.0, PRISMA 2020.*

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Virtual and Augmented Reality Approach to Cognitive Ergonomics Risk Management

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Abstract. Virtual Reality (VR) and Augmented Reality (AR) technologies are used in ergonomics and safety management to support workplace design, training and risk prevention. While existing applications mainly address physical ergonomic risks through motion capture, digital twins and real-time assessment tools, VR/AR potential for cognitive ergonomics remains underexplored. This research presents a literature review on VR/AR applications in ergonomics and examines the cognitive risks associated with immersive technologies. Furthermore, a novel approach of VR-Based Mindfulness for Cognitive Ergonomics is proposed aiming to improve attention regulation, reduce cognitive fatigue and enhance employee well-being through immersive experiences integrated into workplace practices. The study highlights the dual role of VR/AR as both enablers of cognitive performance enhancement and potential sources of cognitive strain, emphasizing the need for human-centered design and holistic risk management approaches.

Keywords: *Virtual Reality, Augmented Reality, Cognitive Ergonomics, Mind-fulness, Industry 5.0, Human-Centered Design (HCD).*

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A Comparative Analysis on Health and Productivity in Workplaces Focusing Ergonomic Stress Factors

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Abstract. This paper presents a comparative analysis of indoor air quality (IAQ) and ergonomic parameters in office environments in Romania, Italy and Latvia. It investigates how environmental factors influence employees' health, cognitive performance, and productivity. The study highlights substantial regional differences in building infrastructure, legislative frameworks and climatic conditions revealing how these disparities contribute to varying risks of occupational diseases and absenteeism. Using a mixed-methods approach, the re-search synthesizes data from scientific literature and national reports to assess the vulnerabilities of existing office buildings and the effectiveness of current air quality monitoring practices. The findings highlight the critical need for harmonized European standards and adaptive ergonomic solutions tailored to local contexts. By correlating environmental stressors with organizational out-comes, the paper provides practical recommendations for policymakers and facility managers.

Keywords: *Indoor Air Quality (IAQ), Ergonomics, Workplace Environment, Comparative Study, Environmental Factors.*

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Artificial Intelligence Applications Supporting the Revised NIOSH Lifting Equation

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Abstract. Manual material handling remains a major source of work-related musculoskeletal disorders, particularly in industrial and logistics environments. The Revised NIOSH Lifting Equation (RNLE) is widely used to assess lifting-related risk by calculating the Recommended Weight Limit and Lifting Index. However, its traditional application relies on time-consuming manual measurements, provides only a limited representation of dynamic exposure and does not adequately account for complex lifting conditions, worker variability or fatigue. This paper analyzes these limitations and examines current applications of artificial intelligence supporting ergonomic risk assessment in manual material handling. Particular attention is given to computer vision, deep learning, inertial measurement units, surface electromyography and multimodal sensing. These technologies can support continuous posture tracking, automated estimation of selected RNLE variables and recognition of high-risk movements. The paper also reviews five commercially available AI-supported ergonomic solutions. Publicly available information indicates substantial differences in their scope and level of automation, while it does not consistently specify which RNLE inputs are obtained automatically or require user input. Independent validation remains limited and currently does not allow a direct comparison of the completeness or accuracy of the reviewed systems. AI-supported solutions can improve the efficiency and consistency of ergonomic assessment, but their output may also introduce uncertainty related to sensors, algorithms and data quality. They should therefore be interpreted as decision-support tools that complement, rather than replace, qualified ergonomic judgement.

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Keywords: *Artificial Intelligence, Ergonomic Risk Assessment, Revised NIOSH Lifting Equation, Manual Material Handling, Computer Vision, Wearable Sensors.*

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Optimizing Damage Control Resuscitation and Outcomes in the Combat Casualty Care by Integrating Wearable Cobotics with AI, AR and Spatial Computing

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Abstract. The fifth online and live operational trial of the wearable Cobot Prometheus III (PN 100016 / 000013797) was conducted on November 24–25, 2025, at the Athens Concert Hall (Megaron). The integration of its digital utilities into a single wearable cobot framework is designed to reduce the cognitive load on battlefield paramedics, streamline physical deployment, and optimize treatment timelines for severely injured casualties. Developed under the Program of Excellence 2014-16, the system was integrated into a clinical simulation for pre-hospital severe combat surgical trauma and poly-trauma management and care. The trial was executed in collaboration with the Emergency Ambulatory Service of Thessaly and the Educational Department of the National Emergency Ambulatory Service (Athens Training Department). Three experienced experts evaluated in a pilot simulating study the prospective impact, the key role and the necessary modifications for the optimum ergonomics of integration of Prometheus III with AR glasses and spatial computing for Diagnosis, Triage, Rescue, and Evacuation of the casualties in the Battlefield. On an operational and technological level Utility, Workflow process Ergonomics of the Cobot Prometheus III ecosystem based on 1. Augmented Reality for real-time diagnostic overlays and enhanced situational awareness.2. Artificial Intelligence (AI) and Spatial Computing for automated triage support and predictive telemetry. 3.Wireless Digital Ultrasound for rapid, field-level internal scanning. 4.Real-Time Telecommunications for continuous telemetry monitoring and remote clinical oversight. On a clinical level ergonomic assessment focused heavily on how the system's integrated technologies enhance real-time decision-making and damage control resuscitation, strictly adhering to Tactical Combat Casualty Care (TCCC) principles.

Keywords: *Cognitive Ergonomics, Combat Casualty Care, Golden Hour, Augmented Reality, Wearable Cobotics, Damage Control Resuscitation.*

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The Impact of Aesthetic Expressiveness on the User Experience of Cookbooks

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Abstract. This study examines how traditional and experimental (postmodern) cookbook designs affect usability and aesthetic perception. Two prototypes were created: a conventional layout emphasizing clear hierarchy and legibility, and an experimental layout featuring a fragmented structure, varied typography, and schematic icon-based instructions. A within-subjects experiment (N = 297) assessed objective usability (task accuracy and completion time), subjective simplicity, and aesthetic evaluations across five dimensions. Results indicate a trade-off between usability and cognitive outcomes. The experimental design improved orientation efficiency and memory retention, likely due to increased visual salience, but hindered deep reading performance and reduced perceived simplicity. The traditional design consistently enabled faster, more accurate comprehension and received higher ratings for beauty, visual engagement, quality, and symbolic value. Innovation ratings did not differ significantly. Demographic effects were minimal, although older participants showed slower task completion in both conditions. Overall, the findings suggest that traditional lay outs optimize clarity and usability, while experimental designs enhance memo ability and perceived novelty, highlighting a functional–aesthetic trade-off in editorial design.

Keywords: *Aesthetic Expressiveness, Cookbook, Graphic Design, User Experience, Visual Complexity.*

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Ergonomic Redesign Through Digital Human Modeling for Physical Workload Reduction

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Abstract. The aim of this study is to develop an ergonomic assessment of the working postures of a worker at a selected workplace, where the assembly cable packaging process takes place, and based on the identification of stressful operations, to propose specific measures that will help reduce the occurrence of musculoskeletal diseases. Selected software was used to create a digital model of the workplace and simulate work activities. The assessment was carried out using three selected methods. After applying these assessment methods, the most critical place was identified at this workplace. Subsequently, three design solutions were created that will ensure the improvement of ergonomic conditions at the given workplace and ensure suitable conditions for the worker. The effectiveness of the individual designs was verified using digital simulation. The simulation results were subsequently clearly processed, and it can be concluded that the improvement of ergonomic parameters occurred in all proposed solutions, with the most significant improvement being achieved in the third design solution, which led to a reduction in the worker's workload and more favorable values of the evaluated ergonomic indicators. The results thus confirmed that appropriately designed technical measures can significantly contribute to reducing the physical workload of workers, increasing work safety and improving ergo-nomic conditions in the workplace.

Keywords: *Workplace Ergonomics, Musculoskeletal Disorders, Digital Simulation.*

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Multimodal Approach to Non-Invasive Monitoring of Ergonomic Risk and Fatigue During Repetitive Activity – Case Study

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Abstract. Prolonged computer-based work in suboptimal postures is a leading cause of work-related musculoskeletal disorders (MSD) affecting the neck, back, and upper limbs. This case study aimed to pilot and evaluated a low-cost multimodal approach combining opensource pose estimation with non-invasive heart rate variability monitoring as a potential alternative to traditional ergonomic assessment. A 25-year-old male CAD operator performed computer work over three consecutive days in three postural configurations at a height-adjustable desk: suboptimal sitting (Scenario A), ergonomically adjusted sitting (Scenario B), and ergonomically adjusted standing (Scenario C). After four hours of work each day, a 2-minute video recording was processed using scripts in a programming language to automatically compute REBA scores from the skeletal landmark network of an open-source pose estimation library. The resulting scores were subsequently compared with manual assessment. Morning HRV parameters (RMSSD, SDNN, Readiness) tracked cumulative physiological load across days. Automated assessment achieved agreement within ±1 score point in all evaluated cases, confirming the feasibility of the proposed system. REBA assessment recorded a progressive reduction in ergonomic risk from Scenario A to C, with HRV indicating lower physiological load under optimized conditions. These findings establish a proof-of-concept for scalable, camera-based monitoring deployable in industrial settings without specialized equipment.

Keywords: *REBA, Landmarks, HRV, Script, Musculoskeletal Disorders, Height Adjustable Desk.*

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Environmental Ergonomics Assessment of Road Traffic Noise on Major Urban Roads in Zagreb

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Abstract. Road traffic noise is one of the most significant environmental factors affecting urban populations and should be considered not only an environmental issue but also an important aspect of environmental ergonomics. This study assessed the urban acoustic environment at three representative road sections in the City of Zagreb through simultaneous traffic counting and environ-mental-noise measurements. Traffic volume was determined from recorded audios, while noise levels were measured using a smartphone-based sound level meter application during the morning and afternoon peak periods. The equivalent continuous sound level (LAeq), together with the maximum (LAFmax) and minimum (LAFmin) sound pressure levels, was analyzed and interpreted in relation to the strategic noise map of the City of Zagreb. The results showed that higher traffic volume did not necessarily correspond to higher measured noise levels, indicating that traffic-flow conditions, vehicle speed, and local road characteristics significantly influence the urban acoustic environment. Although the measured equivalent noise levels generally corresponded to the intended land-use categories, short-term peak noise events may still contribute to reduced acoustic comfort. The findings demonstrate that field measurements provide valuable complementary information to strategic noise maps and highlight the importance of integrating environmental ergonomics principles into urban transport planning and noise management.

Keywords: *Environmental Ergonomics, Road Traffic Noise, Traffic Volume, Strategic Noise Map.*

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The Influence of Visual Structural Elements of Packaging Design on User Experience

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Abstract. This study compared two types of packaging visual design: a minimalist design and a complex design that includes a greater number and variety of structural elements. The aim was to examine whether the addition of a QR code to medicine packaging with different levels of visual and structural complexity affects users' ability to locate and use the QR code, and their overall experience with the packaging. The study included 48 participants who handled the package, scanned the QR code, and completed a questionnaire assessing QR code findability, QR code usability, and the overall packaging experience. The findings indicated that QR code findability may be reduced when packaging is overloaded with visual and structural elements. Although age differences were not statistically significant, a notable proportion of participants aged 60 years or older were unable to use the QR code, suggesting that this type of interactive element may represent a barrier for some older users. This emphasizes the need to include older participants in packaging evaluations to support more inclusive design.

Keywords: *User Experience, Packaging, Visual Design, Quick Response Code, Usability.*

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Visual Attention in Packaging Design Incorporating a Thermochromic Pictogram

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Abstract. Pictograms on packaging may serve as functional visual cues, supporting the efficient identification of the product's main function and reducing the risk of incorrect use. The aim of the study was to examine whether the presence of the thermochromic pictogram affects visual attention toward other packaging elements and whether visual attention toward the pictogram is associated with the subjective evaluation of packaging attractiveness. The study included 54 participants. Gaze data were collected using an eye-tracking system while participants viewed packaging with a pictogram simulating a thermo-chromic color change. The eye-tracking measures included Time to First Fixation (TFF) and Total Fixation Duration (TFD). Participants also evaluated packaging attractiveness using a 7-point Likert scale. The results showed that the presence of the thermochromic pictogram did not significantly affect visual attention toward other elements in packaging. Furthermore, visual attention toward the thermochromic pictogram was not significantly associated with attractiveness ratings. These results contribute to the still limited body of eye-tracking research on dynamic visual elements in packaging design and provide a basis for the further development of physical thermochromic packaging proto-types.

Keywords: *Pictogram, Thermochromic Inks, Packaging, Eye-Tracking, Subjective Evaluation.*

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Risk Analysis of Latent Transcendent-Destructive Factors in Human-Machine Systems: A Pilot Study

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Abstract. This paper proposes an approach to risk analysis in complex human-machine systems by incorporating a previously overlooked category of latent transcendent-destructive meta-factors. Traditional safety models often reach their limits because they limit analysis to the standard "human-technology-environment" triad, ignoring deep-seated cognitive deviations and value inversions within the operator's consciousness. The authors introduce a two-component mathematical framework designed to detect and quantify these hidden threats. The first component utilizes association rule mining via the apriori algorithm to uncover latent behavioral regularities from operational data. The second component employs Fuzzy Cognitive Maps to simulate causal relationships and calculate the cascade effects of these factors on overall systemic risk. Initial verification of the approach was conducted through local exploratoion experiments utilizing historical accident logs. The simulation results demonstrate that while external environmental factors can trigger cascading disruptions, automated technical barriers and internal human mobilization loops can actively damp destructive entropy. Finally, the paper outlines a proactive, dual-circuit safety system to implement these models in real industrial environments.

Keywords: *Ergonomics, Reliability, Industrial Safety, Accident Analysis, Human Factor, Systemic Risk, Human Operator, Transcendent Destructive Factor, Fuzzy Cognitive Map, Association Rule Mining.*

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Human–Machine Interaction Control in Automated Systems: An Exploratory Time-Scale Dynamic Approach

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Abstract. The paper analyzes the development trends of automated systems within the "Industry 5.0" concept and the key features of the "Operator 5.0" concept. An exploratory approach to modeling human-machine interaction in critical automated systems is presented, based on the mathematical apparatus of dynamic equations on time scales. It is shown that traditional differential or difference models alone are not capable of adequately describing the hybrid nature of ergatic systems functioning. A formalization of the time scale for the functioning of "human-technical environment" systems is proposed as a union of intervals (continuous monitoring) and isolated points (discrete events). A generalized delta-differential equation is derived to assess the probability of an operator's error-free performance. The sensitivity of system stability to discrete disturbances is proved. A concept of adaptive control of the operator's cognitive load is developed. The practical significance and applicability of the models are confirmed by numerical examples.

Keywords: *Ergonomics, Reliability, Simulation, Human Factor, Human-Operator, Industry 5.0, Operator 5.0, Time Scales, Dynamic Equations, Adaptive Control, Ragged Rhythm, Cognitive Load, Exploratory Modeling*.

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Overcoming Crisis in University E-Learning: An Ergonomic Analysis of Digitalization Risks

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Abstract. The rapid digitalization of higher education, accelerated by pandemic and wartime conditions, has introduced significant ergonomic challenges threatening both learning effectiveness and the well-being of students and educators. This article identifies key ergonomic problems arising from e-learning adoption and proposes a methodology for ergonomic support in digital educational environments. Using Fuzzy Cognitive Mapping, the study models causal relationships. Expert assessments were aggregated into an adjacency matrix, followed by iterative computation of steady-state values and scenario analysis. The results show that technostress and uncontrolled AI use are the primary drivers of ergonomic quality degradation. A vicious circle of reinforcing risks among dementia, burnout, and loss of motivation was identified. Scenario analysis confirms that reducing technostress and controlling AI usage significantly improves ergonomic quality. A three-level methodology for overcoming crisis phenomena is proposed: ergonomic certification and monitoring, adaptive learning based on student-as-operator models, and digital environment hygiene with cybersecurity measures.

Keywords: *E-learning, Ergonomics, Digital Dementia, Fuzzy Cognitive Maps, Human Factor, Technostress, Adaptive Learning, Cybersecurity, Ukraine, Artificial Intelligence.*

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Mechanical performance of electrospun PCM materials managing thermal comfort

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Abstract: Electrospun materials incorporating phase change materials (PCM) are promising candidates for the development of value-added clothing with thermoregulating properties. The study concerns the fabrication of oil based PCM encapsulated into polyvinyl alcohol (PVA) and evaluates its mechanical performance. Although higher PCM content results in greater heat enthalpies, an adverse effect was observed for the tensile strength, strain at break and Young's modulus. Lower PCM content also indicates more favorable thermo-mechanical performance, whereas PCM increasing reduces materials stiffness.

Keywords: *Electrospinning, PCM, Tensile Properties, Thermo-Mechanical Performance.*

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Subjective Perception of Physical and Cognitive Ergonomics in Tram Transport During Peak Loads

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Abstract. This paper investigates passenger perceptions of physical ergonomics, spatial comfort, and cognitive stress during tram travel during peak traffic periods. Utilizing a structured survey questionnaire, the study analyzes the interrelationship between specific demographic characteristics of the active working-age and youth populations, physical fatigue caused by adverse vehicle kinematics and uncomfortable fixed handrails, and social dynamics within a crowded environment. Emphasis is placed on environmental, health, and hygiene factors as sources of perceived stress, alongside the efficacy of digital coping mechanisms (Active Noise Cancellation headphones). For the purposes of this study, a survey was conducted among passengers using Zagreb's tram public transport service. The results highlight critical thresholds where physical discomfort and ergonomic disruptions override the economic viability of public transit, prompting some passengers to consider shifting to private automobiles or taxi services. The paper offers concrete guidelines for optimizing interior design and traffic management to retain the public transit user base.

Keywords: *Ergonomics, Tram Transport, Passenger Stress, Ride Comfort, Modal Shift, Social Dynamics.*

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Development of a Decision Support Model for Reducing Students' Mental Workload in Industrial Engineering: Basis for Curriculum Redesign

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Abstract. This study focuses on addressing the increasing mental workload experienced by Industrial Engineering students by developing a decision support tool that will serve as a basis for redesigning the BS Industrial Engineering curriculum of a State University. Motivated by classroom observations and student feedback indicating fatigue, diminished engagement, and academic strain, the research aimed to identify key individual, psychosocial, and academic factors influencing students' mental workload. Using the NASA Task Load Index (NASA-TLX) and a structured questionnaire, data were collected from sophomore to senior students and analyzed through multiple linear regression. Results revealed that organizational involvement significantly predicts mental workload among second-year students, time management is the primary factor for third-year students, and organizational leadership roles significantly influence workload among fourth-year students. By integrating ergonomic assessment and statistical modeling, the study contributes actionable insights toward improving student well-being while maintaining academic rigor.

Keywords: *Mental Workload, NASA-TLX, Engineering Education, Curriculum Redesign, Multiple Regression Model.*

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Tool Sizing and Ergonomic Risk Assessment for Hand Tool Use: An Integrated EMG–MCDM–Behavioral Framework

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Abstract. Musculoskeletal diseases (MSDs) are closely linked to the use of hand tools, especially in developing nations where ergonomic adaptation and preventive safety measures are still scarce. To enhance occupational safety and in form ergonomic decision-making, this study aims to develop and evaluate an integrated framework that combines behavioral risk perception analysis, electromyography (EMG), and multi-criteria decision-making (MCDM). A PRISMA based systematic review, expert elicitation utilizing the Analytic Hierarchy Process (AHP) and Best-Worst Method (BWM), a cross-cultural risk perception sur vey referring to the DOSPERT index, and an experimental EMG investigation were all part of the mixed-method approach. EMG signals from the surface were captured while performing repetitive hand tool operations, processed using common time- and frequency-domain indicators, and then subjected to machine learning classification models for analysis. The findings revealed a substantial correlation ($r = 0.520$, $p < 0.001$) between the prevention of work-related diseases and the identification of fatigue using EMG-based methods. Physical injuries were found to be the most important element in risk prioritizing, followed by ergonomic risks and tool damage. EMG data revealed a significant decline in muscle performance coinciding with the onset of tiredness at approximately 25 repetitions. Furthermore, cross-cultural research revealed that worker groups differed in how they perceived and tolerated risk. The suggested paradigm facilitates organized risk prioritization, improves early fatigue detection, and offers practical insights for ergonomic tool design and workplace safety tactics. These findings contribute to advancing integrated approaches in ergonomics by linking physiological, cognitive, and decision-making factors within a unified model.

Keywords: *Ergonomics, Electromyography, Muscle Fatigue, Hand Tools, Multi-Criteria Decision-Making, Risk Perception, Occupational Safety.*

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Use of Augmented Reality for Proxemics Studies

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Abstract. The study investigates how augmented reality influences out-comes in proxemics studies, focusing on interpersonal distances within a futuristic vehicle environment. Using the Hololens 2 device, 37 participants engaged in two phases: interacting with a virtual mannequin in augmented reality and real-world interactions with actual individuals. The experiment involved a single seating configuration—face-to-face—a common layout in proxemics studies. Post-experiment, subjective data was collected via a questionnaire, including the NASA TLX test, to assess participants' workload and experience. Employing a Human-Centered Design approach, the research sought to determine the ease of conducting augmented reality experiments. In summary, the research aims to answer the following questions:

1. *"Did employing augmented reality affect the outcome of the proxemics test?"*
2. *"In terms of workload, was it demanding for participants to conduct the test in augmented reality?"*
3. *"What impact did the use of augmented reality have on user experience?"*

Keywords: *Augmented Reality, Proxemics, Interpersonal Distance, Vehicle Interiors, Human Centered Design, NASA-TLX.*

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Traditional motifs as inspiration for modern clothing souvenirs

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Abstract. The cultural heritage of Zadar County serves as a valuable source of inspiration for the development of contemporary clothing souvenirs that integrate tradition, functionality, and innovative design. The starting point of the work is elements of the folk costumes of northern Dalmatia, which are reinterpreted in the author's design collection, whose garments are adapted to the needs of the user with an emphasis on satisfying the ergonomic fit according to the body type. The research, conducted through an online questionnaire, complemented by market analysis and an examination of consumer attitudes, con-firmed a growing interest in authentic, sustainable, and functional souvenirs that communicate local cultural identity. The findings reveal that both domestic and international respondents prefer authentic, high-quality, and practical souvenirs and express positive attitudes towards contemporary garments incorporating ethnographic motifs inspired by the cultural heritage of Zadar County. The results demonstrate that the integration of cultural heritage with contemporary fashion design represents a sustainable and innovative approach to the development of textile souvenirs. Such products contribute to the preservation and promotion of cultural identity, enhance the user experience through improved functionality and comfort, and strengthen the competitiveness of cultural tourism by offering distinctive, value-added products that connect tradition with modern design.

Keywords: *Ethno Souvenirs, Quadrilateral (hrv. četverokuka), Folk Costume, Design, Ergonomics.*

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Ankle Joint Loading in Ballet Positions

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Abstract. Classical ballet dancers are exposed to high loads and risk of injury due to the intense physical demands of dancing. The aim of the study was to determine the load on the ankle joint in basic positions in classical ballet. A simplified biomechanical model of the foot in the sagittal plane was defined. A preliminary study was conducted in which one ballerina participated and the pressures acting on the feet were measured in ballet positions I, III, IV and VI using a portable pedobarographic platform. The measurements were carried out without pointe shoes, and pointe shoes were used only for ballet position VI. It was determined that the highest load on the ankle occurs in ballet position I. The force with which the ankle joint is loaded is greater when a greater force occurs in the toe area. Pointe shoes reduce pressure in the toe area and relieve the ankle. Despite all simplifications and limitations, this preliminary study showed biomechanically interesting conclusions that need to be confirmed in a larger sample of subjects.

Keywords: *Ballet Positions, Pedobarographic Platform, Feet Pressures, Biomechanical Model, Ankle Joint Loading.*

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Artificial Intelligence: promises, limitations, standards, risks and impacts on human factors domain

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Abstract. Artificial intelligence has been on top of discussion for the past few years. It inspires hope and fear at the same time, involves risks while the topic faces a lot of misinformation. This article, written by specialists in human factors, analyses the potential impacts as well as the measures currently being implemented in relation to this new tool. Following a brief overview of the nature of intelligence, we compare certain properties of human and artificial intelligence. We then explore the potential benefits of AI for human work, its limitations and the risks associated with this technology. As this technology falls within the category of 'machines' placed on the market in Europe, we outline the applicable standards and how they have evolved. We then address some social considerations, as well as the possible economic consequences of this technology. We conclude with a reflection on the role of humans in relation to machines. Human capabilities remain and will continue to remain for a long time to come, far superior to those of any machine. Designers must avoid the mistakes of the past by excluding operators from control loops. It led to enough workplace accidents over the past few decades.

Keywords: *Artificial Intelligence, Capacities, Limitations, Risks, Regulations.*

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Driver Workload in Traffic-Flow and Route Optimization

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Abstract. Traffic-flow and route-optimization models primarily evaluate alter-native solutions using technical indicators such as travel time, congestion, delay and route length, while the physical and cognitive demands experienced by drivers are rarely incorporated. This review examines ergonomic methods that can support a more human-centered assessment of traffic routes and proposes a framework for integrating workload indicators into traffic-flow and route-optimization models. Cognitive workload can be assessed using NASA-TLX as a route-level subjective measure and eye-tracking as a continuous indicator of visual attention. Physical workload can be evaluated through electromyography, supplemented by postural methods such as RULA and REBA. The proposed framework synchronizes continuous ergonomic measurements with traffic, vehicle-motion and location data, enabling workload to be analyzed at both road-segment and route levels. Rather than immediately combining all measures into a single score, an ergonomic route profile is proposed to preserve information about the intensity, duration and location of increased workload. This profile can confirm a technically optimal route, distinguish between alternatives with similar traffic performance or identify trade-offs between traffic efficiency and driver well-being. Future experimental validation should compare alternative routes using synchronized traffic, EMG, eye-tracking and NASA-TLX data.

Keywords: *Driver Workload, Traffic-Flow Assessment, Route Optimization, Human-Centered Ergonomics.*

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The Impact of Mental Workload and Cognitive Slips on the Level of Awareness of Traffic Signs

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Abstract. The purpose of this study is to determine the effects of mental workload and cognitive slips on traffic sign recognition among the students at Visayas State University Isabel. This research focuses on determining the levels of mental workload, cognitive errors, and traffic sign awareness, as well as the relationships among these variables. The study employed the use of quantitative research design and utilized a descriptive-correlational research approach. The data collection involved the NASA Task Load Index (NASA-TLX) for mental workload, the Cognitive Failures Questionnaire (CFQ) for cognitive errors, and the traffic signs awareness test. The result showed that mental workload and cognitive slips exhibited a significantly negative relationship with the awareness of traffic signs, but at a very weak level ($r = -0.225$ and $r = -0.222$, respectively; $p < 0.05$). This implies that the increase in mental workload and cognitive slips is connected to the decrease in traffic sign awareness. In addition, the regression analysis showed that mental workload and cognitive slips accounted for only 6.19% of the variance in traffic sign awareness ($R^2 = 0.0619$), indicating the very low impact of these variables on traffic sign awareness. Based on the above-stated facts, it can be concluded that mental workload and cognitive slips have an impact on traffic sign awareness, but not crucial for the process of traffic sign awareness development. It shows that other factors, such as experience, should be taken into consideration in further investigations.

Keywords: *Cognitive Load, Cognitive Slips, Mental Workload, Road Safety, Students, Traffic Sign Awareness.*

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Thumb Slit, Pull Tab, and Color Cue Comparison in Paperboard Packaging Opening Design

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Abstract. This study examined the effect of different visual opening cues on the usability of paperboard packaging using a combination of eye tracking, objective opening time, and subjective opening difficulty ratings. Four packaging samples differed only in their opening cue: no cue, thumb slit, pull tab, and color. Eye tracking was used to evaluate users' visual attention to the opening cues, while opening time and subjective ratings assessed usability. The results showed that structural opening cues, particularly the thumb slit and pull tab, improved opening performance and were perceived as easier to use than the no-cue and color-cue designs. Overall, the findings suggest that structural opening cues provide greater usability benefits than a color-based cue alone, supporting affordance theory and offering practical guidance for ergonomic packaging design.

Keywords: *Packaging Usability, Affordance, Eye-Tracking, Opening Time, Subjective Evaluation.*

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Digitalization and the Development of Products with Reduced Health Risks: Evidence from European Manufacturing Companies

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Abstract. Digital transformation is increasingly recognized as an important driver of product quality, safety, and innovation. However, limited empirical evidence exists regarding whether the adoption of digital technologies and tools is associated with the development of products designed to reduce health risks during use. This study investigates these relationships using data from 163 manufacturing firms participating in the 2022 European Manufacturing Survey across Latvia, Lithuania, Slovakia, and Spain. Comparative analyses based on contingency tables, Pearson's chi-square tests, and Cramer's V were used to ex-amine associations between product innovation and four groups of digitalization-related variables: digital product elements, digitally provided product-related services, product control technologies, and simulation software. The results show that most digital technologies were not significantly associated with the investigated type of product innovation. Significant positive associations were identified only for Product Lifecycle Management (PLM) systems or Product/Process Data Management, software for advanced computation, simulation and data analysis, and online training provided as a digital product-related service. The study contributes to literature by distinguishing between different dimensions of digitalization and identifying those most closely associated with the development of safer products.

Keywords: *Product Innovation, Reduced Health Risk, Digitalization, Production Control, Digital Elements of Product, Product-related services.*

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Designing for comfort, fit and usability: ergonomic development of the reusable half-mask

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Abstract. Reusable respiratory protection often creates communication barriers, discomfort during prolonged wear and pressure around the ears and facial soft tissues. This paper presents the ergonomic development and preliminary evaluation of a lightweight reusable transparent mask within the Easy2reUse project. The concept combines a clear front section to improve facial visibility and support communication, a head-supported structure that avoids ear straps and laterally positioned filter cartridges. The design was developed through an iterative process focusing on low weight, visibility, sealing performance, comfort during extended wear and adaptability to different user groups. The current prototype is available in multiple sizes and several material combinations for the transparent section and sealing edge are under evaluation. The prototype was assessed through user testing involving 22 participants, a discomfort questionnaire, the Mask Usability Scale and finite element contact simulations. The results showed low overall discomfort (mean 0.50 on a 0–7 scale), with the highest ratings observed in the cheek regions. Participants reported good overall comfort, easy donning and doffing, minimal interference with communication and virtually no ear-related discomfort. Following design modifications to the sealing geometry, a second contact simulation demonstrated improved contact between the seal and the face model without gaps around the nose and mouth region. The study demonstrates how visibility fit, comfort and sealing performance can be addressed simultaneously in the development of reusable respiratory protection.

Keywords: *Reusable Mask, Ergonomics, Human Comfort, Transparent Materials, Fit, Product Design.*

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Contextual effects of typeface and pictogram on visual processing

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Abstract. Pictograms and typography are frequently combined in visual communication, yet the extent to which their perceived coherence depends on semantic context remains unclear. A better understanding of these relationships can support the design of clearer and more effective visual communication. This study examined how typeface selection and pictogram complexity influence perception, visual processing, and perceived coherence in pictogram text combinations. Ninety participants completed an eye-tracking experiment using three thematic categories: cobbler, herbal pharmacy, and gluten-free restaurant. Participants viewed simple and complex pictograms paired with selected typefaces while reading time, fixation count, fixation duration, and saccade count were recorded. They also rated the visual appeal of each combination. Results showed that the impact of pictogram complexity depended on semantic context. In the herbal pharmacy category, simple pictograms led to longer reading times and more saccades, suggesting reduced semantic clarity and greater visual exploration. In contrast, complex pictograms in the gluten-free restaurant category increased reading time, indicating higher perceptual load. No significant differences were found in the cobbler category. Appeal ratings were mostly unrelated to processing efficiency. Overall, the findings highlight the importance of context-sensitive typography and pictogram design in visual communication systems and suggest that visual complexity should be evaluated in relation to the semantic context in which pictogram–text combinations are used.

Keywords: *Appeal, Eye-Tracking, Pictogram, Reading Time, Typography.*

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Occupational Safety in Micro and Small Enterprises: Accident Losses, Working Conditions and Communication Barriers in the Hungarian Electrical Sector

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Abstract. Small and medium-sized enterprises have an important role in employment and economic activity, but occupational safety in micro- and small enterprises may remain informal and may be influenced by time pressure, cost con strains and routine-based work practices. This paper examines occupational safety in the Hungarian electrical sector, focusing on accident-related losses, the working environment and barriers to effective safety communication. The study is based on Hungarian occupational accident and enterprise data, a questionnaire survey conducted among respondents from electrical-sector enterprises, informal observations during questionnaire administration and newsletter implementation, and a small-scale newsletter-based communication attempt. The questionnaire involved 43 respondents from 22 enterprises, while the newsletter activity involved 35 participants. The findings suggest that workplace accidents may cause damage beyond dividual injury. They may affect business continuity, productivity, replacement work, treatment costs and wider social costs. The questionnaire results show that respondents mainly recognized direct physical hazards, especially electric shock, falls and tool-related injuries. The newsletter experience indicated that short digital messages can attract attention and support basic information transfer, but they did not demonstrate long-term knowledge retention, behavioral change or accident reduction.

Keywords: *Occupational Safety, Micro and Small Enterprises, Accident Losses, Electrical Sector, Safety Communication, Working Environment.*

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Bridging the Gap Between Laboratory Evidence and Workplace Adoption of Occupational Exoskeletons: The RELAX Protocol and Preliminary Supporting Evidence

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Abstract. Work-related musculoskeletal disorders remain a major occupational health challenge in warehouse logistics. Passive back-support exoskeletons have demonstrated promising biomechanical effects, but evidence on long-term workplace implementation, adherence, organizational outcomes, and economic value remains limited. The Reduction of the Lifting Load Among logistics workers through a passive back exoskeleton (RELAX) project is an 18-month controlled workplace intervention involving approximately 90 warehouse workers. This manuscript presents the RELAX protocol together with preliminary supporting evidence from a preceding 24-week randomized controlled trial (RCT) among logistics workers. The RCT serving as background showed reduced back muscle activity during exoskeleton-assisted lifting, a decrease in perceived work intensity over the intervention period, and moderate adherence to exoskeleton use. RELAX extends this work by evaluating worker-reported outcomes, usage, productivity, sickness absence, employee turnover, implementation processes, and economic consequences over longer durations. By combining ergonomic, organizational, and economic perspectives, the study aims to provide evidence supporting future large-scale adoption of occupational exoskeletons in the industry.

Keywords: *Occupational Exoskeletons, Warehouse Logistics, Ergonomics, Implementation, Musculoskeletal Disorders.*

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The Convergence of Biomechanical and Biochemical Hazards in Dentistry: Analysis of Ergonomic Risks and Microplastics Exposure

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Abstract. This paper explores the critical intersection of biomechanical and biochemical hazards in the dental profession, specifically focusing on the convergence of ergonomic risks and microplastic exposure. Utilizing a systematic methodology compliant with ISO 45001:2023, the study presents a comprehensive case analysis of a dental professional diagnosed with suspected Carpal Tunnel Syndrome (CTS) in Western Romania. Ergonomic evaluation conducted via the Rapid Entire Body Assessment (REBA) tool revealed a medium risk level (score 6), primarily attributed to static orthostatic postures and chronic vibration exposure from specialized dental handpieces. Concurrently, the research highlights how daily dental procedures generate ultrafine aerosols containing resin-based microplastics, which have the potential to induce systemic inflammation and accumulate in human skeletal tissues. These findings suggest that ergonomic stressors synergistically interact with biochemical burdens to exacerbate musculoskeletal degradation. Consequently, the paper advocates for an integrated occupational health framework that combines biomechanical assessments with microplastic mitigation strategies to enhance practitioner well-being.

Keywords: *Occupational Health and Safety, Occupational Risks Investigation; Musculoskeletal Disorders, Microplastics Exposure, Dentistry.*

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Hand–Arm Vibration Transmission in Chainsaws: Implications for Protective Glove Selection

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Abstract. This study investigates vibration transmissibility from chainsaw handles to the operator's hand under controlled operating conditions, with and without the use of anti-vibration gloves. Measurements were conducted on a Stihl MS 462 chainsaw using a dual-sensor setup consisting of a SVANTEK SV 150 accelerometer mounted on the handle and a SVANTEK SV 105DF accelerometer positioned between the hand and the glove. This configuration enabled direct assessment of vibration transmission through the glove–hand interface under realistic grip conditions. To ensure measurement repeatability, cutting operations were excluded, and tests were performed under idle and full-throttle no-load conditions, providing stable vibration excitation dominated by engine dynamics. Three anti-vibration gloves and a bare-hand reference condition were evaluated through repeated trials. Vibration transmissibility was determined from simultaneously recorded handle and hand vibration signals. Frequency-domain analysis was performed using 1/3-octave bands to assess glove performance across different frequency ranges. The results demonstrated a significant effect of glove type on vibration transmissibility under all investigated operating conditions ($p < 0.001$), with extremely large effect sizes ($\eta p^2 = 0.94–0.96$). Glove 3 consistently exhibited the lowest transmissibility values and the highest vibration attenuation performance, particularly on the rear handle during throttle operation ($T = 0.58 \pm 0.04$). In contrast, transmissibility values exceeding unity were observed on the front handle during throttle operation, indicating vibration amplification rather than attenuation. Frequency-band analysis revealed that glove effectiveness was strongly frequency-dependent, with Glove 3 providing the most consistent vibration reduction across the investigated conditions.

Keywords: *Hand-Arm Vibration, Transmissibility, Chainsaw Vibration, Anti Vibration Gloves, Frequency Analysis.*

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Biomechanical and Ergonomic Evaluation of Ladder Ascent under Representative Ladder and Task Conditions – a case study

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Abstract. Ladder ascent is common in occupational and everyday settings, yet it places substantial demands on balance, coordination, joint mobility, and force production. Although ladder angle and rung spacing are often treated as design properties, their ergonomic relevance is reflected in the biomechanical response of the climber. This exploratory single-participant case study examined ladder ascent as a human-centered ergonomic task under selected representative combinations of ladder geometry and task demand. A single healthy adult male participant completed four selected climbing conditions: a reference condition, a low-demand geometry condition, a high-demand geometry condition, and an operationally demanding condition involving asymmetrical climbing, rushed pace, and baggage carriage. Whole-body motion was recorded using an Xsens Awinda IMU system and processed in Biomechanics of Bodies, with additional analysis in MATLAB. Peak lumbar flexion, lumbar range of motion (ROM), and peak modeled foot support force were used as primary outcome measures, while peak hip flexion and mean REBA score were used as secondary measures.
Within this case-study dataset, peak lumbar flexion provided the clearest descriptive separation between conditions, with the lowest value observed in the low-demand condition and the highest value observed in the operational condition. Peak modeled foot support force showed a broadly similar pattern, although force differences were interpreted as model-based relative indicators rather than directly measured ground reaction forces. Peak hip flexion suggested altered movement strategy under the operational condition, while REBA indicated moderate ergonomic demand across conditions but showed lower sensitivity than the biomechanical measures. Overall, the findings are consistent with interpreting ladder ascent as a person–environment interaction in which ladder geometry and task state are reflected in postural, modeled loading, and ergonomic demand.

Keywords: *Ladder Ascent, Ergonomics, Biomechanics, IMU Motion Capture, Support Loading.*

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The impact of time spent using computers in engineering design offices on the risk of musculoskeletal disorders assessed by the ROSA method

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Abstract. The increasing demands of engineering design, product development, numerical analysis, technical documentation, and manufacturing preparation require extensive use of Computer-Aided Design (CAD) tools, resulting in engineers spending a substantial proportion of their working time at computer workstations. Prolonged computer use is associated with an increased risk of work-related musculoskeletal disorders (WRMSDs), reduced productivity, and higher occupational health costs. Despite these concerns, the influence of computer exposure time on ergonomic risk among CAD users has received limited attention. This study investigates the effect of computer working time on the risk of WRMSDs among employees in engineering design offices using the Rapid Office Strain Assessment (ROSA) method. The ergonomic risk assessment was performed under four different computer workstation conditions to evaluate how workstation configuration and duration of computer use influence the level of musculoskeletal risk. By using a chair and monitor with adjustable height and a chair with an adjustable backrest, a CAD engineer who spends less than four hours per day on computer work is not at high risk of musculoskeletal disorders.

Keywords: *Musculoskeletal Disorders, Computer Workstation Conditions, Computer-Use Duration, ROSA Method.*

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Technostress as a Digital Job Demand: Its Association with Burnout among Healthcare Professionals in Primary Care

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Abstract. Burnout among healthcare professionals (HCPs) has become a critical occupational health concern, and the rapid digitalization of healthcare delivery has introduced technostress as an emerging psychosocial risk factor. This study evaluated the association between burnout and technostress among HCPs working in primary care in Saudi Arabia. A cross-sectional quantitative survey was conducted at the Family Medicine Centers (FMCs) of the Royal Commission Health Services Program (RCHSP) in Jubail, using a census-based invitation strategy. Burnout was measured with the Maslach Burnout Inventory Human Services Survey (MBI-HSS), and technostress was assessed with the Technostress Creators Scale. Descriptive statistics and Pearson correlation analyses were used to evaluate the relationship between the two domains. Burnout was prevalent, with emotional exhaustion emerging as the dominant dimension. Technostress showed a statistically significant moderate negative correlation with overall burnout ($r = -0.588$, $p < 0.001$), with the strongest contributions from techno-complexity, techno-insecurity, and multitasking. The findings support the conceptualization of technostress as a contemporary occupational stressor in digitally transforming healthcare settings and have direct implications for ergonomic intervention design, digital workflow optimization, and human-centered technology integration in primary care.

Keywords: *Burnout, Technostress, Healthcare Professionals, Ergonomics, Digital Health.*

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AI-Enabled Personalized Precision Exercise Prescriptions for Community-Dwelling Older Adults: A Pilot Study

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Abstract. Exercise is a key therapeutic intervention to enhance physical capabilities in older adults. Precise movement training is essential to improve an individual's ability to adapt to physical stressors and activities of daily living. This study applied Open AI GPT-4.0 to design precise exercise prescriptions of Nintendo Switch Ring Fit Adventure for elderly in the community. Participants received six precise exercise prescription training sessions to assess the feasibility. A total of 14 community-dwelling elder adults participated in this study. The results showed statistically significant improvements in upper limb muscle strength (mean 2.00, SD 2.35, p = 0.007), lower body strength (mean 3.57, SD 1.91, p = 0.000), and static balance (mean 37.18, SD 41.82, p = 0.005) and low er body flexibility (mean 2.57, SD 2.73, p = 0.004). The results of this study show that precision movement training is important for improving a person's ability to adapt to physical stressors and daily activities. Applying AI-based precision exercise prescriptions can enhance daily fitness outcomes. Future research will expand the sample size and extend the training duration to further validate its effectiveness.

Keywords: *Generative AI, Nintendo Switch Fitness Ring, Precise Exercise Prescription.*

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Analyzing the Relationship between Contextual Parameters and User Experience in Holographic-Based Applications

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Abstract. Holographic applications are increasingly used in education, training, and entertainment, offering new forms of interaction and engagement. Although previous studies have examined user experience in mixed reality environments, the role of contextual parameters remains underexplored. This research investigates the influence of contextual parameters on user experience during the use of a holographic serious game. The research combines objective measurements of contextual parameters recorded during application use with subjective user assessments of the perceived influence of these parameters on the overall experience. By comparing measured contextual conditions with users' perceptions, the research examines whether environmental factors affect user experience and to what extent users recognize their influence.

Keywords: *User Experience, Serious Games, Contextual Parameters, Holographic Application.*

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Customer Journey Design and AI – Driven Capability in Experiential Services

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Abstract. This study examines the role of artificial intelligence (AI) in reshaping customer journey design within experiential services, particularly in contexts where value is co-created through emotional, sensory, and relational interactions. Existing literature highlights AI's growing ability to automate service tasks, personalize interactions, and dynamically coordinate touchpoints across pre-service, in-service, and post-service stages. Despite increasing scholarly attention to AI-driven customer experience, limited research has examined how AI fundamentally redesigns customer journeys in experiential service settings. This study addresses this gap by developing and empirically testing a model in which AI-driven capability influences customer centric outcomes through customer journey design, bounded by perceived control. The model proposes that customer journeys are evolving from static linear processes into adaptive hybrid systems integrating both human and AI capabilities. AI contributes through sensing, prediction, personalization, and continuous assistance, while human actors remain essential for empathy, judgment, and relationship-building. Survey data will collect respondents of international academic conferences who had used at least one AI-enabled service during the event journey. Measures were adapted from validated instruments, and the model will be estimated using partial least squares structural equation modelling with bootstrapping; estimation is currently in progress. This paper therefore reports the conceptual model and the full empirical protocol and specifies for each hypothesis the analytical criterion against which it will be evaluated. The study contributes by identifying customer journey design as the mechanism through which technological capability is transmitted into experiential value, and perceived control as the boundary condition on that transmission.

Keywords: Customer Journey Design, Customer-Centric Outcomes, AI-Driven Capability, Experiential Services, Perceived Control.

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Augmented Reality in Online Fashion Shopping: Effects on User Experience and Purchase Intention

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Abstract: In the context of rapid digital transformation, augmented reality (AR) has emerged as an important tool in online shopping, particularly in fashion retail. This study investigates the impact of AR technology on consumers' purchase intentions in the e - commerce environment in Ho Chi Minh City. Using a quantitative approach, the study develops a structured questionnaire and collects data from consumers who have experienced AR - based online fashion shopping. The data collected are analyzed using SPSS and Smart PLS to examine the effects of key AR - related factors, including interactivity, vividness, satisfaction, and product perception, on purchase intention. The findings are expected to provide empirical evidence on how AR enhances consumer experience and influences buying behavior in online fashion shopping. Based on the results, the study offers managerial implications for online fashion businesses seeking to apply AR effectively to improve customer experience and stimulate purchase intention.

Keyword: *AR, Online Fashion, User Experience, Purchase Intention.*

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A Novel Fuzzy Logic Approach to Sleep Latency Assessment Among Adults in Southwestern Nigeria

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Abstract. Sleep latency is a key indicator of sleep quality, yet its measurement is often influenced by subjective bias and environmental variability. The prevalence of sleep disorders and poor sleep quality due to various environmental, physiological, and socioeconomic factors requires adequate monitoring and proper assessment. This study developed a fuzzy inference system that models sleep-latency quality (SLQe) using environmentally derived parameters for assessment among adults in southwestern Nigeria, addressing limitations of conventional threshold based on experimental outcome and self-reported evaluation methods. 27 randomly selected adults who consented to participate were invited and took part in the study. The study examined the impact of environmental factors (light, noise, temperature, and vibration) and health conditions on sleep patterns. Anthropometric measurements such as height, weight, and body mass index (BMI) were recorded to evaluate individual variations in sleep responses. The data collected was analyzed using SPSS and MATLAB fuzzy logic modelling. The findings confirmed that factors such as ambient temperature, noise levels, and lighting conditions significantly influence sleep latency. Experimental results demonstrated that the scoring fuzzy-logic based outcome provided a more flexible and human-centric assessment of sleep latency quality compared to traditional approaches. The study established that sleep-latency quality can be mathematically represented as a function of environmental factors (Ef) or sleep disorders (Sd) i.e. SLQe = max (Ef or Sd). This research contributes significantly to sleep-latency quality assessment techniques and non-invasive sleep solutions for health improvement. Future research should explore more subjective factors effects on sleep-latency quality among the Nigerian adults.

Keywords: Sleep Latency, Environmental Factors, Fuzzy Logic, Subjective Sleep Quality, Scoring Methods.

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A Mathematical Model for Predicting Spinal Shrinkage in Engineering Students under Mental Load Using Stevens' Power Law

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Abstract. Sedentary academic work leaves engineering students sitting for long periods with heavy mental demands, but most studies on spinal shrinkage have looked only at physical strain. This research sets out to see if sustained mental workload alone causes measurable height loss in students, and whether Stevens' Power Law could model the link. This work measured standing height in 57 engineering students at FUNAAB, Nigeria, before and after a two-hour cognitive task. Mental workload was rated straight afterwards with the NASA-TLX. A paired t-test showed a clear drop in height (mean shrinkage 7.77 ± 10.99 mm, $t(56) = 5.338$, $p < 0.001$), with 63% of participants (36 students) losing height. For those 36, the power model gave $S = 366.617 \times I^{-0.842}$. Surprisingly, it showed an inverse relationship and explained just 10.4% of the variation ($R^2 = 0.104$, $p = 0.055$). While mental effort clearly reduces spinal height at group level, the individual link to perceived workload is more complex than expected. Larger studies with objective measures would help clarify this.

Keywords: *Spinal Shrinkage, Mental Workload, Stevens' Power Law, NASA-TLX, Cognitive Ergonomics, Engineering Students.*

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Development of Work Severity Index for Bakery Operations

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Abstract. This study assessed ergonomic risks in bakery operations, focusing on personal, task, and environmental factors. Conducted at a university-owned bakery in Abeokuta, Nigeria, the data collection involved demographic profiling, environmental measurements (temperature, noise, vibration), and worker interviews. A Work Severity Index (WSI) was computed from the severity, frequency, and duration of identified ergonomic risks. Each risk factor was rated on a 1–5 scale for severity and likelihood, with risk indices (RI) derived from their product; relative weights (RW) determined the significance of each parameter, and the WSI was obtained by summing the weighted risk indices across all factors and categorizing the result into low, medium, and high risk. Results showed an overall low ergonomic risk, with a mean WSI of 7.88 ± 1.79; most workers fell in the low-risk category, though several fell into the medium risk range, particularly for task and environmental factors, with individual WSIs ranging from 5.84 to 10.32. The study highlights the need for ongoing ergonomic assessment and targeted interventions to enhance worker safety in bakery settings.

Keywords: *Ergonomic Risk, Work Severity Index, Bakery Operations, Occupational Safety, Musculoskeletal Disorders.*

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Development of Technology for Assessing the Consistency of Fuzzy Hazard Models for Violations of Horizontal Flight Level Norms

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Abstract. The direct and hidden influence of the Human Factor on Flight Safety causes up to 90% of aviation accidents, and hence the relevance of relevant research. The object of research is the attitude of ATC-Cadets to dangerous actions or conditions during Decision Making. "Attitude" is a component of the ICAO Flight Safety concept and is determined by the interaction of the "Liveware - Software" blocks of the SHELL model. The subject is the consistency of ATC Cadets' opinions regarding the dangers of violations of the Horizontal Flight Level Norm. Using the Cooper-Harper Scale, the features of mental prediction of 99th ATC-Cadets of the dangers of violations of four Flight Level Norm variants with a length of L=20 km were assessed. Membership Functions of the Linguistic Variable of the “Hazard Levels” were constructed. Scale is defined by ICAO. Aggregative multiplicative indicators of individual and group consistency of opinions were introduced. Criteria for applying the “transition point” by L.A. Zadeh were developed. The consistency of empirical Membership Functions is on average 0.84. Generalized individual opinions are also consistent: the values of the coefficients of variation are on average 4.4 times smaller than the criterion indicator. Which indicates homogeneity, consistency, and therefore the reliability of individual opinions.

Keywords: *Flight Safety, Human Factor, Horizontal Flight Level Norms, Air Traffic Controllers-Cadets, Membership Functions, Level of Coherence.*

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Ergonomic Pattern Engineering in Women's Mountaineering Clothing Design

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Abstract. This paper examines the potential of applying 3D technology in the design of mountaineering clothing, with a focus on developing functional and aesthetically coordinated garments. Using the CLO3D software package, patterns for women's mountaineering jacket and trousers were created, from the conceptual design to 2D construction documentation. The research includes an analysis of the functional and aesthetic requirements of contemporary users and the role of digital tools in product design and development. The paper presents technical drawings, and modelling of garments, with particular emphasis on functional features such as ventilation openings, pockets, and reinforcements. The collection design is inspired by natural forms, with scaly motifs integrated as both aesthetic and structural elements. The limitations of the CLO3D software package were also analyzed, especially regarding the representation of certain technologies used in actual clothing production. The research results confirm that the use of 3D tools significantly accelerates the product development process, reduces the need for physical prototypes, and helps lower costs and waste. However, digital processes cannot fully replace practical knowledge of materials and production technologies. In conclusion, the paper highlights the importance of integrating design, technology, and sustainability as key factors in the development of modern mountaineering clothing.

Keywords: *Mountaineering Clothing, CLO3D, Clothing Construction, Ergonomic 3D Modelling, Functional Design, Sustainability.*

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Ergonomic Assessment of Military Operational Postures

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Abstract. Military activities frequently require personnel to maintain constrained physically demanding postures while handling equipment under operational conditions. This study evaluates the postural ergonomic risk associated with three representative military positions (standing, kneeling and prone) using the Rapid Entire Body Assessment (REBA) method. The assessment considered the posture of the trunk, neck, legs, upper arms, lower arms and wrists, together with external load, coupling quality and activity characteristics. The results showed clear differences among the analysed positions. The kneeling position produced the highest REBA score (9) and was classified as high risk, primarily because of trunk flexion, asymmetrical lower-limb support and pronounced knee flexion. The standing position received a score of 6, while the prone position had the lowest score of 4; both were classified as medium risk. The comparatively lower score for the prone position was associated with greater body and equipment support from the ground. However, this does not imply the absence of ergonomic risk, since prolonged neck extension, shoulder loading and contact pressure are only partly represented by REBA. The findings confirm that REBA can be used as an effective initial screening tool in military ergonomics, although its results should be interpreted together with operational requirements, equipment characteristics and exposure duration. The study provides practical implications for training, equipment design and injury prevention.

Keywords: *Military Ergonomics, Postural Assessment, REBA, Operational Postures, Musculoskeletal Risk.*

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Evaluating Bamboo-Based Design: An Assessment of Sustainable Chair and Table Models

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Abstract: This study introduces a student desk and chair set designed specifically for elementary school students, using bamboo plywood as the primary material. The design emphasizes modularity, flexibility, and ergonomic optimization. Each piece of furniture is made of interlocking wood and metal joints, allowing for easy assembly, disassembly, and adjustment. The desk features four independently adjustable surfaces, inclined from 0 to 30 degrees, supporting activities such as writing, drawing, and reading. Each workspace measures 700 mm by 400 mm, based on ergonomic standards. Structural reinforcement is provided by support bars and connectors beneath the tabletop. The chair includes a 15-degree backrest and adjustable seat height (380–430 mm), constructed from 14 bamboo plywood components fastened with metal screws.
To validate the structural safety of the set, Finite Element Analysis (FEA) was performed using SolidWorks software. Results indicate strong mechanical performance under typical educational loads. This research contributes to the broader context of sustainable educational furniture by demonstrating the use of renewable materials and adaptable design strategies. Preliminary user testing with students and teachers highlighted improved posture and engagement but also revealed challenges in weight and assembly time. Future work will focus on refining connection systems and exploring material combinations to further enhance usability and reduce environmental impact.

Keywords: *Ergonomic Design, Student Furniture, Adjustable Desk, Adjustable Chair, Structural Integrity, Sustainable Materials.*

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Beyond Keywords: AI vs. Text Search for Exploring New Trends in Human Factors and Ergonomics in Sustainable Manufacturing

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Abstract. Human Factors and Ergonomics (HF/E) have emerged as a foundational pillar of the social dimension in corporate sustainability reporting (CSR). However, evaluating HF/E initiatives within these voluminous, narrative-heavy public documents remains a significant challenge due to non-standardized corporate terminology. The paper connects scientific research in HF/E with business practice by investigating the HF/E visibility within the sustainability reporting of global manufacturing leaders. While HF/E is essential for the transition to Industry 5.0, which prioritizes human-centered design and wellbeing, many companies do not explicitly use the term "ergonomics" within public reports. This study uses basic artificial intelligence (AI) skills to analyze sustainability reports for latent HF/E concepts and compares these findings against a traditional research methodology based on specific word search, used in previous research. More specifically, a comparative content analysis across 16 sustainability reports published by top-ranked companies in sustainable manufacturing was conducted using the same dataset and two competing approaches: (1) a traditional systematic text review methodology based on keywords related to safety, digital technologies and wellbeing, and (2) a research methodology relying on an AI based platform interrogated using defined research questions. The paper discusses the AI ability to quickly analyze voluminous CSR documents and to identify proactive ergonomics initiatives that keywords search overlooked. The conclusion highlights the need for advanced AI skills in HF/E research and recommends deeper analysis on the opportunity to expand human factors and ergonomics interdisciplinarity with AI, involving different HF/E stakeholders like AI specialists, researchers, company experts and policymakers.

Keywords: *Industry 5.0, Corporate Sustainability Reporting, Human Centric Manufacturing, Artificial Intelligence, AI skills, Ergonomics.*

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EMG-Based Evaluation of a Passive Upper-Limb Exoskeleton During a Simulated Liposuction Task: A Pilot Feasibility Study

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Abstract. Upper-limb musculoskeletal disorders are common among surgeons performing repetitive, fine-motor procedures that require sustained arm elevation, such as liposuction. Passive exoskeletons have shown promise for reducing shoulder loading in industrial settings, but their evaluation in surgical contexts remains scarce. This pilot study assessed the feasibility of an EMG-based protocol for evaluating the Hapo FRONT passive upper-limb exoskeleton during a simulated liposuction task, performed by one participant under three conditions: without exoskeleton (NAT), medium support (EXO1), and high support (EXO2). Surface EMG from eight muscles was compared across conditions (Mann–Whitney U test, Hodges Lehmann estimate) over more than 110 movement cycles per condition. Results showed significant decreases in trapezius ascendency, pectoralis major, biceps and triceps brachii activity (13% to 52%), while latissimus dorsi showed a consistent increase (+23% to +32%) under both support levels, suggesting a redistribution rather than a uniform reduction of muscular demand. These findings validate the protocol's feasibility and reveal a biomechanically plausible pattern of muscular unloading and compensation, providing a solid foundation for extending this evaluation to a larger group of plastic surgery professionals and, ultimately, to real surgical practice.

Keywords: *Musculoskeletal Disorders, Passive Exoskeleton, Upper Limb, Electromyography, Surgical Ergonomics.*

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Psychosocial Risks and Subjective Well-Being among Employees in Public Administration

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Abstract. Digitalization, the expansion of electronic public services and hybrid forms of work have substantially changed the organization of work in public admin situations. Although these developments may improve service efficiency, they may also intensify psychosocial risk factors related to information overload, time pressure, work-life imbalance and emotional demands. The aim of this study was to investigate psychosocial risks and subjective well-being among employees of a Latvian ministry and its subordinate institutions and to examine associations between psychosocial working conditions and subjective well-being. A cross-sectional survey was conducted among 76 employees. Psychosocial factors were assessed using the short version of the Copenhagen Psychosocial Questionnaire (COPSOQ III), while subjective well-being was measured with the WHO-5 Well-Being Index. The highest demand-related scores were observed for work pace (M=67.93), emotional demands (M=54.28), quantitative demands (M=50.82) and work-life imbalance (M=53.62). At the same time, substantial psychosocial resources were identified, including support from colleagues (M=76.97), sense of community (M=76.64), support from supervisors (M=73.36), meaning of work (M=72.04) and trust at work (M=70.72). The mean WHO-5 score was 52.1, and 42.1% of respondents scored below the recommended threshold of 50 points. Well-being correlated positively with job satisfaction, role clarity, organizational justice, self-rated health and predictability, and negatively with work-life imbalance and quantitative demands. The findings suggest that workload distribution, role clarity, organizational justice and work-life boundaries may be relevant priorities for psychosocial risk management in the studied public administration setting.

Keywords: *Psychosocial Risks, COPSOQ III, Well-Being, Public Administration, Work-Life Balance.*

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10th International Ergonomics Conference - ERGONOMICS 2024

Dear colleagues,

Croatian Ergonomics Society (CrES) has been organizing conferences in the series "Ergonomics" since 2001 to promote ergonomics and exchange knowledge and experience with the scientific and professional community from Croatia and the world. The Conference traditionally brings together enthusiasts, experts and scientists from Croatia and from all over the world, who present their state-of-art research findings and exchange professional ideas, as well as their practical experiences.

The 10th International Ergonomics Conference - ERGONOMICS 2024 was held from 5th-6th December 2024 at the Hotel International, Miramarska 24,10 000 Zagreb, Croatia. The Conference was organized by several faculties of the University of Zagreb:

- University of Zagreb Faculty of Transport and Traffic Sciences
- University of Zagreb Faculty of Mechanical Engineering and Naval Architecture
- University of Zagreb Faculty of Textile Technology
- University of Zagreb Faculty of Graphic Arts

The Conference program included presentations of papers from the following groups of topics (not limited to):

- Aesthetics and Ergonomics
- Biomechanics and Modelling in Ergonomics
- Cognitive Ergonomics
- Consumer Ergonomics
- Education and Trainings in Work Safety and Ergonomics
- Ergonomics for People with Disabilities and Aging Population
- Ergonomics in Product and Process Design
- Ergonomic Regulations, Standards and Guidelines
- Healthcare Ergonomics
- Human Comfort
- Packaging and Ergonomics
- Physical Ergonomics and Human Factors
- Psychoacoustic Ergonomics
- Safety and Risk Ergonomics
- Social and Occupational Ergonomics
- Traffic and Transport Ergonomics

The Organizing Committee (OC) of the ERGONOMICS 2024 Conference, chaired by CrES president Asst. Prof. Jasna Leder Horina, PhD, received more than 50 contributions within a diverse range of conference topics. After the review process, the International Scientific Committee accepted 53 abstracts for presentation. Croatian Ergonomics Society published Book of abstracts - 10th International Ergonomics Conference – Ergonomics 2024 (Print ISSN: 2757-0517; Electronic ISSN: 2757-0525) with the accepted, peer-reviewed abstracts in English.

90 registered people participated in the Conference. The participants came from Croatia, Ukraine, Latvia, Algerie, Macedonia, Belgium, Slovenia, Slovakia, Columbia, United states of America, Nigeria, Vietnam, Philippines, Malaysia, Tunisia, South Africa, Senegal, Peru, Germany, Japan, Indonesia, Romania, Austria and Italy.

The conference was organized as a hybrid event with the following presentation options:

- live, on-site oral presentation
- real-time on-line oral presentation
- pre-recorded oral presentation
- poster presentation

The Conference opening ceremony started with an invited lecture who also addressed the participants with a few words of welcome.

The authors of the accepted abstracts were invited to contribute with full papers. After the peer review process was done by the international and Croatian reviewers, 53 full papers were accepted for publication in the post-conference proceedings. The papers were be published by Springer Nature P. Co. in "Proceedings of the 10th International Ergonomics Conference - ERGONOMICS 2024" indexed in Scopus, in the series Springer Series in Design and Innovation, ISSN 2367-3370 (available online and print).

The tenth edition of the Conference provided a great opportunity for all the participants and stakeholders from Croatia and abroad to contribute to the advances in ergonomics, share their knowledge and experiences, and expand their interdisciplinary research network. We believe that the 11th conference Ergonomics 2026 will be a new opportunity for a successful promotion of ergonomics. We expect it will gather an even greater number of participants in this interesting and relevant research area which opens strong interdisciplinary perspectives for scientific cooperation.

Asst. Prof. Jasna Leder Horina, PhD
President of the Croatian Ergonomics Society
President of the Organizing Committee
Ergonomics 2026 Conference President



Journals that support the work of the Croatian Ergonomics Society

Safety: Journal for the safety in the work organization and living environment

Institute of safety research and development

Promet - Traffic&Transportation





The Journal Tehnički glasnik - Technical Journal

Interdisciplinary Description of Complex Systems – INDECS



Advanced Materials & Sustainable Manufacturing

ISSN 2757-0525

