SIGNIFICANT NECK PAIN’S RISK FACTOR TO INTENSIVE COMPUTER USER OF WOMEN EMPLOYEE

Rizal Rohim  
Department of Mechanical Engineering, Polytechnic of Sultan Haji Ahmad Shah  
(Corresponding author E-mail: rizalrohim@polisas.edu.my)

B.T. Hang Tuah Baharudin  
Department of Mechanical and Manufacturing Engineering, Faculty of Engineering, University of Putra Malaysia

ABSTRACT

Computer use is common among workers around the world, but prolonged use of a computer can cause neck problems especially on female workers. Therefore, an exploratory study is needed to investigate the risk factors of neck pain among computer workers. Surveys have been carried out on intensive computer users who spent more than six (6) hours in front of the computer. The objective of the study is to determine the significant neck pain risk factors on intensive computer users and in these surveys seventy-nine participants are involved to obtain demographic, workstation design and job demand information. The results from questionnaire reported the significant risk factors associated with several risk factors which are “job type”, “history of neck pain”, “used vision correction”, “marital status”, “the position of monitor screen” and “the eye level or height of monitor screen”, “using telephone while keying” and “time spent on computer”. This finding may inform employers about the importance of proper job scheduling in order to prevent any injuries. Prolonged use of a computer to do a task were frequently associated with the incidence of neck pain.

KEYWORDS: neck pain, computer work, risk factor, ergonomic

1. INTRODUCTION

The advancement of technology has promoted higher usage of computer in daily lives, especially for education and work purposes in manufacturing firms and industries since over four decades ago. The utilization of computer has become an essential means in industry in various countries around the world, including Japan, Kuwait, Taiwan, Australia, United States, Nepal and Greece (Babski-Reeves et al., 2005; Fogleman and Lewis, 2002; Hou, 2012; Kim et al., 2012; Shrestha et al., 2011). 2020 vision stated, Malaysia will become a country fully equipped with high-end technology (Faryza et al., 2015). This has been proved, the Malaysian ICT industry registered a growth of 14.2% to RM70.9 billion in 2015 compared with RM62.1 billion or 12.5% growth in 2014. According to Chairman of the National ICT Association of Malaysia (PIKOM), achievement was driven mainly by the increased use of mobile devices, social media, cloud solutions, e-commerce and Big Data Analytics (BDA), which is driving the growth of the Internet of Things (IoT) (Awani, 2015). This rapid development era demanded employees to use the computer intensively (O. Evans and Patterson, 2000) to help the organizations in raising work quality, productivity and efficiency (Culpan, 1995) and use for data entry, data storage, designing and information search (Faryza et al., 2015). In a manufacturing operation, computers were applied in all aspects which include planning, control, scheduling, designing, distribution, processing, marketing, and
production to meet the high demand of product (Shaheem et al, 2015). Nevertheless, it was reported to cause an adverse effect regarding health and safety of the workers (O. Evans and Patterson, 2000; Faryza et al., 2015; Skilling et al., 2005) including neck pain (Buckle and Jason Devereux, 2002).

2. PROBLEM STATEMENT

Malaysia is moving towards a technology-driven and high-tech production-based pattern of development (Lai and Yap, 2004). To facilitate the rapid growth of technology, Malaysian industry also encourages the intensive use of a computer to promote better productivity and efficiency (Idrus et al., 2008).

Association between the intensive computer usage and the increased risk of upper extremities (Korhan and Mackieh, 2010; Yang and Cho, 2012) has been observed by previous researchers, including neck pain. Office and computer workers had highest incidence of neck disorders (Green, 2008). Many researchers have reported that the incidence of neck pain occurred among office workers in the various countries including Atlanta, Sweden and Finland (Gerr et al., 2002; Korhonen et al., 2003; Wahlström et al., 2004). Statistics on neck pain in Malaysia, showed the annual years of healthy life lost per 100000 people from neck pain in Malaysia has increased by 16.3% since 1990, an average of 0.7% a year (Graphiq, 2016). However, many cases have not been reported because of lack of awareness and understanding on ergonomics (Mohd Yusuff et al., 2016). In Malaysia, neck pain also was contributed high percentage after lower back pain in a study of WMSDs among office workers (Abdullah et al., 2016; Balakrishnan et al., 2016; Faryza et al., 2015). The longer time spent sitting and keying during computer work were significantly correlated with neck pain (Mahmud et al., 2014). Study by Zainon@Md.Ali and Dawal, (2008) also indicate highest prevalence on neck pain injury to intensive computer users in Malaysia. This occurrence explains the frequent occurrence of chronic neck pain among women. The finding was also supported by the studies from others researchers where women are more tendency to involve in the occurrence of WMSDs compare to men (B. Cagnie et al., 2007; Chiu et al., 2002; Ernst et al., 2015; Korhonen et al., 2003). This injury does not only burden business with productivity loss, workers and their families with personal suffering, but it also encumbers society at large with medical and social security expenses (Lale, 2013).

Therefore, an in-depth study is required to identify the contributing factors and problems of neck pain among workers in Malaysia. The objectives of this research were to identify the individual, physical and psychosocial risk factor contribution to neck pain among women in an office environment.

3. LITERATURE REVIEW

Musculoskeletal disorders (MSD) have become a common issue among workers who frequently use a computer in performing their job tasks (O. Evans and Patterson, 2000; Korhan and Mackieh, 2010; Szeto et al, 2005). This occurrence has brought a significant impact regarding financial aspect. It has led to loss productivity and has become a high financial burden on national health systems (Aziz et al., 2015). The neck and shoulder pain was frequently reported with prevalence rates of at least 30% in Netherland and 40% in Belgium (Buckle and Jason Devereux, 2002) and also in Malaysia, 53.6% in average was reported have neck pain and 53% in average have shoulder pain (Faryza et al., 2015). Not
surprisingly, women were revealed to be affected by this disorders the most (Vogt et al., 2003).

Work-Related Musculoskeletal disorder (WMSDs) among office worker with intensive computer use is widespread, and the prevalence of symptoms is growing. Survey has reported 70% to 75% from the computer user among employees have health problems, which mostly includes the symptoms of eyestrain, headaches, neck pain and blurred vision (Foye et al., 2002). Work-Related Mu

Ergonomic risk factors are those physical exposures of force, contact stress, awkward and static posture due to display position or keyboard arrangement (Ketola, 2004). To understand the frequency as well as the severity of the risk factors that may be present the physical demands, or exposures, of each task performed in a job must be analysed. The different available approaches to estimate these physical exposures include worker self-report, bio-instrumentation, and direct observation (Barondess et al., 2001). In highly static posture computer work, where a worker did the task for an extended period, identification of exposure can be a simple process. In non-routine work and job rotation, exposures to risk factors may be a lengthier and thought-intensive process. Job description alone is not enough to determine exposure for every employee. Worker self-reporting can address both task-specific exposures within employment and the distribution of tasks performed by each employee (NRC, 1999). The self-reports permit assessment of exposures in the past as well as the present (Barondess et al., 2001). Direct observation does not allow for prior exposure interpretation. Bioinstrumentation provides quantifiable results, but can be invasive and may alter work practices the same may be true of observation (NRC, 1999). There are also psychological and physiological ergonomic risk factors that should be given due note. The nature vs. nurture theory comes into play for psychological ergonomic risk factors. How a person was raised/trained to perform certain tasks, and how they handle stress by increased workload are examples of psychological risk factors (Barondess et al., 2001). There are few risk factors that can cause neck pain while using visual display. It can be divided into three main groups which are (i) individual factors (e.g., age, gender, physical activity, etc.); (ii) physical factors (e.g., exposure to workstation design and task demands); and (iii) psychosocial factors of the workplace (Johnston, Souvlis, Jimmieson, & Jull, 2008).

4. RESEARCH METHODOLOGY

Seventy-nine female workers with age between 21 to 57 years old (mean: 35.9, SD: 9.43) were involved in this study. The subject was recruited from the clerical staff and administrative officers from Polytechnics of Sultan Haji Ahmad Shah (POLISAS), Pahang, as a future premier institution, industry-led TVET, at which work quality is a necessity. Data was collected using self-administered questionnaires. The questionnaires were divided three parts. Parts 1 is based on Demographic Characteristics (age, gender, marital status, etc) and
job title of the officer completing the questionnaires. Part 2 are related to job demand are such as the hours of working, duration of working with computer and duration of working before taking a break. The aim of this questionnaire is to identify the physical and the psychosocial factors in the development of the neck pain. Part 3 is based on perceived neck pain and disability. It was developed at Northwick Park Hospital in Middlesex England (Leak et al., 1994). It provides an objective measure for observing symptoms over a period of time. The survey includes the question about the neck pain intensity and the effect on sleeping and duration of symptoms. The subjects were to rate the closest severity and disability perceived, based on the description for each rating score. Statistical analysis was conducted using IBM Statistical Package for Social Sciences (SPSS) version 20. The relationship between risk factors (individual, workstation and task demand) and the neck symptoms and neck pain and disability was investigated using Chi-Square t-test which is Kruskal-Wallis or Mann-Whitney U analysis, depends on the number of categories in the variables to be examined. All analyses were performed with significant level was defined at p<0.1 and p<0.05 (90% and 95% confident level).

5. RESULT AND ANALYSIS

The results from demographic and neck pain and disability survey were analysed to determine the risk factors that associated to neck pain in computer work. It was categorized into three groups of factors, which are individual, workstation characteristic and job demand factors. Non-parametric analysis was used since the data has no normalized distribution as per Normality Test. The result are presented in Table 1–3.

<table>
<thead>
<tr>
<th>Individual Factors</th>
<th>p-value (two-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age***</td>
<td>0.968</td>
</tr>
<tr>
<td>Marital Status</td>
<td>0.08*</td>
</tr>
<tr>
<td>Physical Activity</td>
<td>0.54</td>
</tr>
<tr>
<td>Vision Correction</td>
<td>0.004**</td>
</tr>
<tr>
<td>Working Period</td>
<td>0.773</td>
</tr>
<tr>
<td>Job Type***</td>
<td>0.004**</td>
</tr>
<tr>
<td>Occupational Status***</td>
<td>0.723</td>
</tr>
<tr>
<td>Typing style***</td>
<td>0.515</td>
</tr>
<tr>
<td>History of neck pain</td>
<td>0.001**</td>
</tr>
</tbody>
</table>

**Significant at the 0.05 level  ***Kruskal Wallis Test
*Significant at the 0.1 level

From the analysis of individual factors, four items were found to have a significant different level of responses between respondents which are job type, history of neck pain, used vision correction and marital status. On job type, the respondents who were in the clerical job have significantly higher neck pain and disability score than those in the managerial job and others with \( \chi^2 = 11.15, p = 0.004 \) (two-tailed). The mean neck pain and disability score among employees in the clerical group was 47.48, higher than ones from the managerial group which only was 29.54. This is thought to be due to the static posture and load of work that the workers from the clerical group are obliged to perform during the working hours. On the other
hand, the workers from managerial work are required to move around and spend most of the time changing the position and activities. Hence, they suffered less neck pain and disability than those from the clerical group. The respondents with a history of neck pain have given significantly higher neck pain and disability score than those with no history of neck pain with, U= 436, p = 0.001 (two-tailed). This result was supported by previous findings (Venerina Johnston et al., 2008; Leaver et al., 2013). Nolet et al., (2011) stated that an individual with the previous history of neck pain was more likely to report neck pain in future. Nevertheless, this study has a lack of knowledge of the characteristics of previous neck pain such as the cause, the duration and the time of occurrence. This information might be useful to predict the severity of current neck pain symptom. Furthermore, the respondents who are wearing the glasses for vision correction have given significantly higher neck pain and disability score than those without vision correction with U= 485, p = 0.004 (two-tailed). This finding also supported by Venerina Johnston, (2007), wearing vision correction with graduated lenses and greater negative affectivity associated with neck pain due worker tense to focusing on their work and can cause head bowed forward. The respondents that have married have given significantly higher neck pain and disability score than those with no married with p<0.1. This result was supported by literature (Fejer, Jordan, & Hartvigsen, 2005; Nolet et al., 2011).

Table 2: Differences Between Workstation Characteristic Factors and Neck Pain and Disability score.

<table>
<thead>
<tr>
<th>Workstation Characteristic Factors</th>
<th>p-value (two-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height of monitor screen***</td>
<td>0.001***</td>
</tr>
<tr>
<td>Distance of monitor</td>
<td>0.47</td>
</tr>
<tr>
<td>Position of monitor</td>
<td>0.000**</td>
</tr>
<tr>
<td>Resting arm on desk while keying</td>
<td>0.892</td>
</tr>
<tr>
<td>Arm parallel to floor while keying</td>
<td>0.308</td>
</tr>
<tr>
<td>Adjustable back rest on chair</td>
<td>0.77</td>
</tr>
<tr>
<td>Arm rest on chair</td>
<td>0.47</td>
</tr>
<tr>
<td>Chair support thigh</td>
<td>0.41</td>
</tr>
<tr>
<td>Neck support on chair</td>
<td>0.374</td>
</tr>
<tr>
<td>Chair have castor base</td>
<td>0.62</td>
</tr>
<tr>
<td>Ability of chair to swivel</td>
<td>0.62</td>
</tr>
</tbody>
</table>

**Significant at the 0.05 level                ***Kruskal Wallis Test
*Significant at the 0.1 level

Concerning workstation characteristic factors, the position of monitor screen at the respondents’ side with U= 342, p = 0.000 (two-tailed), and the eye level or height of monitor screen with $\chi^2 = 14.993$, p = 0.001 (two-tailed), were having a significant risk factor to higher neck pain and disability. It was known that placing the monitor to the side of the user’s body may cause neck and shoulder pain due to twisting and awkward posture. Looking off to one side for a prolonged period may cause fatigue and shortening of cervical muscles which may lead to an increase in neck pain (Hooobchaak, 2013). This finding also support by the literature that poor positioning of computer devices may cause the worker to be in awkward static posture as well as significantly associated with eye and back, and shoulder and head discomforts (Johnston et al., 2008; Lale, 2013).
Table 3: Differences Between Job Demand Factors And Neck Pain And Disability Score

<table>
<thead>
<tr>
<th>Job Demand Factors</th>
<th>p-value (two-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working hours per day</td>
<td>0.981</td>
</tr>
<tr>
<td>Overtime hour per week</td>
<td>0.092*</td>
</tr>
<tr>
<td>Computer used per day</td>
<td>0.54</td>
</tr>
<tr>
<td>Keyboard used per day</td>
<td>0.672</td>
</tr>
<tr>
<td>Mouse used per day</td>
<td>0.572</td>
</tr>
<tr>
<td>Time spent sitting before taking a break</td>
<td>0.96</td>
</tr>
<tr>
<td>Time spent on computer before changing to non-computer task</td>
<td>0.052*</td>
</tr>
<tr>
<td>Sharing workstation</td>
<td>0.44</td>
</tr>
<tr>
<td>Using telephone while keying</td>
<td>0.031**</td>
</tr>
<tr>
<td>Perception towards Workstation Comfort***</td>
<td>0.26</td>
</tr>
</tbody>
</table>

**Significant at the 0.05 level       ***Kruskal Wallis Test
*Significant at the 0.1 level

From the analysis of job demand factors, three items were found to have a significant different level of responses between respondents which are using telephone while keying, time spent on computer and overtime hour. Table 3 illustrated that frequency of simultaneous usage of telephone and keyboard with U= 560.0, p = 0.031 (two-tailed) was have significant associated with neck pain. The use of a telephone while working may cause the worker to adopt awkward postures. For example, a worker is required to tilt the head in order to hold the receiver in between shoulder and head. This posture may put stress on the neck region and consequently may result in neck pain (Simps, 2016). A significant relationship has been found between the time spent on the telephone and self-reported neck symptoms previously (Bernard et al, 1994). The respondents that are working overtime more than 8 hours per week showed a significant relationship with the neck pain and disability score (p < 0.1). This finding may be resulted from the higher workload of employees who worked for longer working hours as per explained in the literature. Consequently, it will cause tiredness, fatigue and job stress (J. Park et al, 2001). Elevated mental stress may produce a higher risk of getting neck pain due to increasing and sustained inactivation of neck and shoulder muscles (Larsman et al., 2013). Besides that, the worker that spent at least 2 hours on the computer before changing to non-computer task also showed a significant relationship with the neck pain and disability score with U = 585.0, p = 0.052. Long working hours is correlated with job demand, which means that workers have to maintain static and awkward postures for prolong periods contributing to musculoskeletal overload and pain. The literature supports it, prolonged use of a computer to do a task such as typing and designing were frequently associated with the incidence of neck pain (Babski-Reeves et al., 2005; Mahmud et al., 2014; Szeto, Chan, Chan, Lai, & Lau, 2014) due to adapting an awkward posture of the neck in a certain angle in a given period (Nejati, Lotfian, Moezy, & Nejati, 2014).

6. CONCLUSION

The aim of the present study was to determine the risk factors and relationship between perceived neck pain with the duration of computer work among women employees at Polytechnic of Sultan Haji Ahmad Shah, Malaysia. In order to achieve this aim, the possible
risk factors of neck pain symptoms were identified. The analysis suggested that the neck pain symptoms were significantly associated with various risk factors which are history of neck pain, job type, using vision correction, marital status, the position and height of monitor screen, the overtime hour, the time spent on computer before changing to non-computer task and the usage of telephone while keying. These findings may inform employers about the importance of proper job scheduling in order to prevent any injuries. Implementation of the better ergonomic environment may help the human force to work more effectively, efficiently and productively on their jobs, and eventually creates a successful organization. The future research will be focus on certain risk factor for neck pain such as the position and height of monitor screen associated with time spent on a computer task.

REFERENCES


Rizal Bin Rohim is a Lecturer at Department of Mechanical Engineering, Polytechnics of Sultan Haji Ahmad Shah, Kuantan Pahang. He received his Bachelor Degree from University Science of Malaysia (USM) with a degree of Bachelor Engineering in Manufacturing Engineering with Management in 2002 and Master Degree in Manufacturing System Engineering from University of Putra Malaysia in 2017. Previously, he was working as a Research assistant at USM for three years, focusing on Ergonomic, Machining and Biomaterial engineering. After three years working as a Research Assistant, he moves to private industry, working as a Process Engineer at Sunningdale Tech Sdn. Bhd (Subcontractor of Hewlett Packard). During working at industries, he was involving with Robotics and Automation that consist of Total Quality Management and Preventive Maintenance. After getting an experience in private industry for four years, he decided to work in the government sector as a lecturer until now. In addition to teaching, he has contributed in OSHA committee and human resources, and in a development of co-curriculum.