A screening tool for back pain detection among computer users

Vinothini Padmanathan[1],* and Isa Halim[1]

[1]Centre of Smart System and Innovative Design, Fakulti Kejuruteraan Pembuatan, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia

*Corresponding e-mail: vinothini.padmanathan@gmail.com

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ABSTRACT – The purpose of current study was to develop a screening tool to identify computer users who are in high probability of getting back pain. The current study conducted among 96 computer users who are working in the office working environment. The Standardized Nordic Questionnaire was used to identify prevalence of back pain for past one year. The subjective and objective measurements were used to identify the physical, individual and psychosocial risk factors. The logistic regression was used to identify the significant factors to formulate a probability score for the screening tool. The coefficients of logistic regression were transformed into components of the probability score. The screening tool consists of 3 items; lack of sleep, back posture and regular break with the score ranging from -1 to 5. The cut off score of ≥ 1.5, has a maximum sensitivity, specificity, Positive Predictive Value (PPV) and Negative Predictive value (NPV).

1. INTRODUCTION

Musculoskeletal pain among computer users with one-year prevalence rate ranging from 23 % to 38 % [1]. Besides that, low back pain is one of the most expensive causes of work-related disability in terms of medical compensations and medical costs [2]. One of the ergonomic interventions to reduce musculoskeletal disorders among the working population is by using a screening tool. A screening tool is a form of a checklist or questionnaire used by professionals or respective agencies in identifying individuals who may be at risk of getting certain health disorders [3]. Developing a screening tool for back pain detection is extremely crucial because a screening tool will be able to provide early information regarding individual's risk of getting back pain, which will indirectly help the respective agencies to tailor effective prevention strategies to reduce the occurrence of back pain [3]. Hence the purpose of the current study is to develop a screening tool to identify computer users in office who are in high probability of getting back pain as earliest as possible.

2. METHODOLOGY

A cross sectional study was conducted among 96 computer users at offices in public universities, manufacturing industries, law firms and banking sectors. At baseline, risk factors associated with physical, individual and psychosocial were identified using questionnaires and objective measurement. Individual risk factors such as age, sex, height, body mass index (BMI), sleep quality, knowledge on ergonomics, hand dominance and hand grip strength were included for the back pain screening. Besides that, anthropometric measurements such as sitting height, forearm length, arm length and hand length were measured. Next, information on physical risk factors such as posture, chair design, desk design, monitor placement, keyboard, mouse, document holder, regular break and work station designs were assessed by using Rapid Office Strain Assessment (ROSA) [4] and questionnaire. Lastly, Job Content Questionnaire (JCQ) [5] was used to identify the psychosocial risk factors such as psychological demand, decision latitude, supervisor support, co-workers support and job insecurity. The prevalence of back pain for past one year among computer users in offices was measured by using Standardized Nordic questionnaire [6]. To develop a probability score to predict the occurrence of back pain among the computer users, a series of statistical analyses were conducted. The associations between each factor (individual, physical, and psychosocial) and back pain prevalence were evaluated by using univariate logistic regression analysis. Any factors with a p-value ≤ 0.1 were included in the multivariate analysis. Multivariate logistic regression analysis with backward stepwise selection was then performed to identify the potential factors and to construct an optimal model to predict the prevalence of back pain. Statistical significance was set at 5 % level. Based on the model, a simplified scoring system was developed based on the coefficient values. A score was assigned to each variable based on the value of the beta (β) coefficient. The β coefficients for each factor were divided by the smallest absolute value of the regression coefficient and then rounded to the nearest integers. The score for the risk factors which has the smallest β coefficient value was given as 1. The reference level of each categorical factor was assigned as zero. A total score for the probability of developing back pain was calculated as the summation of each variable. A receiver-operating characteristic (ROC) curve and the area under the curve (AUC) were calculated to evaluate the discriminatory ability of the score index. The cut-off score that gave the maximum summation of sensitivity, specificity, Positive Predictive Value (PPV), and Negative Predictive Value (NPV) was taken as an optimum. All statistical analyses were performed using SPSS for Windows 24.

3. RESULT AND DISCUSSION

The screening tool developed by this study consists of three items: back posture (assessed by ROSA), regular break and lack of sleep. The sleep quality was assigned with a score of 1 for 'No' answer and a score of 0 for 'Yes'. For back posture, the score was assigned as 1(x), whereby the 'x' was the score derived from the posture section of the ROSA checklist. Hence, the score for back posture ranges from 1 to 4. Meanwhile, the regular break was assigned with a score 1 for 'No' and a score of 0 for 'Yes'. The total score for an individual [1 (sleep quality) + 1x (Back Posture) - 1 (regular break)] could range from -1 to 5, with a higher score indicating a higher probability of developing back pain. A cut off score of at least 1.5 ≥ had sensitivity of 93 % and specificity of 31 %. The positive and negative predicted values were 82 % and 58 %, respectively. The area under the receiving operating characteristics curve (ROC) was 0.72 (95 % CI 0.59-0.84) [Figure 1].

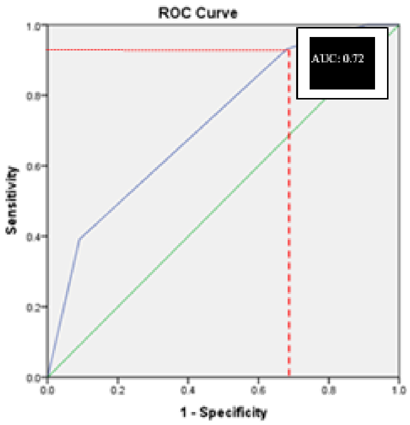

Figure 1 The ROC Curve for Back Pain Cut off Score of ≥ 1.5 Score

Here is an example of a case study to demonstrate how the screening tool works. Consider a 40 years old male computer users in the office, with complaints of lack of sleep and overall ROSA score for back posture, is 3. Meanwhile, the worker is having a regular break in his job.

His total probability score for back pain is:
{1(1) [Lack of sleep] + 1(2) [Back posture] – 1(0) [Regular Break]}
= 3, whereby the score is > than the cut- off point score of 1.5. Therefore, the worker is having a high probability of getting back pain.

The screening tool which is developed in the current study is extremely easy to execute and can be implemented within a short span of time because it mainly depends on subjective information from a worker. However, one of the limitations of the screening tool might be to identify the accurate back posture based on the static picture. To overcome this limitation, computer users or ergonomists who applying this screening tool need to observe the worker back posture during the computing tasks to avoid any wrong misclassification of the outcome which possibly compromises the total score of screening tool. Within the above stated drawback, the screening tool is a promising tool for the early identification of computer users who are in high probability of getting back pain, who will receive the huge benefits from the early prevention measures. The screening tool developed by this study can be utilized by ergonomists or safety health officers to identity computer users who are in less probability of getting back pain and eliminate them from undergoing an initial ergonomics risk assessment. This will indirectly reduce the time and cost of assessment by assessing only the high probability or target group.

4. CONCLUSIONS

A screening tool for early detection of back pain among computer users working in office was developed, and it contained 3 items with scores ranging from -1 to 5. The current study shows that the score ≥ 1.5 appears to have an acceptable sensitivity, specificity, positive predictive value, and negative predictive value for the cut-off point of at least 1.5

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