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Evaluation of Office Ergonomic Risk Using Rapid Office Strain Assessment (ROSA)

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ABSTRACT

Musculoskeletal Disorders (MSDs) caused by computer use have become the most common ergonomic risks. The risk experienced can be in the form of financial losses or even lives. Therefore, efforts are needed to prevent the occurrence of ergonomic risks so as not to cause large losses. The Rapid Office Strain Assessment (ROSA) has been designed to identify ergonomic risk factors and is reliable for the assessment of office workers' MSDs. This study evaluates the potential risk of ergonomics in female office workers because a previous study found that MSDs were more common in women. From the two workers observed, it was found that workers 1 and 2 received different scores on several assessment components. The different things are the length of the seat holder, armrests, spine brace, and keyboard. This difference is caused by body posture and different types of chairs. The length of the chair and the spinal brace is influenced by the different postures of the two workers. Worker 1 has a shorter upper leg length than worker 2, so she cannot use the backbone section of the chair. Although there are differences in scores on some components of the assessment, both workers have the same final ROSA score, which is 5. This indicates that further posture assessment needs to be done using tools other than ROSA to detect the specific cause of MSDs levels.

Keywords: Musculoskeletal disorders, Ergonomic risk, Rapid Office Strain Assessment

1. INTRODUCTION

The use of computers has increased significantly over the past 20 years and can be found in almost all workplaces (Bagheri and GHaljahi, 2019). Although it can increase production and productivity, there are bad effects from the computer such as psychological pressure, musculoskeletal disorders (MSDs), and fatigue (Bagheri and GHaljahi, 2019). MSDs caused by computer use has become the most common ergonomic problems (Matos and Arezes, 2015; Sartang and Habibi, 2015; Talab *et al.*, 2017). This problem arises because of static work, inappropriate posture, or repetitive movements of the upper limbs (Chaiklieng and Krusun, 2015; Poochada and Chaiklieng, 2015) In more detail, workers usually perform their functions in a sitting position and work with office equipment such as computers (monitors, keyboards and mouse), telephones and documents (Matos and Arezes, 2015). This condition has a high-risk factor for ergonomics in the long run (Sartang and Habibi, 2015; Bagheri and GHaljahi, 2019). The risks experienced can be in the form of financial losses, loss of life (Bagheri and GHaljahi, 2019) and work motivation issues (Tannady, Erlyana and Nurprihatin, 2019). Therefore, efforts are needed to prevent the occurrence of ergonomic risks so as not to cause large losses (Bagheri and GHaljahi, 2019).

Several approaches and strategies have been introduced to overcome work fatigue and reduce MSDs, including preparing training programs on ergonomic principles, job rotation and relaxing time arrangements among

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employees (Bagheri and GHaljahi, 2019). In terms of ergonomic principles, posture assessment techniques are very effective in identifying potential fatigue (Talab *et al.*, 2017). The Rapid Office Strain Assessment (ROSA) has been designed to identify ergonomic risk factors and is reliable for the assessment of office workers' MSDs (Poochada and Chaiklieng, 2015).

This study evaluates the potential risks of ergonomics in office workers using ROSA. MSDs occur more in female workers than in men (Sartang and Habibi, 2015), so this study discusses two female operators.

Several studies have tried to find a relationship between MSDs measurement in ROSA with other measurement tools. Previous research tested the performance of Rapid Upper Limb Assessment (RULA) and ROSA to predicted MSDs risk using One-Way Analysis of Variance (ANOVA), Pearson correlation coefficient, and chi-square test (Talab *et al.*, 2017). Other studies showed that the measurement of MSDs in ROSA and work-related fatigue in the Geldard Burnout Inventory (GBI) correlate directly and significantly (Bagheri and GHaljahi, 2019).

Other measurement tools had been used to improve ROSA performance. Previous studies analyzed respondents using the Nordic questionnaire first, before measuring ROSA (Sartang and Habibi, 2015). Other studies have proposed a combination of ROSA and The Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) in the assessment of pain in the shoulder (Chaiklieng and Krusun, 2015). Meanwhile, ROSA is used directly to assess the potential of MSDs (Matos and Arezes, 2015).

Researchers have divided the final ROSA score according to the level of ergonomic risk, such as (Chaiklieng and Krusun, 2015):

1 = low (score 1-2)
2 = medium (score 3-4)
3 = high (score 5-7)
4 = very high (score 8-10)

If the final ROSA score is greater than 5, a further ergonomics assessment and a work station improvement is needed (Chaiklieng and Krusun, 2015). If the level of risk is very high, then improvements must be done immediately (Chaiklieng and Krusun, 2015).

2. METHODOLOGY

In this study, the calculation of ROSA is done by obtaining data from 3 (three) parts, namely Parts A, B, and C. Figure 1 shows the stages of data processing from the three sections to the conclusions and recommendations. In Part A, the data are chair height, seat length, armrest, spinal support, and Part A duration. Meanwhile, the data in Part B consists of monitor usage data, monitor usage duration, telephone usage, and duration of use telephone. Finally, the data in Part C are about the use of the mouse, the duration of the use of the mouse, the keyboard, and the duration of the use of the keyboard. In Part A, the duration is added when calculating the Final ROSA Score, while in Parts B and C, the duration is added directly to each assessment component.

Data in Parts B and C are used to obtain Monitor and Peripheral Scores. Monitor and Peripheral scores are then used in conjunction with Part A to obtain the ROSA final score results. Furthermore, based on these scores conclusions and recommendations can be obtained according to the principles of ergonomics.

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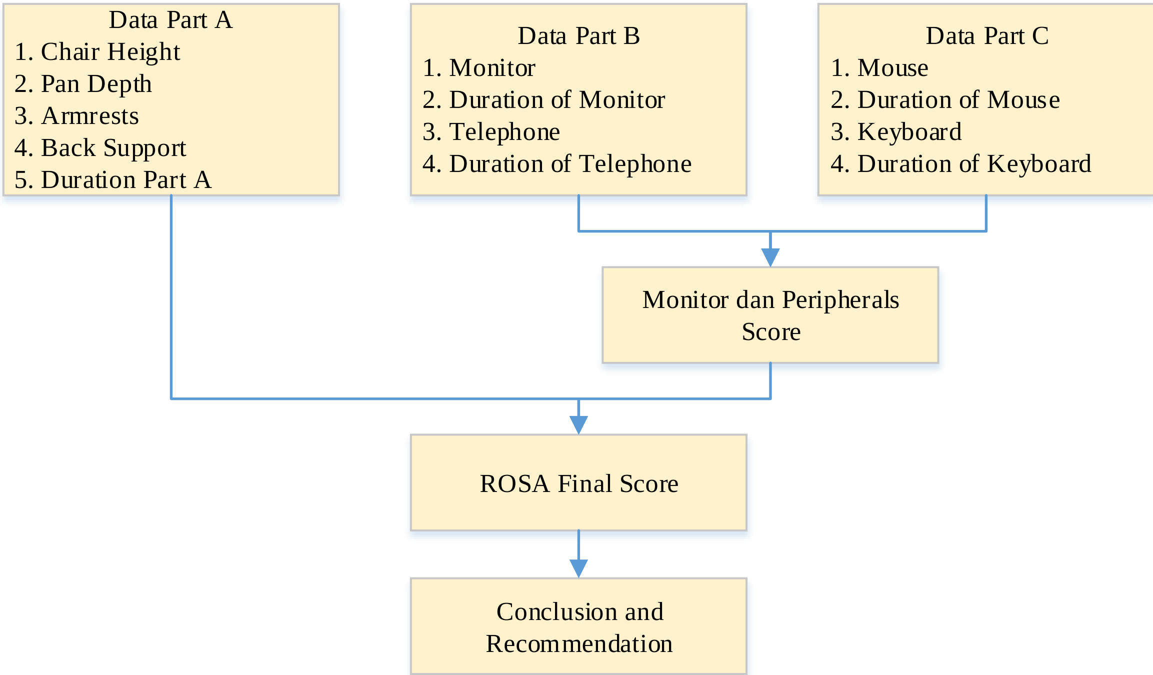

Figure 1. Data Processing Stages

3. RESULTS AND DISCUSSION

Table 1 explains the results of the ROSA assessment of both workers. From the two workers observed, it is found that workers 1 and 2 received the same value in several assessment components. The assessment components referred to are seat height, duration of Part A, all components in Part B, use of the mouse, duration of use of the mouse, and duration of use of the keyboard.

The different things are the length of the seat holder, armrests, spine brace, and keyboard. This difference is caused by body posture and different types of chairs. The length of the chair and the spinal brace is influenced by the different postures of the two workers. Worker 1 has a shorter upper leg length than worker 2, so she cannot use the backbone section of the chair. Besides, the type of chair is also different, namely worker 1 uses a chair with armrest features, while worker 2 does not get a similar chair. Regarding the keyboard, worker 1 uses a keyboard with an adjustable height. Meanwhile, worker 2 uses a laptop so that she cannot adjust the height of the keyboard at the time of writing.

Although there are differences in scores on some components of the assessment, both workers have the same final ROSA score, which is 5. This indicates that further posture assessment needs to be done using tools other than ROSA to detect the specific cause of MSDs levels. Furthermore, work station improvements can be made under the measurement results.

Table 1. ROSA Assessment Results

Variable	Worker 1	Worker 2
Part A		
Chair Height	2	2
Pan Depth	2	3
Armrests	2	3
Back Support	3	2
Duration Part A	1	1
Part B		
Monitor	2	2
Duration of Monitor	1	1
Telephone	2	2
Duration of Telephone	-1	-1
Part C		
Mouse	1	1
Duration of Mouse	1	1
Keyboard	1	2
Duration of Keyboard	1	1
ROSA Final Score	5	5

4. CONCLUSION

Taking into account that humans are the most important resource of every organization (Bagheri and GHaljahi, 2019), it is necessary to improve work behavior, ergonomics risk assessment, ergonomic work station design, and supervision of MSDs among computer users (Chaiklieng and Krusun, 2015; Sartang and Habibi, 2015). With the final ROSA scores for

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both workers obtained (score 5), it is necessary to assess the level of ergonomic risk with other tools, for example, Quick Exposure Check (QEC) (Pratama *et al.*, 2017), RULA or Rapid Entire Body Assessment (REBA). As a follow-up, improvements to the work station must still be done.

Future studies can use more specific sample rooms, for example, the graphic design workforce community with other ergonomic components such as noise and lighting levels (Tannady, Nurprihatin and Chandra, 2017). Future studies can also predict productivity based on the production function of Cobb-Douglas (Nurprihatin and Tannady, 2017), and the level of risk of MSDs in ROSA. It is expected that there is high productivity that can answer the needs of consumers so they get a good title (Tannady, Nurprihatin and Hartono, 2018). Study of workload (Nurprihatin, Yulita and Caesaron, 2017; Lestari, Tannady and Nurprihatin, 2018) can also be done to reduce the level of waste (Tannady *et al.*, 2019), and the workload of each worker. If the additional workforce is needed, then a feasibility analysis with Benefit-Cost Ratio (BCR) is necessary (Nurprihatin *et al.*, 2019).

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