



Enhancing User's Work Experience with Ergonomic Furniture Design for Work from Home (WFH) Setups

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Abstract. As remote work continues to gain prominence, the importance of designing ergonomic furniture for home-based work setups has increased significantly. This article employs a mixed research methodology involving interviews and observations to explore the impact of ergonomic furniture on users' work experiences and to provide valuable insights into the design principles of such furniture. Through interviews, participants will share their experiences and perspectives on using ergonomic furniture in their remote work environments, allowing for a deeper understanding of the benefits and challenges associated with such furniture. Additionally, observations will be conducted to assess how ergonomic furniture influences productivity, health, and body strain reduction. The article will delve into the various advantages of ergonomic furniture, including increased productivity, improved health, and reduced strain on the body, highlighting their significance in enhancing the overall work experience. Moreover, the article will shed light on the challenges encountered when designing ergonomic furniture for home-based work setups, such as limited space availability and budget constraints. By combining interview findings and observational data, the article will propose practical design solutions that address these challenges, enabling the creation of ergonomic furniture capable of accommodating different home-based work setups and enhancing users' work experiences. The insights derived from this research will serve as valuable guidance for the development of ergonomic furniture tailored to support users in their remote work environments.

Keywords: Ergonomic Furniture, Work From Home, User Experiences.

1 Introduction

Numerous organisations facilitated the relocation of their staff from the workplace to remote work arrangements in response to pandemics subsequent to the government's

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implementation of the Movement Controlled Order (MCO) [1]. Telecommuting, which is also known as remote working, refers to a work structure where employees are not required to travel to a central workplace, such as an office building, warehouse, or store [2]. The acronym "WFH" is used as a nickname for the concept of working from home. In the absence of treatment or a vaccine, ceasing most human contact is the only way to stop the spread of the viral disease. Essentially, the less contact there is with society, the less the virus spreads. Social lockdown is urgent to bring overall transmission down and reduce infection cases over a longer time frame to avoid overwhelming the health system. Malaysia is experiencing a tremendous challenge in terms of occupational health issues because of this particular viral disease caused by the coronavirus. This pandemic affected Malaysia's economy and disrupted society during the Movement Control Order (MCO). The profession that has been involved with direct contact and exposed with people are listed to become a high risk to be infected during the pandemic because the spreading of Coronavirus increasing rapidly day by day. Work from Home (WFH) describes work being done remotely instead of at an office. They are performing their daily tasks at the site with the support of computers and communication technology. An analysis of differences along with these aspects between working at home and working in a typical workplace on possible consequences for individuals from changing their working environment from premises to their own home [3]

2 Work From Home Ergonomic Issues

Since the pandemic of COVID-19, Work from Home (WFH) has become the new norm for employees worldwide, and it should not be considered an option or temporary solution due to the pandemic; a new practice in the home-office workplace needs to be implemented. The most frequent issues related to WFH are:

2.1 Neck, Shoulder and Back Pain

A consultant obstetrician, gynaecologist and functional medicine practitioner, Datuk Dr Nor Ashikin Mokhtar said that it is an excellent precaution to avoid catching the SARS-CoV-2 virus that causes Covid-19 as well as other bacteria or other viruses [4]. Workers might find that making a shift home-office may cause a lot of pain, especially neck, shoulders and back. Working for 40-plus hours a week at your dining table can lead to back, shoulder and neck strain. While it may be comfortable, having your legs or whole body in a horizontal or diagonal position can lead to muscle numbness and discomfort [4]. Repetitive work occurs when the same body parts are repeatedly activated and there is no possibility of at least a short period of relaxation or variation in movement is not possible. Relevant determining factors are the duration of the working cycles, their frequency and the load level of the performed activity. Examples of repetitive work are keyboard use while typing, data entry, clicking and drawing a computer mouse [4,5]

2.2 Musculoskeletal Disorder

The Centre for Disease Control [5,6] found that 35% of people who work from home sit 8 hours or more a day are likely to develop musculoskeletal disorders because they do not have a practical chair to fit the standard office working chair. Disorder of musculoskeletal system represents the main cause for absence from occupational work. Musculoskeletal disorders lead to considerable cost for the public health system [7]. Specific disorders of the musculoskeletal system may relate to different body regions and occupation work [6]. For example, a disorder in the lower back is often correlated to lifting and carrying of loads or to the application of vibration. Upper-limb disorders (fingers, hands, wrists, arms, elbows, shoulders and neck) may result from repetitive or long-lasting static force exertion or may be intensified by such activities [7].

2.3 Poor workstation

According to the newspaper article from Free Malaysia Today [4], employees may experience a physical, mental or emotional reaction during the lockdown. Some of the employees have to deal with in-laws, noise distraction, childcare and a poor workstation environment. The real society level risk during work from home or working remotely when the employees are not having a good interaction and communication for working as teamwork [4]. As a professional designer, some of their daily tasks need to work as a team and communicate during the progress for opinion. If the employee has an improper workstation during the lockdown, they will avoid arranging a video call meeting unless it was an urgent meeting or task. Employees performance is affected by furniture ergonomics, balance temperature, visual condition and accurate lighting for concentration on employee's daily task performance [8]. performance is affected by furniture ergonomics, balance temperature, visual condition and accurate lighting for concentration on employee's daily task performance. Poor workstation design also can contribute to the physiological stress level. Such as working position, type of furniture and home-based office workstation environment [7,8]

3 Research Aims

The primary aim of this research was to develop cost-effective ergonomic furniture suitable for both private workspaces and general settings, encompassing a range of seating options that is comfortable and have a personal space. Additionally, the study considered user behaviour, movement, and environmental factors [9] in the context of the COVID-19 pandemic. The potential contribution of this paper is to increase user experience and satisfaction while promoting employee productivity and work-life balance in the currently unpredictable situation of the pandemic. This paper focuses on the specific problems that is related to usability issues, environments, or situations related to the existing furniture that decrease employee productivity.

4 Research Methodology

The study employed qualitative methodology for the research design to develop a solution for employees' productivity and increasing working experiences while promoting work-life balance to encourage working remotely in Malaysia. According to Varvin [10] and Creswell & Poth [11], qualitative research into intervention studies is a research method that is gaining popularity across disciplines. Qualitative research is appropriate for this study because it takes a humanistic or idealistic approach to comprehend a study question [10; 11; 12]. The qualitative technique is used to better understand people's beliefs, experiences, attitudes, behaviours, and interactions during WFH. The research will be divided into three phases of development: research methods (stages 1 and 2) .

Stage 1 focuses on a preliminary study on WFH issues and scenarios in Malaysia to select the parameters of the topic scope search of information sources to see if existing sources will suit this research requirement (refer to Figure 1).

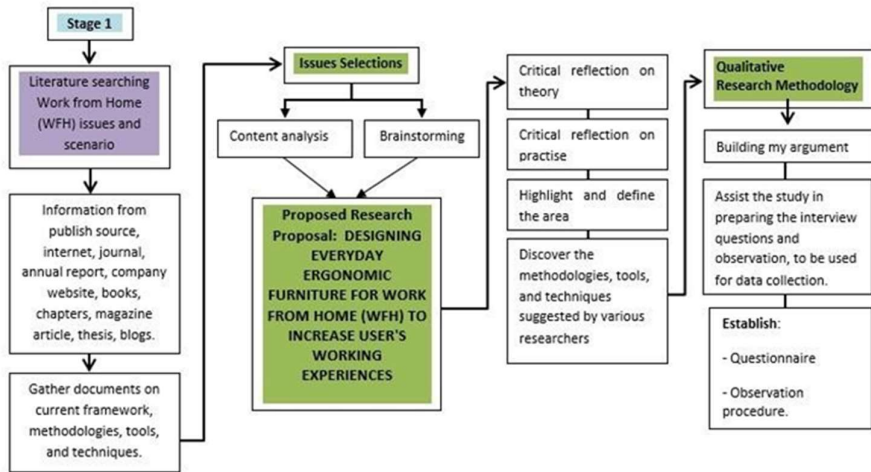


Fig. 1. preliminary search for background information

Stage 2 focuses on a qualitative approach to gathering data. As shown in figure 2, the study intends to use qualitative research to employ observation and in-depth interviews during the data collection process. The study's objective described employees' productivity and increased working experiences while promoting work-life balance and working remotely in Malaysia. This section also explained the chosen method, instrument, and participant strategy during the data collection process. The study required a deeper understanding of the contribution to increasing user experience and satisfaction while promoting employee productivity and work-life balance by designing an ergonomic active seating chair related to comfortable working options, user experience, movement, and environment [9]. Due to that restricted movement, this

study used plenty of research methods, such as participant observation and interviews closer to the user. Participant observation is similar to naturalistic observation in that it involves observing the problem from the facilities that are already provided in the target area in which it typically occurs. As with actual observation, the collected data can include interviews (usually instructed), notes based on their observations and interactions, documents, photographs, videos, and other artefacts [12]. The data from the face-to-face interview will be interpreted as the outcome and given as facts. This data will help this research analyse the user's personal experiences and expectations of the existing furniture provided in their at-home working area [10]. In addition, this research had to develop a method classification as an important tool in developing the wall-mounted table design, including public participation in the design process, and identify the perception of the privacy workstation design makers related to ergonomic design and comfortability.

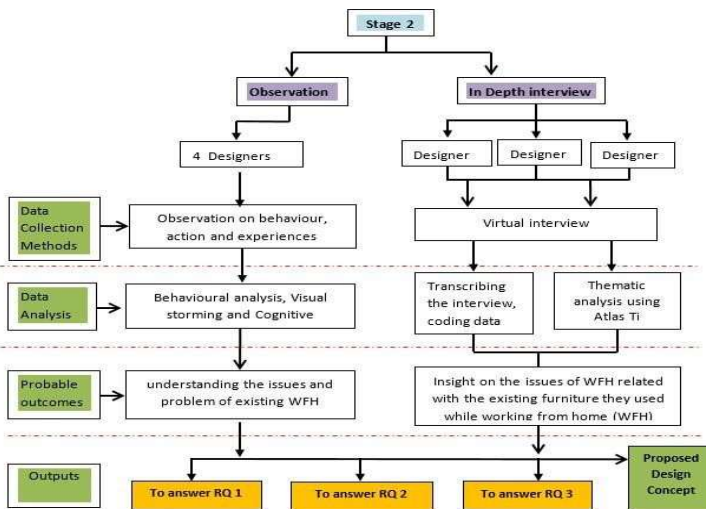


Fig. 2. Stage 2 research design process for data collection

5 FINDINGS AND ANALYSIS

This section intends to highlight the relevance of employee productivity during this new norm of working from home and improve users' working experiences through the design of standard ergonomic furniture. It is also to identify the respondent's opinions about the existing furniture for work from home (WFH) since this research has included issues about the COVID-19 pandemic worldwide. Figure 3 summarises the demographic data for the four respondents who took part in this study. There are three males and one female, aged between 23 and 29 years old, single, and generating income between 2000 and 3000 ringgit in Malaysia. This data analysis refers to respondent socioeconomic information. The participants voluntarily took part in this study because a local graphic designer needs to work from home (WFH) due to the pandemic.

5.1 Finding from the Interview

The findings from the interviews were extracted from the coding techniques used throughout the four interview scripts to generate new insights and concepts derived from the data. This process of labelling the code and theme is to identify the issues from the online face-to-face interview sessions and understand the users' working experiences in the home-based office environment (refer to figure 3). Eight themes were identified based on the coding analysis to help this study interpret the data findings and make an argument for the claims presented in this section. This article exclusively concentrates on three themes related to the development of WFH furniture. This emphasis is attributed to the fact that a majority of participants mentioned it during the interview.

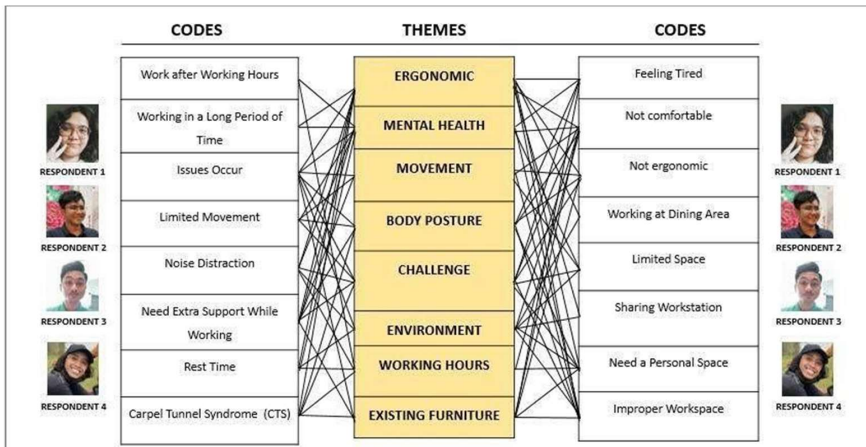


Fig. 3. Finalize the codes related to the themes.

Theme 1 : Ergonomics

The interview demonstrated that all respondents have an issue with their current home-based workspace. The main problems are ergonomics; they are uncomfortable with the furniture, and the size of the furniture is not specific to their body posture. The furniture they use currently is not suitable for an extended period of working time. The respondents face back pain and discomfort during their daily tasks. Hence, an excellent home-based office environment and workspace will make the respondents enjoy and be more focused on working from home with comfortable furniture and proper ergonomic furniture for their body posture.

Theme 2 : Environment

In addition, the respondents did not have a good work area or environment. Such as the respondents need to do their daily working tasks in the bedroom and dining area to boost their mood without feeling pressure or interruption during working time. Designers working from home face the same issues of finding a way to stay active while focusing on finishing their daily tasks. The respondent had a problem with improper furniture for a long sitting time and had to add extra accessories, such as a cushion, to make it feel more comfortable. Otherwise, some respondents had noise disruption coming from outside their room while meeting with colleagues. Distracting noises from the kitchen when their family member cooked and noise exposure from construction near their residential area are the main problems respondents face while working from home. A hot environment will give employees a hard time concentrating and make them quickly feel tired.

Theme 3 : Body Posture

Furthermore, the respondents have issues due to poor body posture and dizziness when sitting for an extended period in front of the screen or desk. Existing furniture arrangements during working hours may cause awkward sitting posture, stress, and body aches. Having enough break time or resting time will boost their energy and reduce muscle pain such as back, lumbar, and shoulder pain. Carpal Tunnel Syndrome (CTS) is one disorder that respondents mentioned during the interview session. This disorder will occur when the respondent uses the keyboard, Wacom, and mouse for a long period of time.

5.2 Finding from the Observation Data

As a result of this, data collection is one of the most important steps in conducting research. In this study, the observation was to fix the problem, help develop the idea, and carry out a brilliant solution. The goals for the observation are: (i) To help designers working from home (WFH) in an ergonomic and comfortable workstation. (ii) To give a privacy workstation for designers to work comfortably and avoid distraction. (iii) To provide proper storage for a designer to fit all their equipment systematically.

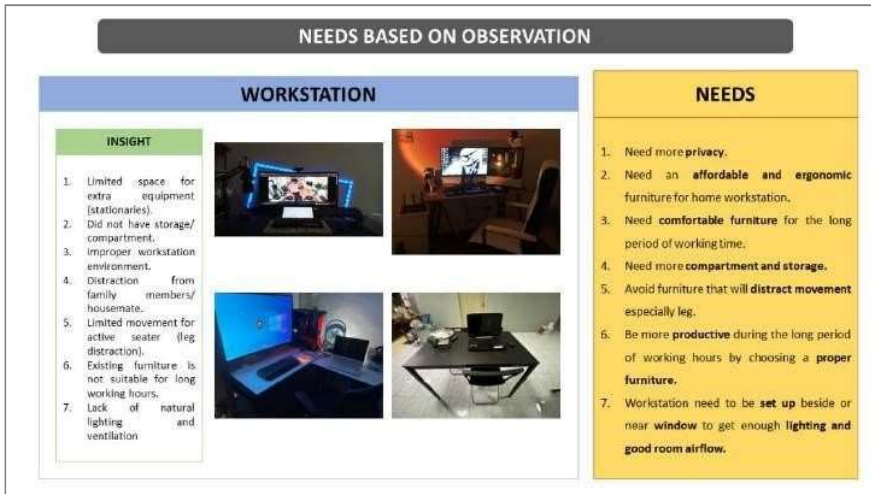


Fig. 4. Workstation needs findings from observation

Based on workstation observation issues that have been identified, a home-based office and location seem uncomfortable with many distractions and problems (Figure 4). During working hours, the limitation of space and storage is the major problem for designers during the COVID-19 pandemic. The respondent used a dining chair and dining table in his living room while working and meeting from home. Respondent 2 custom-built her workstation using an IKEA shelf for the tabletop. She is also facing some problems, such as limited storage and a small table area for her laptop, PC, keyboard, and other extra equipment that needs to be used during her working time. Furthermore, respondents 3 and 4 had a critical time customising their table by using the dining table and adding leg support. They are active workers who need to support their legs during working hours. Still, it showed that the leg support gave them more distraction during their long working hours. Moreover, the challenge of working from home is a lack of natural light, and some of the respondents did not have good airflow in their rooms because they did not have a personal window inside their small space. Hence, all respondents have the same problem with existing furniture and body posture.

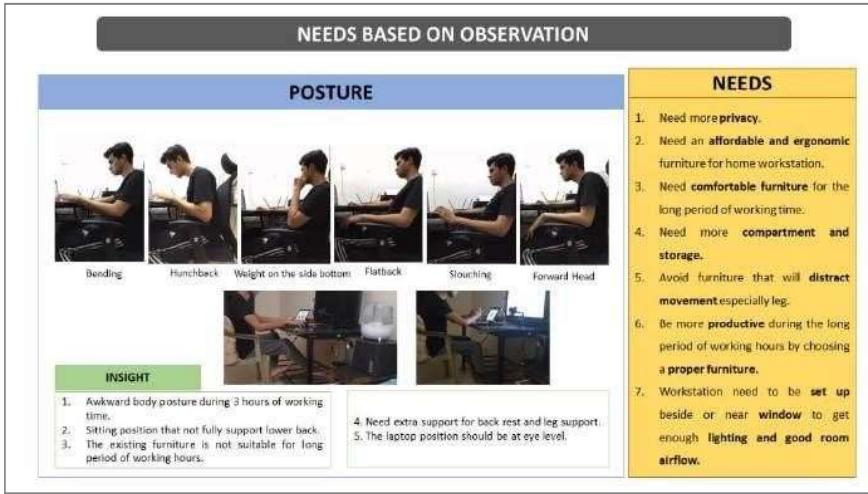


Fig. 5. Posture needs based on observation

The observation was based on body posture issues; respondents had an awkward body posture during the 3 hours of working time (figure 5). Sitting for a long time may need extra support for their back and leg to create a comfortable position and make them more focused on their daily task. Also, the existing furniture is not suitable for an extended working time. Otherwise, the equipment such as laptop and PC position is not at their eye level and forces them to have neck and back pain. The leg support has created a distraction in having flexible movement.

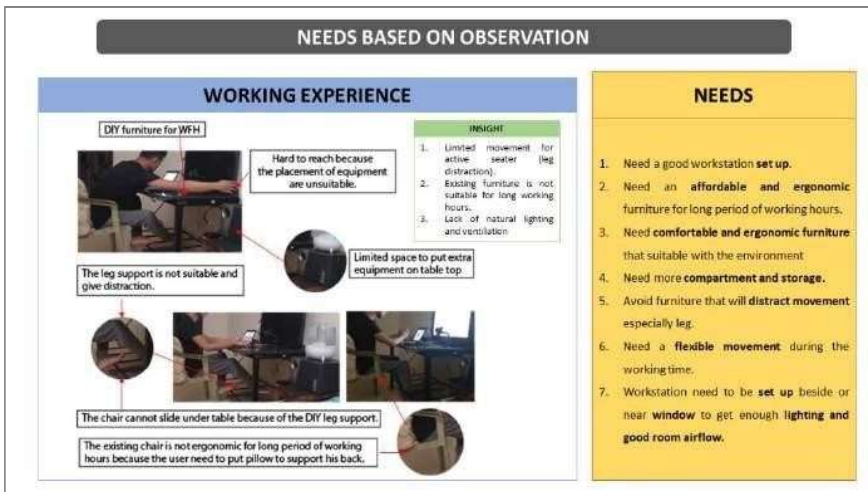


Fig. 6. Working experience needs based on observation

Based on working experience issues, some respondents have an air purifier to keep their room fresh. Using an extra compartment or laptop rack may help get a better height level for their laptop (figure 6). Cushion will also help them support their backs and make them feel comfortable while sitting for an extended period. Limited space will make their workstation messy. The respondent may use a dining chair that does not match their study table. The plastic dining leg chair scratched the floor by making creaky noises because the respondents moved the chair. Other than that, having a snack or drink on their side will keep them active while focusing on their daily task.

6 CONCLUSION AND RECOMMENDATION.

This section summarises findings based on the analysis conducted throughout the entire study. As stated in an earlier section, this research aims to design affordable everyday ergonomic furniture that is specific to private workstations to increase users' working experiences.

6.1 Participants' difficulty while WFH

Based on the findings, it can be inferred that the participants lacked suitable ergonomic furniture in their homes to facilitate comfortable and productive work. The majority of participants reported working in the dining area, which often resulted in strain on their back, shoulders, and neck. Although adopting a horizontal or diagonal body position might seem comfortable, it often led to muscle numbness and discomfort. Prolonged use of devices such as the Wacom tablet and mouse for urgent tasks or jobs contributed to Carpal Tunnel Syndrome (CTS). Participants attempted to alleviate their back and lumbar pain by using additional equipment like cushions for support. Unfortunately, this improper workstation setup and the absence of comfortable furniture made it challenging for participants to complete their daily tasks efficiently due to prolonged sitting.

6.2 Participants WFH furniture

From the data collection, the existing furniture is not practical and unsuitable for the participants who need a long working time. Do-it-yourself (DIY) or custom-made existing furniture areas create more distraction and limited movement, significantly lowering the lower body and legs. Lack of natural lighting and airflow may affect their productivity. Improper workstation design is one of the main issues. The choice of existing furniture for a small bedroom workstation environment can cause little compartments for their equipment that are not suitable for working from home (WFH). During the online face-to-face interview session, the participants is desirous of having an ergonomic workstation design and a practical workstation for working from home (WFH)..

6.3 Proposed furniture concept for WFH user

From the data collection, it appears that an ergonomic and affordable design suitable for long periods of working time affects someone's body posture and material health. Based on an online face-to-face interview, the participants had limited space, especially in their working space, either tabletop or movement, because the existing furniture they used is not suitable for a small bedroom environment. Choosing a separate area as a dedicated private workspace or other space can minimise family members, friends, and outside distractions. Still, at the same time, the combination workstation design with a small bedroom environment will encourage employees' wellness and health. Adjustable table tops will boost employees' energy and focus when adjusting the proper height level, and equipment arrangement will reduce back pain and CTS.



Fig.7. Proposed Design for privacy workstation.

The aims of this study is to comprehend the impact of utilisation and applicability of a wall-mounted privacy feature that incorporates sound-absorbing material to mitigate noise interference from the environment. This is illustrated in Figure 7. The methodology employed ensured that the design concept was aligned with the objective and sustainable outcomes. The process of design development relies on the utilisation of hand sketches and the integration of 3D modelling software in conjunction with material and research design. This integration plays a significant role in the generation of concepts, supporting the 3D modelling design. Additionally, the scaled 3D modelling design expands the scope of ideas that have been developed in the software, allowing for verification of how form and shape can be assembled. The rendering process also contributed to the visual aspect of the process, with possible finishing to bring a realistic element to the virtual model. Based on the verification methodology, the demand on the adjusted privacy table attached to the wall is to provide flexible movement and prevent distraction from either noise from outside the tiny bedroom area or leg distraction. To conclude, the privacy wall-mounted table has fulfilled the objectives and accomplished different sustainable aspects. It is recommended that other researchers adapt this design to further contribute to the body of knowledge in the design field.

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