

Analysis of Improved Work Posture to Reduce Musculoskeletal Disorders using the Rapid Upper Limb Assessment and Ovako Work Posture Analysis System methods (Case Study : Employees in the Warehouse of PT. AFS Maros, South Sulawesi)

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Abstract— PT. AFS is a Limited Liability Company engaged in catering services. One of the most important divisions in this field is the warehousing department. Receiving is the place where the goods are entered, while the store is the place where the goods are stored for some time regarding the expiration date of the product. Goods collection is done when receiving incoming goods, moving goods from the receptionist to the store, and when requesting goods from the production room. Body posture is a determining factor in analyzing the effectiveness of a warehouse operator's work. If the operator's work attitude is wrong or not ergonomic, the employee will tire easily and bone abnormalities can occur. Complaints of Musculoskeletal Disorders are complaints of skeletal muscles that are felt by a person from very mild to severe complaints. For the RULA and OWAS methods, posture analysis is only carried out in the main warehouse. The final Rapid Upper Body Limb Assessment (RULA) score for both workers was Score 7 (Action Level 4) which indicates that this condition is dangerous and requires immediate inspection and changes (on the spot). And the Ovako Work Posture Analysis System (OWAS) shows Category 4 (This attitude is very dangerous for the musculoskeletal system. Needs to be corrected immediately/currently) and Category 1 (in this system problems in the musculoskeletal system don't need to be fixed).

Keywords: Musculoskeletal Disorders, OWAS, RULA, Warehouse.

I. INTRODUCTION

Ergonomics is defined as the study of human influence on the work environment based on psychology, engineering, anatomy, management, and planning and design. In addition, ergonomics is also related to optimization, efficiency, safety, and health as well as human comfort in the work environment [1].

PT. AFS is a Limited Liability Company that focuses on catering services. This company was founded in 1996 and initially only served the needs of "airlines catering". With growing market demands, this company also serves catering for the needs of companies, such as Education and Training Centers, or seminars, as well as other events held by companies in Maros, South Sulawesi.

This company has its warehouse as a place to store goods, namely in the receiving and store sections. Receiving is a place where goods enter, while a store is a place for storing goods for a long time until the product is used for the production process regarding the product's expiration date. Lifting of goods is carried out when receiving incoming goods, transferring goods from receiving to stores, and when requesting goods from the production room or each division such as hot kitchen, bakery, pastry, meal prepared, cold kitchen, hot dishing, and others.

Body posture is a determining point in analyzing the effectiveness of a job. If the work attitude is good and ergonomic, certainly that the results obtained by the workers will also be good, but if the operator's work attitude is wrong or not ergonomic, the workers will easily tire and abnormalities in bone shape can occur [2].

Rapid Upper Limb Assessment (RULA) is a method developed in the field of ergonomics that invests and assesses the work position

performed by the upper body [3]. The Ovako Work Posture Analysis System (OWAS) is a work attitude analysis method that defines the movement of the body parts of the back, arms, legs, and the weight lifted. Each member of the body is classified into a working attitude. The attitude of the observed body parts is the back, arms, legs, and the weight of the worker's load [4].

The workforce working in the warehouse of PT. AFS as many as 4 people. The activity of lifting goods using a carrier. Meanwhile, the transfer of goods from the conveyor to the pallet or the shelves of goods is done manually namely the transfer of goods is carried out by interacting directly with the body of the worker (direct lifting of goods).

Musculoskeletal disorder complaints (MSDs) are complaints on the part of the skeletal muscles that a person feels ranging from very mild to severe complaints [5]. The movement of goods is dominated by body movements which will put pressure on the nerves, blood vessels, and muscles in all parts of the body, especially the shoulders, neck, head, arms, wrists, and feet. The result can lead to musculoskeletal disorders in the body.

Therefore it is necessary to research to reduce musculoskeletal complaints using the Nordic Body Map method and to measure the work posture of workers ergonomically using the RULA and OWAS methods.

II. METHODOLOGY

The variables examined in this research are work posture and musculoskeletal

complaints. Work posture was measured using the RULA (Rapid Upper Limb Assessment) method and the OWAS (Ovako Work Posture Analysis System) method. Musculoskeletal complaints are measured using the Nordic Body Map.

Musculoskeletal Disorders are one of the injuries that workers often experience in doing Manual Material Handling (MMH) activities, namely injuries to muscles, nerves, tendons, bones, bone joints, and cartilage caused by work activities. When a person works in a standing or sitting position, the movement of the spine, especially the waist is vulnerable to extreme movements that can cause injury [6].

RULA or Rapid Upper Limb Assessment was developed by Dr. Lynn McAttanmey and Dr. Nigel Corlett who investigates and evaluates the work position performed by the upper body. This equipment does not perform special equipment in providing measurements of the posture of the neck, back, and upper body in line with muscle function and external loads supported by the body. The Ovako Working Posture Analysis System (OWAS) method is a method that evaluates and analyzes uncomfortable work attitudes that result in musculoskeletal injuries.

The working attitude part that was observed included the movement of body parts from the back, shoulders, hands, and feet. The results of the research show that the OWAS method is effective in assessing, evaluating, and analyzing work attitudes until categories and work method recommendations are obtained [7].

Here are (figure 1) the stages of the process to draw conclusions and suggestions.

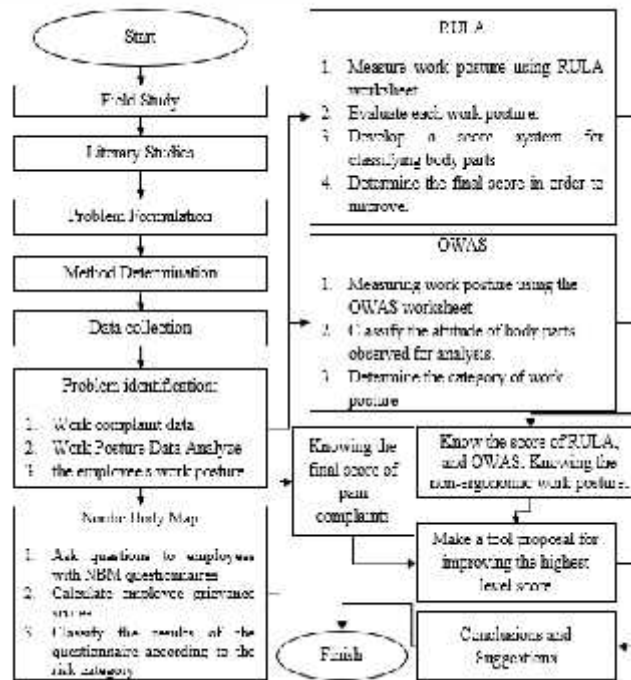


Figure 1. Research Methodology

III. RESULT AND DISCUSSION

Based on the interviews conducted with the employees, the data obtained was 1 person over 20 years old (25%), and 3 people over 40 years old (75%) with male sex. With the height of the average worker above 160 cm.

Based on observations and interview results

Table 1. Subject Characteristic

Employee	Job Specification	Working Hours	Age	Length of Work	Height
1st Employee	Warehouse Coordinator	9 jam	41	16	170 cm
2nd Employee	Main Warehouse	8 jam	41	21	165 cm
3rd Employee	Cold Storage	8 jam	48	8	162 cm
Pekerja ke 4	Main Warehouse and Receiving	9 jam	24	2	171 cm

at PT. AFS, shifts from workers are 9 hours and 6 hours. For the 6 hours, go to work from 06.00 - 12.00 WITA, and 10.00 - 16.00 WITA. Then for the 9 hours, it is from 08.00 - 17.00 WITA. The following of table 1 is the characteristics of the research subject:

Figure 2 is a graph of pain complaints on the workers' bodies based on the Nordic Body

Maps questionnaire:



Figure 2. Result of Nordic Body Maps

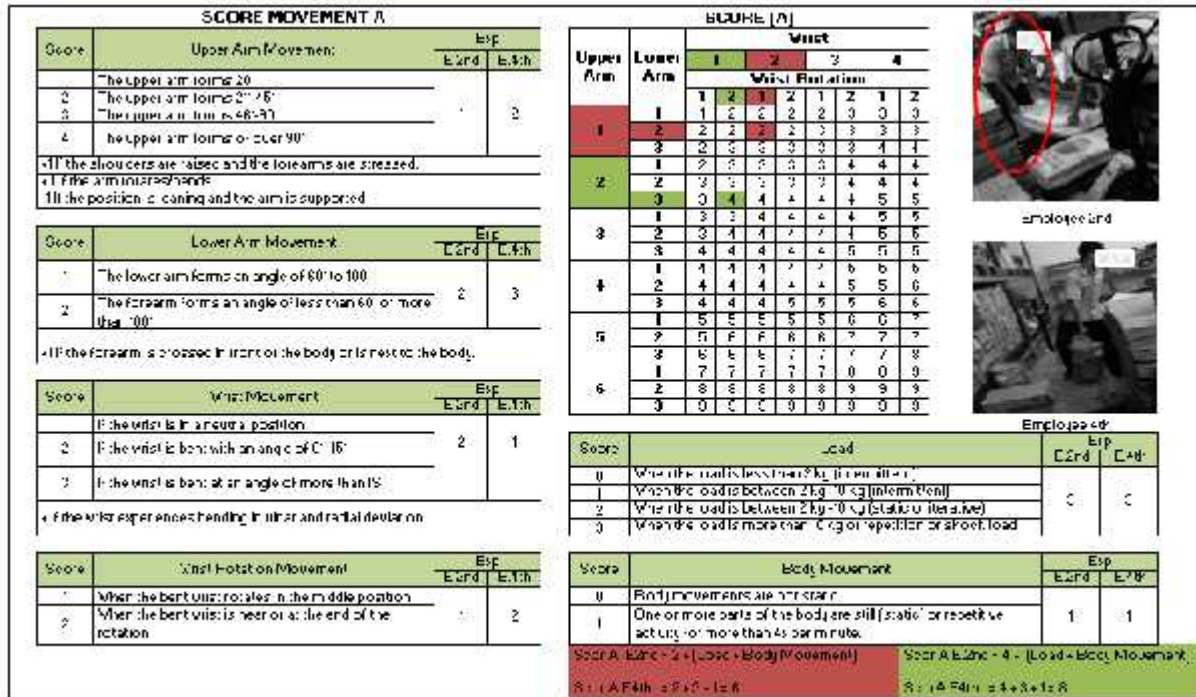


Figure 3. Score Movement A (RULA)

Description :

- 0 Pain in the upper neck
- 1 Stiffness in the lower neck
- 2 Stiffness in the left shoulder
- 3 Stiffness in the right shoulder
- 4 Stiffness in the left upper arm
- 5 Stiffness in the back
- 6 Stiffness in the right upper arm
- 7 Stiffness in the waist
- 8 Stiff in the ass
- 9 Stiff ass
- 10 Stiffness in the left elbow
- 11 Stiffness in the right elbow
- 12 Stiffness in the right forearm
- 13 Stiffness in the wrist of the left hand
- 14 Stiffness in the wrist of the right hand
- 15 Pain in the left hand
- 17 Pain in the right thigh
- 18 Pain in the left knee
- 19 Pain in the right knee
- 20 Pain in the right calf
- 21 Pain in the left ankle
- 22 Pain in the right ankle
- 23 Pain in the left leg
- 24 Pain in the right leg

The graphic aboveshow that the most problematic body part for the four workers is a

pain in the lower neck and back for worker 1, and pain in the upper right arm, waist, and buttocks for the 2nd Employee. For 3rd employee, there is stiff pain in the neck upper part, stiffness in the left and right shoulders, waist, buttocks, and stiffness in the right calf. 3rd Employee is in charge of moving materials from receiving into the refrigerator room, as well as organizing the materials in the refrigerator room.

For the RULA and OWAS methods, postural

analysis is performed only at the main warehouse. Therefore, the analyzed employees are 2 employees, namely the 2nd and 4th employees. The following Figure 3 is the result of data processing for the RULA method on Score A (upper body).

The following Figure 4 is the result of data processing for the RULA method on Score B (lowerbody) and the final RULA score.

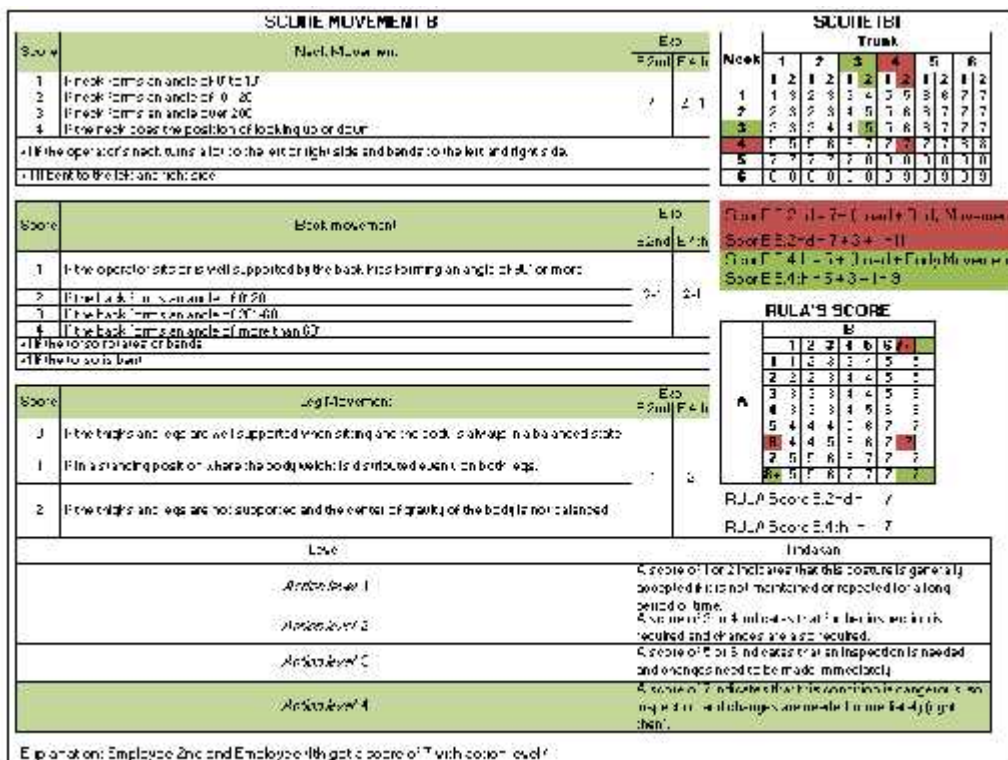


Figure 4. Score Movement B and RULA Score

And for the OWAS score can be seen in Figure 5 below.

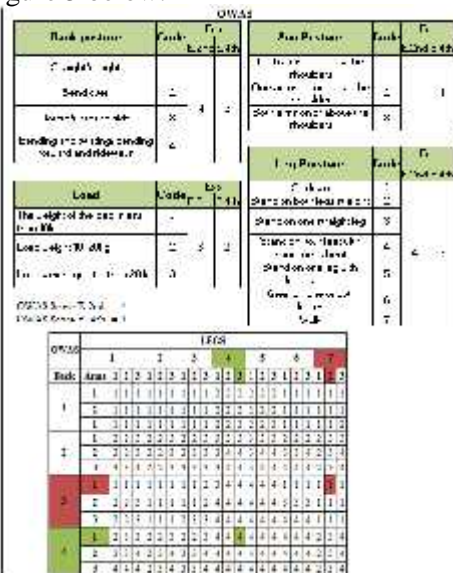


Figure 5. Ovako Work Posture Analysis SystemResult

The OWAS value of the 2nd employee is with a value of 4 and the 4th employee with a value of 1. The categories of OWAS results can be seen in Table 2 below.

Table 2. Category of OWAS

Category	Description
1	In this system, problems in the musculoskeletal system do not need to be repaired.
2	There is little danger to the musculoskeletal system. Needs improvement in the future.
3	Dangerous for the musculoskeletal system. Need to fix as soon as possible.

4	Very dangerous for the musculoskeletal system. Need to fix live/currently.
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Ovako Work Posture Analysis System (OWAS) for the 2nd employee, shows category 4 (This attitude is very dangerous for the musculoskeletal system. Needs to be corrected immediately/currently) and for the 4th employee, shows Category 1 (in this system problems in the musculoskeletal system don't need to be fixed).The results of RULA and OWAS values can be seen in a recapitulation of Figure 6.

Cooperatives No. Per 01/MEN/1978 concerning Occupational Safety and Health, the maximum allowable lifting load for an adult male is 40 kg if the work is done occasionally, 15-18 kg if work is done continuously. Whereas for young male workers, it is 15 kg once in a while and 10-15 kg if the work is done continuously[9].

IV. CONCLUSION

The final Rapid Upper Body Limb Assessment (RULA) score for both workers was Score 7 (Action Level 4) which indicates that this condition is dangerous and requires immediate inspection and changes (on the spot). And the Ovako Work Posture Analysis System (OWAS) shows Category 4 (This attitude is very dangerous

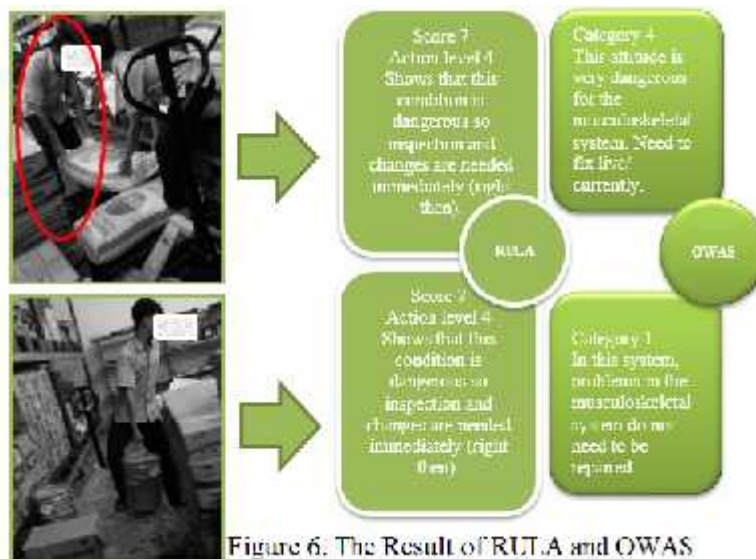


Figure 6. The Result of RULA and OWAS

When workers are standing while the standing elbow height[8].Meanwhile, according to the regulation of the Minister of Manpower, Transmigration and

for the musculoskeletal system. Needs to be corrected immediately/currently) and Category 1 (in this system problems in the musculoskeletal system don't need to be fixed).

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