BRIEF REPORT

Workplace ergonomics problems and solutions: Working from home [version 1; peer review: 2 approved with reservations]

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V1 First published: 08 Oct 2021, 10:1025
<https://doi.org/10.12688/f1000research.73069.1>
 Latest published: 08 Oct 2021, 10:1025
<https://doi.org/10.12688/f1000research.73069.1>

Abstract

Background: Due to the COVID-19 pandemic, in 2020, many employees were required to work from home (WFH). During this WFH period, some employees encountered health issues related to sprains and neck or back pain owing to poor working conditions at home. As the WFH trend may continue over a prolonged period, the underlying causes and solutions to ergonomic issues must be addressed to reduce injuries. This study aims to identify the ergonomic issues encountered when working from home and suggests several solutions to minimise these issues.

Methods: A qualitative ethnographic methodology was adopted. This study used focus group discussion and the panellists were among experts from the fields of higher education, healthcare, human resources (HR), and ergonomics patient in Malaysia. The most common ergonomic issues identified were based on diagnoses and observations in previous studies.

Results: The panellists agreed on ergonomics issues, comprising the use of unergonomic chairs, incorrect sitting postures, irregular arrangement of key objects, improper reach distances of the laptop/keyboard/mouse, poor desk designs, footrest absence, distortion/noise, poor lighting, and poor work environment. Over time, WFH ergonomics issues may lead to burnout, carpal tunnel syndrome or other cumulative trauma disorders, high blood pressure, and stress on the cervical spine and neck. The proposed solutions include a complete WFH ergonomics and wellness checklist for employees and employers, webinar sessions on WFH ergonomics, meet-up sessions with ergonomics or HR experts, workspace rentals for co-workers, implementation of the 20-20-20 rule and job-sharing practices, and the involvement of employers or the government in procuring ergonomic equipment for WFH employees.

Conclusions: This is a preliminary study and the researchers are exploring the root causes of WFH ergonomics issues and proposed solutions. While previous studies have examined workplace

Open Peer Review

Approval Status ? ?

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08 Oct 2021	view	view

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Any reports and responses or comments on the article can be found at the end of the article.

ergonomics, this study focuses on WFH ergonomic issues and solutions during the ongoing pandemic.

Keywords

working from home, ergonomics, focus group, global pandemic, injuries, occupational safety, health

This article is included in the **Research Synergy** Foundation gateway.

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Author roles: **Yeow JA:** Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Writing – Original Draft Preparation, Writing – Review & Editing; **Ng PK:** Formal Analysis, Investigation, Validation, Writing – Review & Editing; **Lim WY:** Methodology, Resources, Validation

Competing interests: No competing interests were disclosed.

Grant information: This research paper was funded by the Malaysia Fundamental Research Grant Scheme (FRGS) project number MMUE/190255.

The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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How to cite this article: Yeow JA, Ng PK and Lim WY. **Workplace ergonomics problems and solutions: Working from home [version 1; peer review: 2 approved with reservations]** F1000Research 2021, 10:1025 <https://doi.org/10.12688/f1000research.73069.1>

First published: 08 Oct 2021, 10:1025 <https://doi.org/10.12688/f1000research.73069.1>

Introduction

Health issues related to sprains, strains, and back pain account for the highest total direct expenses for workers supported by the Social Security Organisation of Malaysia (SOCSO) since 2009.¹ This finding exposes the impact of musculoskeletal injuries on the productivity of a company. Following the nationwide lockdowns since March 2020 in the face of the COVID-19 pandemic, employees were required to work from their homes. According to Bench,² the work-from-home (WFH) setting has led to the development of health issues among employees, with ergonomic and clinical experts receiving numerous complaints about employees having upper back discomfort, neck issues, and eye strain. Hanel³ explained that many workers constantly gaze downwards at their laptop screen, resulting in neck issues.

Other problematic WFH risks include sitting on ill-fitting and rigid chairs for long durations, impeding the adjustment of the sitting posture. Since WFH may become a new norm for employees, it is essential to find long-term solutions to enable employees to WFH with ergonomic office equipment and guidelines. This study recommends WFH guidelines and best practices for human resource (HR) departments and occupational safety and health workers to enhance safety rules and regulations for the reduction of musculoskeletal injuries and risks.

COVID-19 in Malaysia

In March 2020, Malaysia experienced its first lockdown, known as the movement control order (MCO).⁴ The MCO required many employers and employees to abruptly change their work environment and patterns by working from home. This new norm was shrouded in uncertainty, as many were not prepared for WFH due to lack of equipment and space at home. According to JobStreet's Malaysia Survey Report,⁵ 9 out of 10 people were impacted in some way by the pandemic and about 67% of the companies required their staff to WFH. The New Straits Times newspaper⁶ reported several experts raising concerns about WFH practices, including mental health issues, ergonomics issues, and emotional health issues. However, by July 2021, Malaysia has been hit by the third wave of COVID-19 and the cumulative number of confirmed COVID-19 cases had reached up to 1 million cases, including more than 3000 deaths.⁷ The COVID-19 situation in Malaysia is critical, and in most sectors WFH is compulsory. Due to the emergency lockdown, the guidelines for working from a home office have caused high uncertainty⁸ with numerous challenges and significant technical complications for both employees and employers. Employees are required to ensure that their home environment is a safe and healthy place to work.⁹ With ergonomic equipment or settings, such as a height-adjustable chair, adequate workspace, and appropriate desk positioning, WFH conditions could be improved. HR departments, employers, and employees need to place more focus on the standard operating procedures (SOPs) that facilitate WFH practices. While employees have a certain level of responsibility, employers should also diligently fulfil their roles and responsibilities according to the SOPs. Not adequately fulfilling their responsibility to ensure a safe working environment could lead to losses from compensation claims made by employees.¹⁰

Table 1 shows some of the common WFH ergonomics issues raised by concerned experts in the news and several ergonomics articles.¹¹⁻¹⁴

Methods

Study design

In this inductive study, the researchers explored ideas from several case studies in The Star newspapers.¹¹ In order to determine WFH problems and solutions, a focus group discussion was conducted.

WFH is the new norm in Malaysia but many organisations have not prepared working solutions for their employees. To validate the problems and solutions for WFH ergonomics issues, this study adopted a qualitative approach for the preliminary data collection. The questions were validated through face validity by three academicians specialising in ergonomics and HR management.

A focus group of four experts comprising a 55-year-old educator (male), a 44-year-old healthcare worker (male), a 38-year-old HR specialist (female), and a 41-year-old employee with ergonomics-related health issues (male) was conducted. Morgan¹⁷ argued the rule of thumb for the size of a panel is 6-10 homogeneous participants, but there may be reasons to have smaller groups. Due to unstable Internet connection and unfamiliarity with the video meeting platform, some technical issues were unavoidable. Purposive sampling was adopted in this research. The researchers contacted an academician with over 20 years of teaching experience in occupational safety and health via a telephone call. They also browsed through the medical staff list of a well-known private hospital in Melaka, Malaysia and selected the neurology doctors, physiotherapists, and rehabilitative physician to be the panellists. Finally, three medical workers accepted the interview but two of them were forced to pull out due to personal reasons. The participating medical worker recommended one of his patients as the next panellist for this discussion. The researchers contacted an HR specialist that works in a multinational company in Melaka, Malaysia. Due to restrictions on interstate travel panellists were selected from Melaka, Malaysia as the initial plan was to have a face-to-face focus group.

Table 1. Working from home (WFH) ergonomics issues and solutions.

WFH ergonomics issues/problems	Proposed solutions
Improper chair height	Choose a chair with a height adjustment feature
Key object distance	Keep key objects, such as your telephone, stapler, or printed materials, close to your body to minimise reaching
No footrest/armrest	Keep feet flat on floor or footrest and use table or chair with armrest
Poor laptop/desk positioning causes neck stiffness, neck sprain and back sprain	Place the monitor directly in front of you, about an arm's length away. Adjust the desk position to chest level upon sitting down
Poor lighting, glare from screen or vision complications	Adjust position to the brighter light source or next to the window. Use blinds if too much glare
Noise and distortion	Use earphones or find a quiet place for work
Too much screen time	Move away from the screen every 30-45 minutes or use the 20-20-20 rule
Mouse task/keyboarding (awkward hand and wrist postures) increase pressure in carpal tunnel	While typing or using a mouse, keep wrists straight, upper arms close to the body, and hands at or slightly below the elbow level
Fatigue, solitude, and lack of muscular activities	Occasionally go outside for fresh air and sunlight for improved circulation
High mental workload, stress, and burnout	Take a rest and time off, meditate or seek help from friends and family
Poor work layout or design of equipment and poor working conditions	A room with proper lighting, a large flat table surface/desk that allows room for computer equipment
Dehydrated or no proper meal break	Keep reminders for meal breaks and drink water frequently
Metabolic syndrome (weight gain and diabetes)	Physical exercise and a proper diet plan
Working on couch/bed/sofa	Place a pillow behind your lower back and neck for extra support

Data collection

The Malaysian government imposed a full MCO on 1 June 2021 and in-person meetings were not allowed. The focus group discussion was therefore conducted through an online meeting via Google Meet on 2 June 2021. Due to time constraints and difficulties in arranging another slot for all panellists, the focus group was restricted to a total of four panellists. According to Nyumba,²⁰ a minimum of three to four panellists for preliminary studies is acceptable. The discussion lasted approximately 2 h and 15 min and was recorded via note-taking and analysed step by step following practical guides for focus group research by Breen,¹⁴ Krueger,¹⁵ Pascall *et al.*¹⁶ and Morgan.¹⁷ The information was recorded using an inductive approach and Breen¹⁴ agrees that idea-generating research which aims to propose recommendations for future improvements is best facilitated by focus groups. Since this study aims to propose ideas and solutions for WFH ergonomics issues, the researchers selected this method of data collection.

Moderators

The moderators comprised two researchers that had not met any of the panellists prior to the study in order to prevent favour of any one particular speaker's point of view over another.

Questions

The focus group included 15 open-ended questions. The list of issues and solutions to WFH ergonomics (Table 1) were sent to the panellists a week before the date of the interview. Q1-Q2 were designed as an introduction to the home office and Q3-Q7 focused on the participants' general perception of WFH ergonomics issues. Q8-Q10 solicited information about participants' expertise and personal experience with the WFH ergonomics issues and the possibilities of long-term consequences. Q11-Q13 encouraged the participants to share their concerns and ideas about WFH ergonomics problems and solutions. Q14 and Q15 were framed to obtain feedback and conclusions from participants. Table 2 shows the questions asked during the focus group discussion.

Ethics

Prior to the interview, the researchers distributed a consent letter to the panellists requesting permission to disclose and publish their suggestions in this manuscript, which was signed by all participants. The researchers also sent Table 2 to

Table 2. Focus group discussion questions.

Questions
Introduction
(Q1) Self-introduction
(Q2) Do you agree that home offices will become a norm after the pandemic?
(Q3) What could be the common WFH problems?
Lead-in question
(Q4) What are the ergonomics problems when employees work from home?
(Q5) How do these ergonomics problems occur?
(Q6) Allow me to show you some of the common ergonomics problems listed by several researchers (from Table 1). Do you agree with all of them? Why and why not?
(Q7) In your opinion, how often does an employee/employer take the initiative to solve the problems?
Personal experience
(Q8) What could be the possible consequences/impacts if WFH ergonomics problems are ignored?
(Q9) What could be other possible solutions for the problems listed in Table 1?
(Q10) Who plays a vital role in ensuring a safer and healthier home office?
Idea sharing
(Q11) How can the employees/employers gain more knowledge on WFH practices?
(Q12) Does the HR department need to impose new rules/regulations concerning WFH health and safety?
(Q13) Do you have any ideas on how to create public awareness on WFH ergonomics issues?
Conclusion
(Q14) Do you have any other comments about WFH ergonomics issues?
(Q15) What would be your advice to employees that work from home in relation to ergonomics?

Abbreviations: WFH, work from home; HR, human resources.

panellists alongside the consent letter so they were aware of the scope of discussion before the focus group interview. The ethical approval for this study was granted by Technology Transfer Office of Multimedia University (EA135202).

Results and discussion

The focus group discussion results were mainly exploratory and descriptive, with no statistical analysis. The focus group discussion information is valuable as it helps researchers gain insightful knowledge about WFH ergonomics issues and solutions. The focus group discussion was recorded and the most important themes such as WFH ergonomics issues, noteworthy suggestions or solutions, and unexpected findings or advice from the panellists were summarised using note-taking, and comparison was done after the interview (the accompanying dataset is openly available on Figshare²¹). The most common ergonomics issues identified were based on diagnoses and observations by Dr. Edward Laskowski, co-director of Mayo Clinic Sports Medicine, and Corey Kunzer, a Mayo Clinic physical therapist¹² and several other researchers.¹¹⁻¹³

For Q2, all panellists agreed that WFH might become a norm even after the pandemic, especially for IT-related jobs, administrative work, and graphic design. One panellist added that big companies may be stricter with WFH practices and more systematic in handling WFH issues. Furthermore, according to the New Straits Times newspaper,¹⁸ the executive director of The Malaysian Employers Federation proposed that the government amend the Employment Act 1955 to fit the context of WFH and cater to the new norms. The Small Medium Enterprise (SME) Association of Malaysia agreed that the amendment would help companies to set more effective WFH guidelines.

For Q4 and Q5, the panellists agreed with the issues regarding unergonomic chair use, incorrect posture, irregular arrangement of key objects, improper reach distances of the laptop/keyboard/mouse, poor desk designs, footrest absence, distortion/noise, poor lighting, and poor work environment. The panellists added that many employees did not expect WFH to be a long-term situation and did not invest in any ergonomic equipment. Based on Q6, one panellist shared that facing workload, stress, and burnout are common for professional workers, especially those who are married and have childcare responsibilities. He added that the stress of managing children's online classes in addition to household work aggravates this problem. The HR specialist added that those with low technology competency would also be affected by these problems. Additionally, depression, conflicting information about the pandemic, pay cuts, and other negative issues affect emotional health while working. The panellists noted that these are some of the biggest problems resulting in mental workloads from the ergonomics perspective and affecting workers' health. The panellists also highlighted that poor lighting, fatigue, key object distance, dehydration, working on the couch, and weight gain are resolvable issues for employees. However, problems such as mental workload, poor work layout, and pressure in the carpal tunnel may take time to address. For Q8, a panellist highlighted that in the long run, WFH ergonomics issues may lead to burnout, carpal tunnel syndrome or other cumulative trauma disorders, high blood pressure, and stress on the cervical spine and neck. For Q10, a panellist mentioned that all levels (employees, employers, and even the government) play a vital role in ensuring a

safe home office. The proposed solutions include creating a WFH ergonomics and wellness checklist for employees, webinar sessions on WFH ergonomics, meet-up sessions with ergonomics or HR experts, workspace rentals for co-workers, implementation of the 20-20-20 rule proposed by Robin Sharma, job-sharing practices, teamwork, and flexible work schedules. Professional counselling is needed for some staff and employers should encourage more counselling and virtual informal meet-ups among employees. Work-rest balance should be taken into serious consideration. For example, the 20-20-20 rule means that for every 20 minutes spent looking at a screen, a person needs to stop and look at something 20 feet away for about 20 seconds. After 30-45 minutes of work, a break of 5-10 minutes is required. For Q12 and Q13, the HR department must impose several regulations, such as allowing claims for purchasing ergonomics items, employee mental health treatments, medical check-ups, and ergonomics training. One panellist suggested several free online platforms on social media or websites for employees to learn about ergonomics, obtain information about SOCSO rehab centres, receive tax deductions for ergonomic equipment purchases and obtain information about quality control checks on furniture manufacturers. Furniture manufacturers should also be encouraged to produce more ergonomic furniture over aesthetic designs.

Conclusion

This study is novel as it examines the WFH-related ergonomics issues in Malaysia. The focus group discussion proved to be useful in determining WFH ergonomics problems and solutions. Although there were only four participants, the focus group discussion's objective was achieved. Among all the ergonomics problems listed, all panellists agreed that mental workload and stress levels are the major underlying factors leading to poor ergonomics issues, followed by workstation chair height. Malaysian Employers Federation's (MEF) executive director argues that WFH does not suit everyone.¹⁸ There are many that love working interactively and working in isolation will affect their performance and increase their mental stress. Moreover, WFH lacks boundaries between work and home life especially for those with care responsibilities, who often feel completely overwhelmed in the present situation. This study can help HR departments develop a flexible working hours guideline for those affected. The employers should emphasise a more team-based structure or cross-functional organisational structure to enable everyone to work as a team. A shared workload can eventually help to reduce stress among those with care responsibilities in particular.

It is essential to ensure optimum work-rest durations especially after 30-45 minutes of work. In addition, the duration of online meetings should be restricted to 30-45 minutes to reduce the duration of screen time focus. Employers should be open to accepting new online discussion platforms besides virtual meetings. For example, employers should allow discussions freely after the meeting via emails, online suggestions, and online feedback forms, which employees can access at their own convenience. Moreover, employees should abide by the 20-20-20 rule and use an ergonomic chair when they are working from home. Employers can consider buying ergonomic chairs for employees or provide a checklist for employees to check their working conditions related to workplace ergonomics. As mentioned earlier, the government plays an important role in reducing ergonomic problems and amending the Employment Act to suit WFH conditions. The discussion highlighted the value of additional solutions and the responsibilities of every individual in solving these issues. These findings provided preliminary evidence on the need for future research on WFH ergonomics problems and solutions using other methods such as quantitative methods. The focus group discussion findings may be valuable to future researchers in identifying problems for a more specific WFH situation. Future researchers can consider using quantitative analysis to enhance this research.

Data availability

Underlying data

Figshare: 'Workplace ergonomics problems and solutions: Working from home'. <https://doi.org/10.6084/m9.figshare.16550820.v2>.²¹

This project contains the following underlying data:

- Focus group summary. (Due to data protection issues, data was recorded via note-taking and excluded participants' personal data. The summary only contains data on points, opinions, and information from the focus group discussion to establish the causes and solutions for ergonomics issues during WFH.)

Data are available under the terms of the [Creative Commons Zero "No rights reserved" data waiver](#) (CC0 1.0 Public domain dedication).

Acknowledgements

We are thankful to the anonymous focus group panellists for their insightful suggestions and information. Special thanks to the three expert panellists that were involved in face validation and the four focus group participants. The authors would

also like to express their gratitude to Multimedia University and the organising committee of DIFCON 2021 for facilitating the review and submission of the work related to this study. Thanks to Ministry of Higher education (MOHE) for funding the FRGS grant

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Open Peer Review

Current Peer Review Status: ? ?

Version 1

Reviewer Report 07 March 2023

<https://doi.org/10.5256/f1000research.76692.r163234>

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Nancy L. Black

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This article presents interesting insights into detailed perceptions of a limited number of people forced to work from home (WFH) during the COVID-19 public health restrictions in Malaysia. The work addresses the perceptions of four participants to a series of 14 questions including one referencing a table of suggested WFH issues with corresponding proposed solutions in a virtual focus-group setting.

Unfortunately, some of the WFH uses and proposed solutions are incomplete or exaggerated and no specific sources are cited within the table and those cited come from online articles that are not peer-reviewed (Wiener is "the CEO of a leading manufacturer of active office workstations and ergonomics accessories", Bell quotes a physiotherapist and the Star online quotes the "co-director of Mayo Clinic Sports Medicine" and "a Mayo Clinic physical therapist"); better sources are available which are more specific and including ergonomists would make this richer. In Table 1, two elements are particularly problematic: 1) I am unaware of neck or back "*sprains*" occurring due to poor laptop / desktop positioning. Also, one part of the proposed solution is to "*adjust the desk position to chest level*" whereas the normal recommendation would be to adjust the desk position to relaxed elbow height, which is approximately equivalent to waist height, and to use a keyboard separated from the computer screen (raising the screen so that its top surface is slightly higher than eye height). Chest height for the keyboard would be too high. 2) The recommendations to compensate for "*poor lighting, glare from screen or vision complications*" are too vague: "*to the brighter light source*" does not consider visual problems due to light within the field of vision, and positioning "*next to the window*" should also mention 90 degrees relative to the window (not facing or back to the window).

While some of the study design was clear, the paragraph describing the focus study group was difficult to follow. I did not understand how the listing of four experts at the start of the paragraph corresponds to the "*contacted*" people in the second half of that paragraph. This could be easily addressed by rewriting that paragraph.

Generally, the results and discussion section is good, although 20-20-20 should be fully defined

the first time it is referenced. My understanding from the Abstract was that this article would include *"a complete WFH ergonomics and wellness checklist"* although this is not included in the article or in the interview data.

The interview data includes complete transcripts of the interview, which is useful and could support other research studies.

Conclusions are good, but again, references to the peer-reviewed literature would strengthen the recommendations (e.g. how shared workload *"can eventually help to reduce stress"*).

Overall, the article provides interesting insight into how the purposive sample of three professional men and one woman between the ages of 38 and 55 perceived and experienced WFH following extended public health restrictions (without revealing how long they'd been working in these conditions). Analysis by two ergonomists is good. The article is worthwhile but it lacks sufficient references to the relevant scientific literature (which were available at the time of the initial publication) to fully justify the recommendations included. References found in this cited article would assist: Black and St-Onge (2022)¹

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Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Not applicable

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Ergonomics and human factors, workstation design, dynamic workstation use in sedentary work environments, musculoskeletal discomfort, posture

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have

significant reservations, as outlined above.

Author Response 08 Mar 2023

Jian Ai Yeow

Thank you for the feedback and review. Will make the necessary amendment soon.

Competing Interests: No competing interests were disclosed.

Reviewer Report 24 March 2022

<https://doi.org/10.5256/f1000research.76692.r102080>

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Rahul Jain

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This study is important, particularly with regard to workplace ergonomics and solutions during the pandemic crisis. However, there are many aspects in which the authors could expand their aim and also analysis of the data.

The literature review is adequate. However, several articles published on COVID-19 and work from home scenarios in several countries need to be reviewed for a better overview. Also, it is important not only to describe and explain the issue of COVID-19 but also to link it with the situations that occur during the pandemic. The authors seem to have left out this important link of theory/model in relation to the issue being examined. Perhaps theories/models such as Karsh (2006)¹, Sauter and Swanson (1996)², and other relevant theories/models should be included in this section to highlight the importance of the theories/models in guiding the study. These two articles mentioned are very important to show the causation of work-related musculoskeletal disorders (WMSDs) in model form. The current study deals with finding the causation of WMSDs among digital device users during work from home. These citations will help to show the authors various risk factors causing WMSDs because currently, it is not clear from the introduction section how they are devising such theories in their work.

Additionally, these studies: Jain *et al.*, 2021a³, Jain *et al.*, 2021b⁴, Jain *et al.*, 2021c⁵, and Jain *et al.*, 2022⁶, were conducted by our group during this COVID-19 period where we have used expert opinion-based and stakeholder-based surveys for finding out the major risk factors for the causation of WMSDs. Also, we have tested an intervention for preventing the WMSDs problem in the student population. Currently, we are doing some posture-based studies for improving the working scenarios. Therefore, authors can review these studies for preparing the background of their work, because currently there is no such discussion that can be seen in their text about the

causation of WMSDs as per the theories and practices defined in these citations as well as similar citations. It is the right way to discuss things in the meeting by involving the stakeholders and reporting it, but the scientific studies are more important as some information is derived after a large amount of investigation. Currently, the authors have written an essay based on a few references. The authors need to explore the literature fully.

As said, the focus group was conducted among four experts. Is there any approval process for the determination? Who are the approvers for the experts' opinions? Who are the ones making the consensus between experts?

The results are of some interest but the authors could elaborate further on the practical implications of their findings.

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Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Not applicable

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Ergonomics and human factors, workplace design, work from home issues

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

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