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ISETC2025

2ND INTERNATIONAL SCIENCE,
ENGINEERING AND TECHNOLOGY
COLLOQUIUM



THE POWER OF SCIENTIFIC INNOVATION

INTELLIGENT SOLUTIONS FOR A
SUSTAINABLE WORLD

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FACULTY OF APPLIED SCIENCES
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(ISETC 2025)**

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PREFACE

Welcome to the 2nd International Science, Engineering and Technology Colloquium 2025 (ISETC 2025)!

It is with great pleasure that we present this year's colloquium, a distinguished gathering of scholars, researchers, and professionals dedicated to the advancement of applied sciences. Held virtually on 9th July 2025, ISETC 2025 serves as a platform to highlight cutting-edge research, foster meaningful networking, encourage collaborations, and explore innovative solutions to global challenges.

This year's theme, "The Power of Scientific Innovation: Intelligent Solutions for a Sustainable World" highlights our shared goal to solve global challenges through applied science. It celebrates innovation as a key to building a more sustainable and resilient future. We're proud to feature keynote speakers and presenters who bring fresh insights, bold ideas, and breakthroughs shaping tomorrow's world.

We would like to extend our heartfelt appreciation to the Faculty of Applied Sciences, Universiti Teknologi MARA, Perak Branch, Tapah Campus, for their outstanding support and assistance throughout the planning and execution of the event. Their dedication has been instrumental to the success of this colloquium. We would like to sincerely thank all participants and researchers for their valuable contributions. We also appreciate the reviewers for their careful evaluations and helpful feedback. Your hard work and support mean a lot to us.

As editors, we are proud to present this collection of proceedings. It is an honour to bring together the interesting and meaningful work of our speakers and authors. We hope the ideas shared will lead to new discoveries, encourage more research, and help solve global challenges through science and innovation.

Warm regards,

Dr. Emi Norzehan Mohamad Mahbob

Dr. Saiyidah Nafisah Hashim

Ms. Lili Widarti Zainuddin

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ISETC 2025 Proceedings Editors

CAMERA-BASED POSTURE FEEDBACK APPLICATION FOR DESK WORKERS

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Abstract: Musculoskeletal Disorders (MSDs) are prevalent among office workers due to prolonged sitting, repetitive movements, and inadequate ergonomic practices. This study seeks to integrate standardised assessment techniques with straightforward technological interventions to significantly enhance ergonomic awareness and facilitate the early prevention of MSDs among desk workers. Implementing these strategies is advised to promote long-term occupational health and boost productivity within office environments. Standard data collection methods for ergonomic assessments include the standardised Nordic Musculoskeletal Questionnaire (NMQ), which identifies musculoskeletal symptoms across various body regions, and the Rapid Office Strain Assessment (ROSA) method, which evaluates ergonomic conditions at participants' workstations. To complement these approaches, we developed a real-time posture feedback application that employs a camera-based overlay to give users visual cues regarding their posture on-screen. This application aims to increase awareness and encourage self-correction during work tasks, ultimately fostering healthier seating habits.

Keywords: *Musculoskeletal disorders, camera overlay, ergonomics, desk workers*

INTRODUCTION

Musculoskeletal Disorders (MSDs) are becoming an occupational health problem amongst office workers, and this is attributed to prolonged sedentary postures, repetitive tasks and inappropriate ergonomic design of workstations (Chandwani A. et al., 2019). The continuous usage of computers and digital devices has caused people to be in one static position, mainly in the neck, shoulder, and lower back areas, which have been cited as pain hotspots (Poochada & Chaiklieng, 2015). This problem is not usually taken seriously in contemporary office settings. Still, it has huge implications on the welfare and efficiency of employees in terms of musculoskeletal discomfort, fatigue and the risks of developing long-term injuries.

As part of the need to detect and prevent problems early, the study explores the ergonomic risks and musculoskeletal complaints of desk-based workers. To be more specific, this project has two goals: (1) to determine the prevalence and severity of musculoskeletal symptoms with the Standardized Nordic Musculoskeletal Questionnaire (NMQ) and (2) to prototype a camera-based overlay application that can give real-time visual posture feedback to the users to encourage self-awareness and corrective behaviour during work-related tasks (Rodrigues et al., 2022).

This project uses subjective and observational measures coupled with a technological intervention to develop a more dynamic and responsive means of addressing ergonomics. It will include real-time posture feedback, which is hoped will not only help to increase awareness of undesirable posture habits but will also motivate the user to actively correct these postures, as is necessary to maintain musculoskeletal health over the long term (Chu et al., 2025). The study will provide practical implications regarding multiple facets and specific tools that could be applied to everyday work settings. This will eventually lead to better ergonomic-related practices and, thus, a decreased burden of MSDs in the workplace.

METHODOLOGY

This study employed a mixed-method approach combining subjective assessment, observational evaluation, and engineering-based intervention to examine musculoskeletal complaints and ergonomic risks among office workers.

The methodology consisted of two primary components: participant selection, data collection using the NMQ method, and the development of a real-time posture feedback system using a camera-based overlay application.

A total of 30 office workers were recruited based on predefined inclusion criteria. Participants were aged between 20 and 50 years ($\mu = 33, \sigma = 9.87$), with at least six months of continuous desk-based work experience. Individuals with any known musculoskeletal, neurological, or orthopaedic conditions were excluded to ensure consistent data quality. All participants provided informed consent prior to data collection.

RESULTS AND DISCUSSION

The Nordic Musculoskeletal Questionnaire (NMQ) found that there are several areas of the body that were mostly affected in the past 12 months, including parts of the lower back (73.33%), upper back (60%), neck (56.67%) and shoulders (50%). As for the musculoskeletal discomfort experienced during the last seven days, the trend was observed to be similar, although with a lower prevalence ratio to a general extent. Discomfort was reported at the lower back (40%), upper back (33.33%), neck (30%), and shoulders (26.67%).

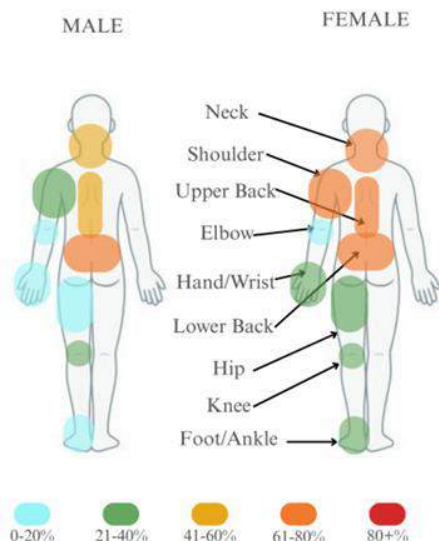


Figure 1. Reported discomfort in the last 12 months

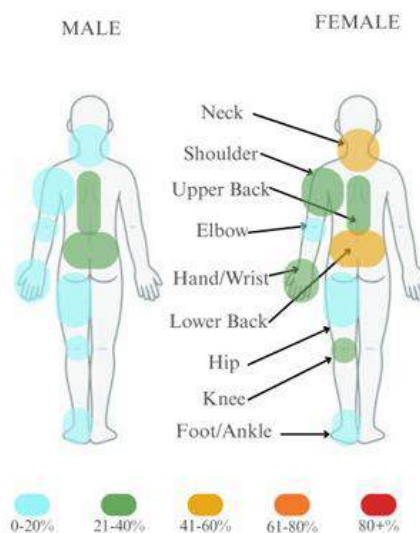


Figure 2. Reported discomfort in the last 7 days

Gender-based analysis showed there was discomfort in both males and females during musculoskeletal conditions in Figures 1 and 2, but the frequency experienced by female participants was higher in areas that include the neck, shoulders and lower back. This variation could be due to several reasons, including anatomical and physiological features in the biology of women's muscles, tendons, and ligaments, and they might end up straining when assuming longer postures (Cavallari et al., 2016; Overstreet et al., 2023). Another thing would be that the workstations are not physically suited to the different body shapes and mechanics, such as repetitive clerical work. These findings illustrate the necessity of using ergonomically flexible workstations and gender-sensitive interventions to minimise the musculoskeletal load in offices.

The prevalence ratio (PR) analysis of musculoskeletal discomfort between different age groups shows that participants aged 40 years and older experienced higher musculoskeletal discomfort in various regions of the body than those below 40. The pattern was further obvious in both 12-month and 7-day discomfort complaints. These findings can be attributed to age-related physiological changes that typically begin around the age of 40. At this stage, the human body undergoes a natural decline in muscle mass and strength (Keller & Engelhardt, 2013). This reduction in muscular support compromises joint stability and increases the physical strain experienced during work-related activities.

To complement the questionnaire and workstation assessment tools, a top-view camera overlay was used to observe and document participants' posture while performing typical office tasks. ErgoVision captured the seating position,

hand placement, and distance to the monitor, offering a visual reference for ergonomic analysis. Images taken during the observation sessions (Figure 3) show participants at their natural working posture without real-time prompts or corrections. From these images, deviations from ergonomic recommendations were identified, including excessive leaning toward the monitor and improper arm placement while typing or using a mouse.

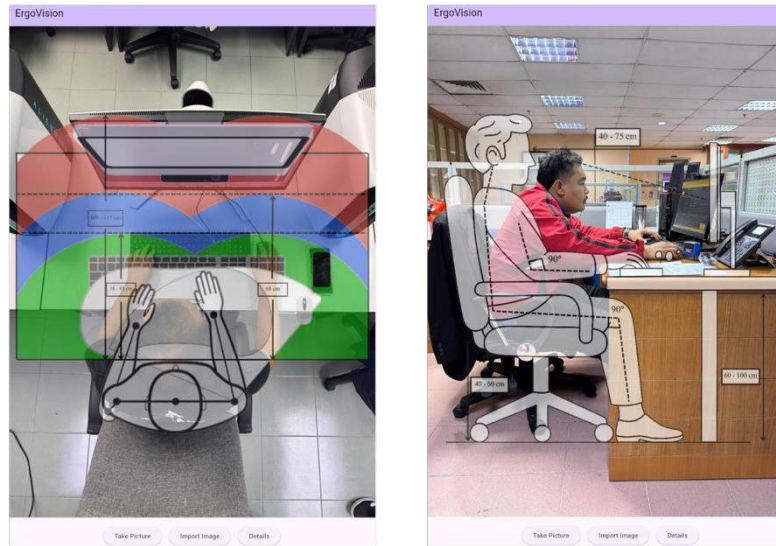


Figure 3. ErgoVision system integrated into a workstation with top and side views

While no automated posture detection or scoring was integrated into the overlay at this stage, the captured images clearly illustrate common ergonomic risks present in real-world desk environments. The top-view perspective proved valuable in highlighting behavioural tendencies, such as reduced monitor distance and awkward elbow angles, that may not be easily recognised by users themselves. These visual records will serve as reference points for future improvements to the feedback system and can also be used in training or awareness materials to demonstrate effective versus poor posture habits in desk-based work settings.

CONCLUSIONS

This study investigated the prevalence of musculoskeletal discomfort and ergonomic risks among office workers using a combination of the NMQ and a custom-developed camera-based overlay system. The results showed a high frequency of discomfort in the lower back, neck, and shoulders, with many participants falling into medium to high ergonomic risk categories. The introduction of the ErgoVision application demonstrated the value of visual posture feedback as a tool for increasing awareness and promoting immediate behavioural correction. Although still in its early stages, the system was well-received by participants and shows promise as a low-cost, user-friendly aid to complement traditional ergonomic assessments.

REFERENCES

- Cavallari, J. M., Ahuja, M., Dugan, A. G., Meyer, J. D., Simcox, N., Wakai, S., & Garza, J. L. (2016). Differences in the Prevalence of Musculoskeletal Symptoms among Female and Male Custodians. *American Journal of Industrial Medicine*, 59(10), 841–852. <https://doi.org/10.1002/ajim.22626>
- Chandwani A., Chauhan M.K., & Bhatnagar A. (2019). Ergonomics Assessment of Office Desk Workers Working in Corporate Offices. *International Journal of Health Sciences and Research*, 9(8), 367–375.
- Chu, C.-H., Pan, J.-K., & Chen, Y.-W. (2025). Ergonomic Workplace Design based on Real-Time Integration between Virtual and Augmented Realities. *Robotics and Computer-Integrated Manufacturing*, 92, 102859. <https://doi.org/10.1016/j.rcim.2024.102859>

- Keller, K., & Engelhardt, M. (2013). Strength and Muscle Mass Loss with Aging Process. Age and Strength Loss. *Muscles, Ligaments and Tendons Journal*, 3(4), 346–350.
- Overstreet, D. S., Strath, L. J., Jordan, M., Jordan, I. A., Hobson, J. M., Owens, M. A., Williams, A. C., Edwards, R. R., & Meints, S. M. (2023). A Brief Overview: Sex Differences in Prevalent Chronic Musculoskeletal Conditions. *International Journal of Environmental Research and Public Health*, 20(5), 4521. <https://doi.org/10.3390/ijerph20054521>
- Poochada, W., & Chaiklieng, S. (2015). Ergonomic Risk Assessment among Call Center Workers. *Procedia Manufacturing*, 3, 4613–4620. <https://doi.org/10.1016/j.promfg.2015.07.543>
- Rodrigues, P. B., Xiao, Y., Fukumura, Y. E., Awada, M., Aryal, A., Becerik-Gerber, B., Lucas, G., & Roll, S. C. (2022). Ergonomic Assessment of Office Worker Postures using 3D Automated Joint Angle Assessment. *Advanced Engineering Informatics*, 52, 101596. <https://doi.org/10.1016/j.aei.2022.101596>



Surat kami : 700-KPK (PRP.UP.1/20/1)
Tarikh : 20 Januari 2023



Prof. Madya Dr. Nur Hisham Ibrahim
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Kelulusan daripada pihak tuan dalam perkara ini amat dihargai.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menjalankan amanah,

Setuju.

27.1.2023

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