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Ergonomics Risk Assessment among support staff in Universiti Malaysia Pahang

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Abstract. Awareness of ergonomic risk assessment among workers are getting intense in many industries nowadays. It is essential since most of the workers spend 7 to 8 hours of their time in the workplaces. Previous study shown that spending too much time with static posture in sitting at workplace leads to the problem of Musculoskeletal Disorders (MSDs). The implications are not only harmful to human body but also effect the productivity. Currently, there are no scientific study conducted to assess the conditions of workers in Universiti Malaysia Pahang (UMP). Therefore, the problem of MSDs could not be justified clearly and the top management did not acknowledge this issue. This study aims to present current scenario of ergonomic risk level at UMP by using structured model. It focuses on operational staff from faculties and Human Resources Department (HRD). Initially, three types of assessments are executed based on general working condition, Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) and Rapid Office Strain Assessment (ROSA). Based on the findings, 90% of the respondents felt discomfort at workplace but prefer to rectify the issues by themselves. Almost 50% of them evaluated themselves in level 4-5 of discomfort level. The CMDQ result shown the discomfort area at faculties and HRD. The workplace at faculties and HRD had been assessed through ROSA and the overall result shown the risk level is medium level respectively. Therefore, further investigation is requires and improvement of workplace need to be proposed to establish good working condition.

1. Introduction

The ergonomics study had played major important role to provide pleasant interaction between people and workplace in many field such as manufacturing, agriculture, mining, services or others industries. The proper coordination of human-workplace had contributed toward organisation productivity and indirectly increased the performance to achieve their goal. The type of workplace is differentiate according to the nature of the industry. For example, the workplace in manufacturing industry usually consist the element of peoples, machinery, material handler, equipment, tool, jig and fixture, workbench, computer, desk, chair and etc. However, in services industry, the workplaces are normally consists the element of peoples using computer, telephone, work document and stationary while dealing with customers.



Previous studies have recognized the contribution of ergonomics in enhancing the performance in service and manufacturing sectors. Ergonomics studies provide sufficient data in designing the organization workplace according to the philosophy of “fit man to job” or “fit job to man”. According to Bridger (2008), attempt to “fit man to job (FMJ)” were based on the idea that productivity or efficiency could be improved by selecting workers with the right aptitude for a particular job[1]. Meanwhile, “fit job to man (FJM)” is an attempt to design task to suit the characteristic of the workers.

In addition for services industry, the roles of ergonomics has becomes more essential and significant due to the meaningful information in designing an ideal workplace and human posture interaction. Basically, the natures of work for service industry required them to work in sitting position for a long time per day. This lead to a sedentary behaviours (SB) which lead to low energy expenditure in a reclining position. If this condition prolonged, it can lead to severe injuries caused by static posture, forceful exertion or repetitive movement [2]. Ultimately, this will caused discomfort or unpleasant condition to human body of workers. Most office works today have undergone radical changes over recent years. Technologies changes have led to a situation where users have little reason to leave their workstations. As a consequence, many people start to experience discomfort and pain brought by the repetitive nature of task, lack of break and task variety. In order to sustain the human and pleasant working environment, the evaluation toward risk surround should be done. The risk assessment is a part of a whole health and safety management system [3]. The purpose of this assessment is to identify hazard or potential situations that can cause harm to human. Ultimately, it assists to identify whether the risk control measure is already in place and provide recommendation if it is not yet considered.

2. Ergonomics Assessment

Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) and Rapid Office Strain Assessment (ROSA) are among the approaches widely used to investigate the problem of Musculoskeletal Discomforts (MSD). Shariat A. (2016) has implemented these approaches among Telecom Malaysia staffs to investigate MSD problems [4]. They need to get involve in one of the approach which is intervention groups (receiving training exercise, receiving modified ergonomics, receiving a combination of exercise and ergonomics modification) and a control group (receiving none of these interventions). The CMDQ Questionnaire was used to measure musculoskeletal discomforts, with focus on pain severity, before treatment and after 2, 4 and 6 months of the interventions. The range of motion (ROM) of the hip, neck, shoulder and knee were measured by goniometer, and the Borg CR10 scale was used to measure the perceived exertion of training exercises. The ROSA questionnaire was used to assess the strain associated with office work. Height and weight were also measured to calculate the body mass index (BMI).

Meanwhile, Liebrechts, (2015) studied on how to get more accurate result of ROSA by examining the validity and reliability through photo-based assessments [5]. Here, twenty-three office work stations were assessed on-site by an ergonomist, and 5 photos were obtained. As a result, the photo-based assessments had identified as most appropriate when applied as a “triage” method for a big group of workstations. Matos. and Arezes, (2015) studied on how the regular use of computer in the office contributed to many risk factors related to Work Musculoskeletal Disorders (WRMSD) such as maintaining static sitting postures for long time and awkward postures of the head, neck and upper limbs [6]. This study evaluates the present of WRMSD in workstation and found that the cause may not be related to the poor availability of equipment but the need to optimize the usage by the workers. It was noticed that the interaction of workers with the tasks and the sitting posture at the workstation along the day have repercussions at a muscular level, essentially for the cervical and shoulders segments.

Poochadaa and Chaiklieng (2015) had studied the issues of Musculoskeletal disorders (MSDs) which complained by call centre workers who involved in static work or tasks required the repetitive motion of the upper limbs and prolonged computer work [7]. The survey was conducted among 216 call centres in Khon Kaen Province, Thailand. The workers are selected from those who had experienced the job more than 6 months, working time at least 32 hours per week and dealt with computer at least 4 hours

per days. By using the ROSA, this study showed that most workers were exposed to the high ergonomics risk for MSDs development. In order to prevent MSDs, there should be ergonomics awareness programme implemented among the workers. A part of that, personal working behaviour and the design of the workstations should be improved according to ergonomics principles.

3. Working Nature in UMP

As a player in servicing a nation through education mainstream, UMP strives to deliver high quality service to the stakeholder. For a past 10 years, UMP has gone through a lot of development phases and these effect the workstation design and equipment. Therefore, most of the offices are equipped with recent design of writing desk and chairs. However, the effectiveness and how it reduce the discomfort for a long sitting work are not proven yet. If the issue is not investigated, there is a high tendency for the worker to face a syndrome called as Work Musculoskeletal Disorder (WMSD's) or Low Back Pain (LBP) injury.

Particularly in UMP, there are no further assessment and analysis to address ergonomics issue among workers. Hence, this study is conducted to assess MSD problem and determine either it is presented or not and how serious the condition. Since support staffs played a major role in university performance, their absenteeism to work may contribute to the low productivity, decrease their availability and performance lost to achieve university yearly target. Basically, the objective of this project is to evaluate the current working condition at UMP which relate to the Work Musculoskeletal Decease (WMSD) problem for support staffs at faculties and Human Resources Department. Besides, it aim to study, measure and compare the issue at both area by using Cornell University Discomfort Questionnaire (CMDQ) and Rapid Office Strain Assessment (ROSA) approach. Finally, the study intended to formulate and propose corrective actions to related departments based on the findings.

In order to further assess this issue, a comprehensive study has been conducted by Damanhuri, Z. *et al.* (2014) to evaluate the discomfort or low back pain among the office workers in Malaysia public universities [8]. Based on their findings, LBP is identified as a highest injury for these category of workers; worked for 10 years or less (66.1%), not attended office ergonomics course (91.2%), used non-ergonomic chair (98.2%) and leave their working chair infrequently (62.5%) and in short duration (74.1%).

4. Methodology

There are three type of questionnaire used during this survey. The first questionnaire initially wants to check the general condition of existence problem in UMP. It contained seven (7) questions about discomfort scenario at present workplace, time consuming at workplace, the current symptom, discomfort scale, starting time to occurred and current action take. The second questionnaire collects background data of the staffs like gender, weight, height and embedded the standard form of Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) which measured the eleven (11) area of human body. The score is calculated based on weightage of frequency, discomfort and interference. The third assessment used standard form of Rapid Office Strain Assessment (ROSA) to check the body contacting at workplace in terms of chair condition, computer accessories (mouse, monitor, and keyboard) and telephone. This questionnaire use to verify the discomfort found in initial survey and CMDQ.

Basically, working conditions of the staffs can be categorized based academic and non-academic staffs. The nature is quite different since academic staffs spend a lot of time in the classroom, laboratories, workshop, meeting room and their own office. Meanwhile, the support staffs work in the nature of less movement, static and spend more time at workstation every day (sitting based). There are 86 respondents participated in the survey and comes various faculties and HRD. The composition of respondents is summarize in Table 1.

Table 1. Respondent composition in the survey.

| Gender | Faculty | HRD | Total | Percentage |
|--------|---------|-----|-------|------------|
| Male | 12 | 10 | 22 | 26% |
| Female | 37 | 27 | 64 | 74% |
| Total | 49 | 37 | 86 | 100 |

5. Results and Discussion

Most of the staffs are female, young and half of them having an ideal weight or Body Mass Index (BMI) and almost 40% of them are fall in excessive weight and obesity 1 and 2. We found that 36% of staff which have ROSA score 4-5 faced a problem of excessive body weight. Almost 85% of staff are satisfied with facilities provided as it is new but they realized the issue of discomfort in their workplace. 50% rate themselves in between 4~6 discomfort score. Support staff normally spent 6 hours to 8 hours of their time at workplace per day and 44% claimed they have problem of fatigue/illness at shoulders/low back /thigh /buttock/ knee. Meanwhile, 37% reported a problem of eye fatigue while focusing for long hours, 6% have a problem of drizzling after sitting for long hours per day. This figure means that even though they felt convenience on working environment, they also have a problem of sitting with their workplace.

5.1 Cornell Musculoskeletal Discomfort Questionnaire (CMDQ)

The result of CMDQ reported total body discomfort and observe the human body area of high impact due to long hours sitting. Based on the result in table 2, the trend shown that every faculty and HRD faced a different problematic area. In general, lower back is the most problematic area and the top (3) three highest is at FKM, FKASA and FKEE. This followed by upper right arm, shoulder and neck. The area of discomfort found in this study are almost similar with the previous studies related to office worker [8, 9]. Therefore, particular attention need to be addressed on these area while developing the workstation for office worker.

Table 2. Discomfort score (Highest score indicates the most affected area)

| Discomfort area | Discomfort score | | | | | | | |
|-------------------|------------------|-------|-------|-------|-------|------|-------|-------|
| | FTek | FIST | FKASA | FKEE | FKM | FIM | FSKKP | HRD |
| Neck | 7.42 | 7.83 | 9.94 | 6.25 | 14.56 | 7.57 | 8.00 | 6.83 |
| Shoulders (right) | 7.42 | 5.83 | 6.78 | 8.58 | 14.63 | 5.00 | 3.71 | 7.46 |
| Upper back | 3.08 | 8.08 | 8.33 | 12.50 | 12.63 | 9.57 | 5.79 | 11.13 |
| Upper arm (Right) | 3.33 | 2.75 | 11.83 | 1.33 | 2.00 | 3.29 | 1.07 | 4.32 |
| Lower back | 6.33 | 10.50 | 19.22 | 16.33 | 23.06 | 8.14 | 12.21 | 8.69 |
| Wrist(Right) | 1.67 | 4.08 | 10.33 | 5.42 | 20.56 | 4.93 | 5.36 | 4.76 |
| Hip/buttock | 4.00 | 11.42 | 5.17 | 7.9 | 6.13 | 4.86 | 10.71 | 9.10 |
| Knee(right) | 1.92 | 0.67 | 12.83 | 3.42 | 15.75 | 4.36 | 2.21 | 4.32 |
| Knee (left) | 1.92 | 0.67 | 8.94 | 3.42 | 10.75 | 4.36 | 10.79 | 3.45 |

FTek-Faculty of Engineering Technology
 FIST-Faculty of Industrial Sciences & Technology
 FKASA-Faculty of Civil Engineering & Earth Resources
 FKEE- Faculty of Electrical & Electronics Engineering
 FSKKP- Faculty of Computer Systems & Software Engineering
 FKM- Faculty of Mechanical Engineering
 FIM- Faculty of Industrial Management

5.2 Rapid Office Strain Assessment (ROSA)

The result of ROSA score was collected through self-assessment at respected area based on Section A (The Chair - Chair Height and Seat Pan Depth), Section B (Telephone and Monitor) and Section C (Keyboard and Mouse). The highest Final ROSA Score for faculty is FKASA (5.00) and followed by

FKM (4.33), FKEE (4.17), FSKKP (3.71), FIM (3.57), FIST (3.17) and FTek (3.00). Referring to table 3, the final ROSA score for faculties and HRD is 3.45 and 3.38, respectively. ROSA standard guidelines stated score 1-2 is consider as low risk, 3-4 is medium risk, 5-7 is high risk and 8-9 is very high risk. The average score of all department in UMP is around 3-4 and therefore fall under medium risk level.

Table 3. Overall score for ROSA analysis based on faculty and HRD

| Section | Content | Faculty | HRD | Overall Result |
|-------------------------|---|-------------|-------------|----------------|
| A | Seat Pan Height / Depth Arm Rest/ Back Support | 3.04 | 2.97 | 3.00 |
| B | Phone / Monitor | 2.73 | 2.51 | 2.62 |
| C | Mouse / Keyboard | 2.96 | 2.78 | 2.87 |
| Monitor& Peripheral | Monitor & Phone Mouse& Keyboard | 3.18 | 2.97 | 3.07 |
| Final ROSA Score | | 3.45 | 3.38 | 3.42 |

Based on the finding, there are several actions can be initiated by the UMP staffs which relate to proper arrangement of workplace design, knowledge about body posture at workplace and minor adjustment to the working environment. The summary is provided in table 4 and figure 1. The current action taken such as coaching and frequent monitor at workplace is suitable to improve the working environment but need consistency since it relates to staff working culture. By continuous effort and monitoring, a minor positive result can be seen in short terms. Therefore, additional approaches and educating the staff will minimize the risk level in the future.

Table 4. Corrective actions for identified problem in the workplace

| No | Problem Description | Corrective Action |
|----|---|---|
| 1 | Discovered an obstacles or unnecessary items like computer CPU, storage box and unused material that blocked the worker leg from free movement. | The related staffs had been taught on the basics of 5'S and be advised to not placing any items under workstation. |
| 2 | Workers not follow standard way of working positions such as did not use chair arm rest for a long hours, improper location of monitor, keyboard and telephone. | Coach the workers on how to adjust the workplace condition and suggest optimum distance to the equipment. |
| 3 | Workers have a lack of knowledge on how to organise his/her sitting position, how to sit and adjust the chair correctly. | The hands on training has been given to related staff on how to apply the correct method of sitting at workplace included the function of controller at chair. |
| 4 | The light seems too glare due to the bright illumination. This condition is unpleasant which had annoyed staff focus and caused to eye fatigue and stress. | The technical evaluation by expertise in UMP in terms of illumination lux and space measurement is needed to evaluate the condition by using special equipment. |

6. Conclusion

The ergonomics assessment conducted can be summed up to several points. Based on current working condition survey, most of the UMP staffs are not aware with the ergonomic problem in their workstations. Problems like eye fatigue, drizzling, illness at certain body parts are stated in the survey but they did not seeking advice from medical doctor or inform their superior. Based on CMDQ survey,

several discomfort area are identified and it is varies between the faculties and HDR. Lower back pain is one of the critical discomfort area faced by the workers in all department. ROSA analysis has further validated the ergonomics condition in UMP. The score indicates the risk is at medium level which require further actions for the institution to improve their employees working environment. Overall, the study on ergonomics in service sector is very crucial to address the problem of productivity and health issues. Awareness on ergonomics aspect and knowledge about good working condition will assist them to initiate changes within their capacities.

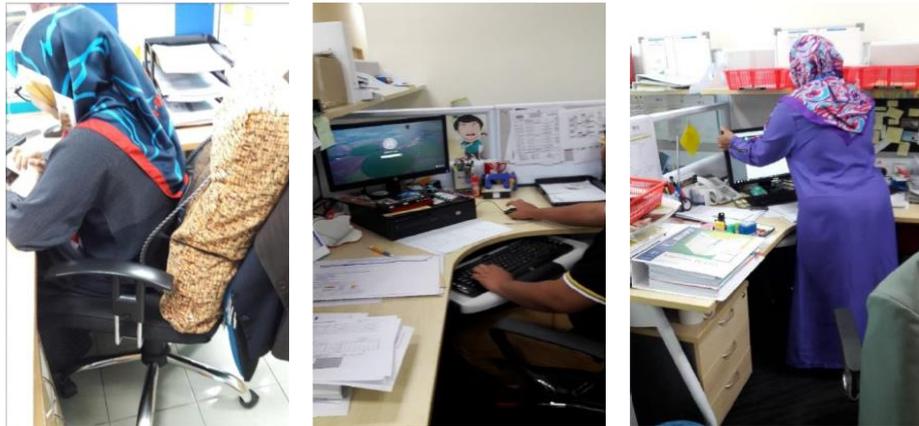


Figure 1. Corrective actions to improve workplace.

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