Identification of Body Posture of Milkfish Satay Workers Using The Rula and Owas Method

Nurfajriah[1] and Mohammad Rachman Waluyo[2]

[1, 2] Industrial Engineering, Engineering Faculty, Universitas Pembangunan Nasional "Veteran", Jakarta, Indonesia

[1]nurfajriahzhia@gmail.com

Abstract. Manual workers are still commonly found in various work activities. Manual work done repeatedly with monotonous movements and long working time has the potential to cause work fatigue. In repetitive monotonous motion it can overload the muscles. Incorrect work posture can lead to excessive fatigue. This poor work posture is often caused by the design of work facilities that are less concerned with conformity with its users. From this study it was found that the current working method is less ergonomic because the testing with RULA and OWAS the majority of the indicators are on a scale of 4 and must be changed how its works. On milkfish management workers, refining milkfish spines, burning milkfish is a monotonous repetitive work that is not supported by appropriate facilities. Work posture with a stand and a twist and often bending. This study aims to redesign the work station to get a good work posture. designing work stations using 8.2 software jack. Work stations consisting of tables and chairs are designed with due regard to anthropometry and operator motion requirements. Design evaluation is done by evaluating the work posture using biomechanical analysis, using a toolkit analysis that includes analysis of SSP, LBA, RULA, and OWAS. Evaluation results in workers sitting with a well-built body position, the direction of the head parallel to the direction of the object subject to work, and the worker being avoided from the bending position and twist.

1. Introduction

In ergonomics, humans are the most important component that must be considered with all its limitations. Because humans become operators of their jobs. Postures and movements that occur during human work will involve the *musculoskeletal* system (muscles, ligaments and joints). Poor posture during work will result in excessive loading on the *musculoskeletal* system. If done repeatedly and for a long period of time will result in disruption of the *musculoskeletal* system such as inflammation, degenerative conditions that affect the muscles, nerves, tendons, ligaments, joints, and human spine. Milkfish Satay is a typical Banten food and is often found in the Serang area, Indonesia. Processed foods from milkfish were introduced by the Banten royal cook in the 16th century to entertain royal guests. Because milkfish has a lot of thorns so it is difficult to eat, so it creates satay milkfish and is still popular today [4]

Body posture in the process of making satay milkfish has not been ergonomic, causing sore complaints, especially on the knees, legs, back and hands. Based on this, it is necessary to conduct a study where the risk of injury, especially *musculoskeletal* disorder, has the potential to occur in an operator, so that a work tool design at the work station can be carried out to create effective, comfortable, safe, efficient and also minimizing the risk of injury to the operators working inside. This research is an experimental study using the design (time series design) of the research subjects are all workers who work as milkfish satay makers [4]

This anthropometry is closely related to the human centered design approach. This approach itself aims to design an equipment or work system based on human characteristics in order to accommodate the needs of as many users as possible of the work system. Characteristics in this context can also be interpreted as the body dimensions of the user [4] Therefore, before the design process itself is carried out, the designer must be able to know the body dimensions that will be a reference in the design and how the process of obtaining these body dimensions.

One of the ergonomic measuring instruments that can be used to identify the source of the causes of musculoskeletal complaints (muscle and skeletal system) is the Nordic body map. Through Nordic body map, it can be seen that parts of the muscles that experience complaints with the level of complaints ranging from feeling ill to very sick. This questionnaire was given before and after doing work [1].

OWAS is an ergonomic method used to evaluate postural stress that occurs to someone while working. The OWAS method was made by O. Karhu who came from Finland in 1981 to analyze postural stress in the field of manual work. The usefulness of the OWAS method is to improve the conditions of workers at work. So that work performance can be improved continuously. The results obtained from the OWAS method are used to design work improvement methods to increase productivity. Actually, the development of OWAS began in 1970 at the Fundia Wire company. This method was developed by Karhu and his friends at the Finnish Labor Health Laboratory (Institute of Occupational Health). This institution examines the influence of work attitudes on health problems such as pain in the back, neck, shoulders, legs, arms, and rheumatism. The study focused on the relationship between work posture and weight [2]

The OWAS method is one method that provides output in the form of work attitude categories that are at risk of workplace accidents at the musculoskeletal section. The OWAS method encodes work attitudes on the back, hands, feet and weight. Each section has its own classification. This method is fast in identifying work attitudes that have the potential to cause workplace accidents.

2. Research Methods

The study was conducted at milkfish satay Hj. Maryam, Banten, West Java. Research on the design of chairs and tables begins with the study of literature. Literature studies conducted by looking for theories relating to the research that will be done include the concept of ergonomics, Anthropometry, OWAS and the Nordic Body Map Questionnaire.

The literature study that has been done before is the basis that will be used to formulate problems and research objectives. The purpose of this study is to produce a work system improvement design that can improve the operator's work posture.

Data collection through interviews was conducted to find out complaints of discomfort and what difficulties were felt by the operator in the process of making satay milkfish. Then the Nordic Body Map questionnaire was given to operators to support the interview results. The questionnaire is in the form of questions to find out the parts of the muscle that have complaints when doing the making of satay milkfish. This questionnaire is given to research respondents, namely operators. At this stage the results of the questionnaire that have been given to the respondents are displayed.

The next step is to interpret complaints and operator expectations into the operator's needs. Operator complaints and expectations are obtained by means of interviews with operators which are expressed in statements, and supported by the results of the Nordic Body Map.

The next step is to assess the operator's posture when doing work whether the body posture is in accordance with ergonomic principles or not by using the OWAS (Ovako Working Analysis System) method in the process of making milkfish satay. After measuring the actual OWAS, the next step is to measure the operator's body dimensions of making satay milkfish using a Set Anthropometer. After the design is complete, a simulation is done using the software jack to find out whether the table and chair designs are ergonomic or not by measuring the value of the OWAS design of chairs and tables. When it's ergonomic, the design of the chair and table is made again.

3. Result and Discussion

In this Milkfish Satay making industry, anthropometric data is used to create virtual human modeling and virtual enviroment testing and is used in setting ergonomic design parameters for the proposed design configuration as the output of the research.

Anthropometry data in the study used secondary data, namely anthropometric data of Indonesian local male and female population based on international ergonomics journals: Anthropometry of Singaporean and Indonesia Populations by Tan Kay Chuan, et al, University of Singapore. Based the anthropometric data, it is then used as the basis for making virtual human modeling (mannequin) using Tecnomatix Jack 8.4 software by inputting Advanced Human Scaling to the 25 body segments provided in software jack 8.4 [3].

Figure 1. Result of Posture Simulation on the refining fish process

The result of posture evaluation Index refining milkfish process 1

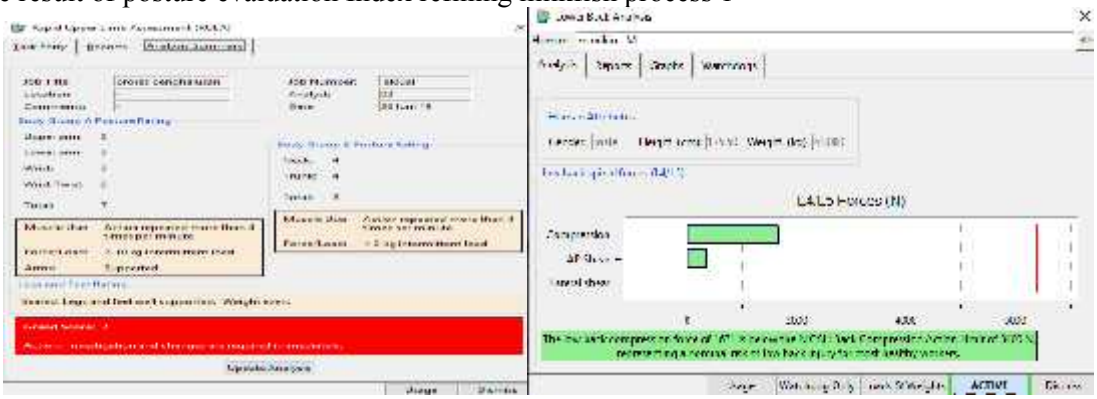


Figure 2. Result of RULA and LBA on refining milkfish

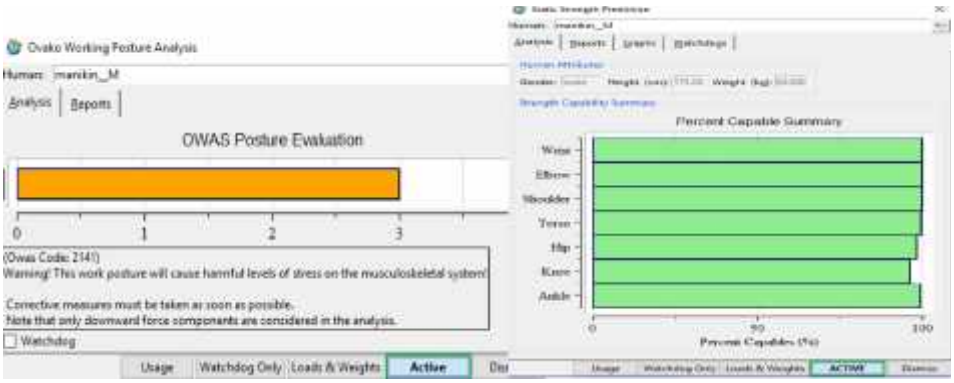


Figure 3. The result of OWAS

Result Posture Simulation on refining milkfish process 2

Figure 4. The body posture on refining milkfish process 2

The result of the posture Evaluation Index Assessment 2

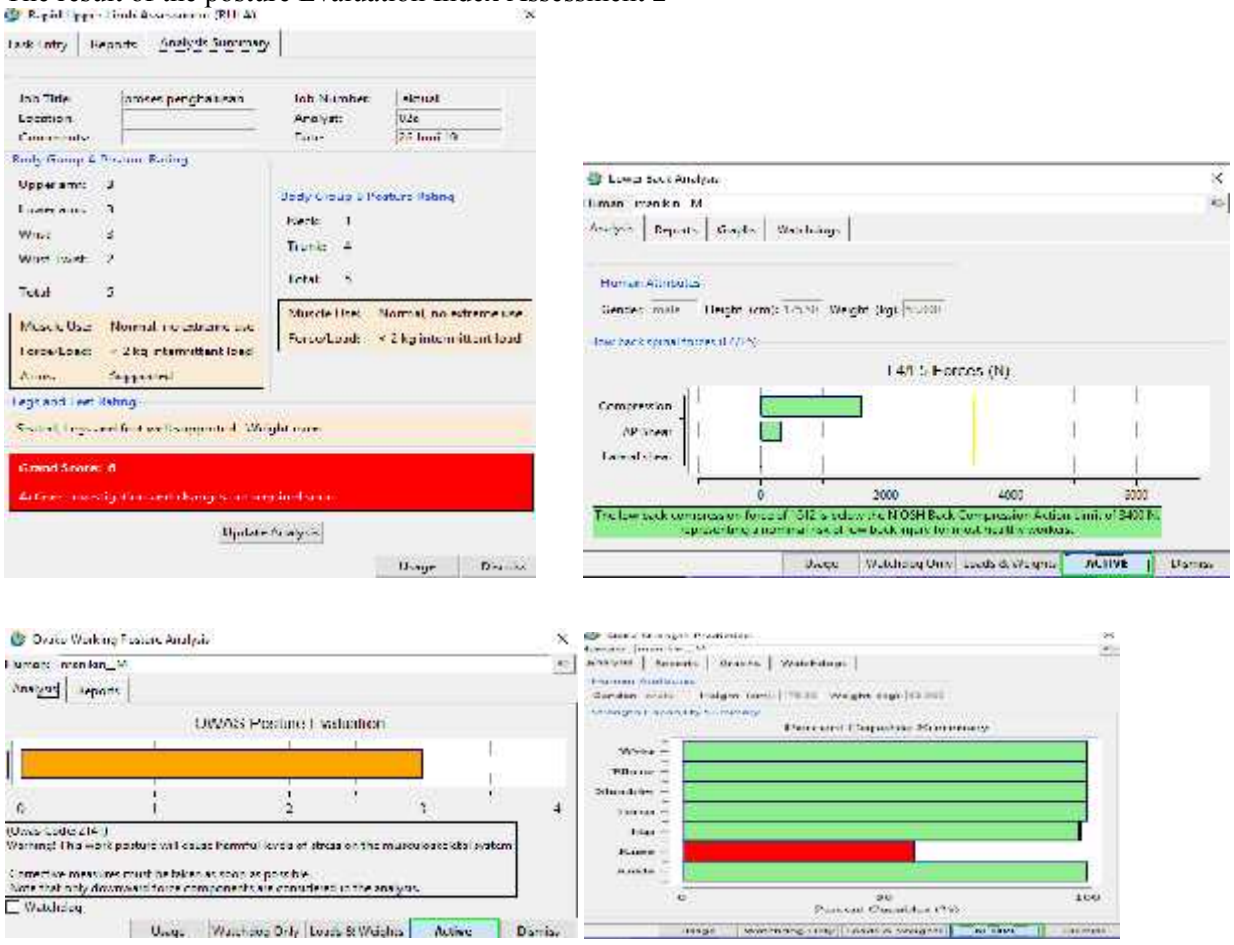
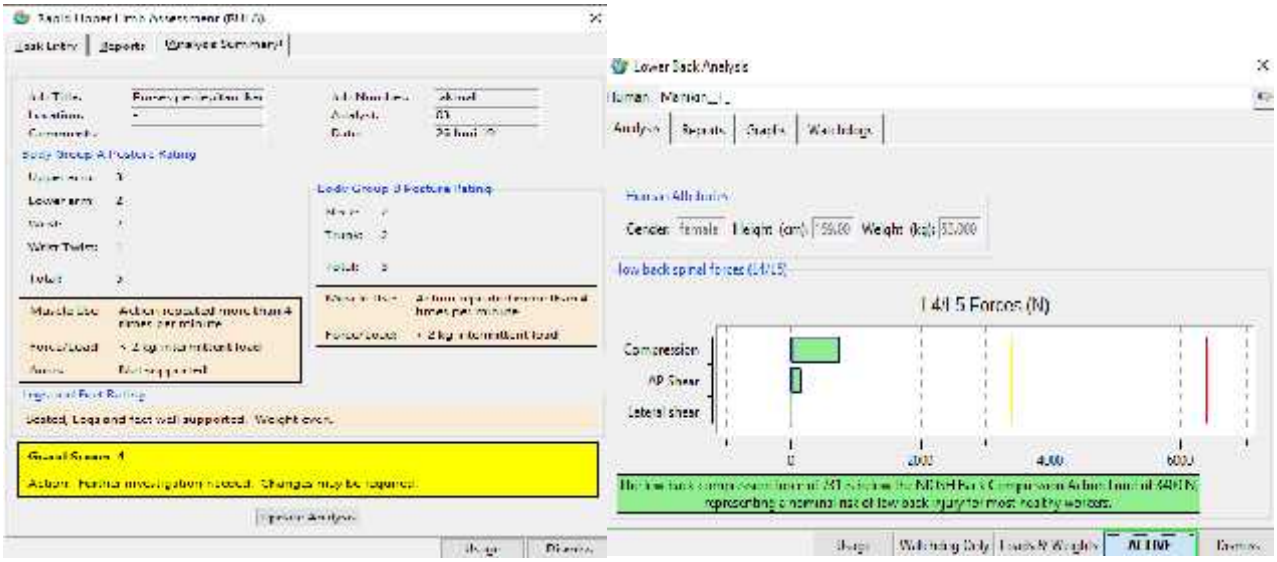


Figure 5. The result of RULA

Posture simulation result of making satay (clamping) process

Figure 6. The process of entering the contents of fish that have been seasoned into milkfish skin

The results of the posture Evaluation Index assessment process of making satay (clamping) Milkfish



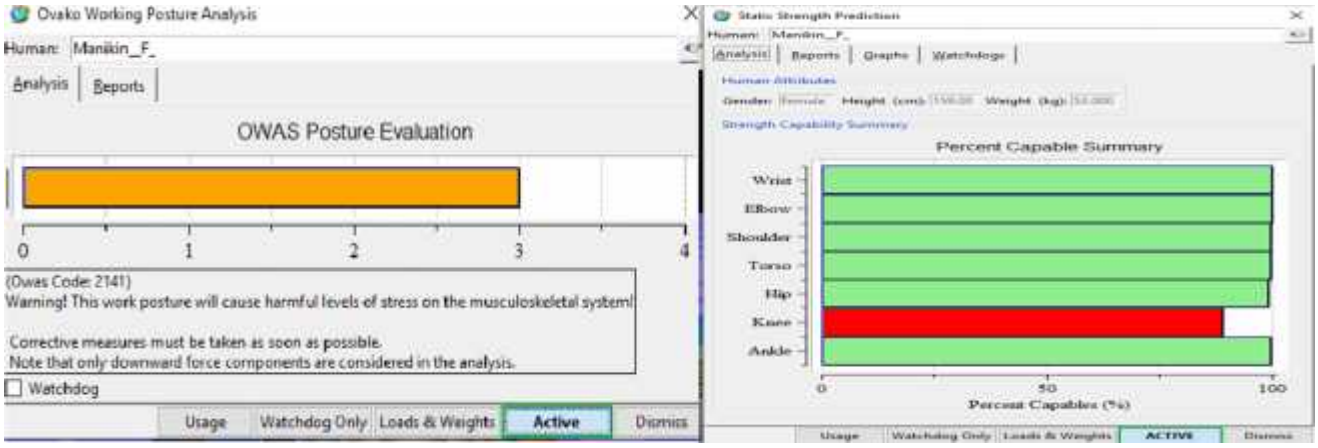
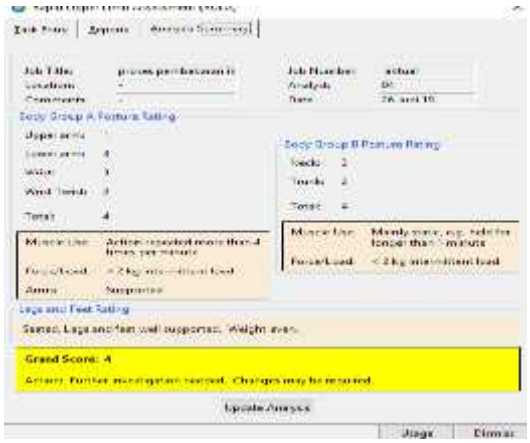


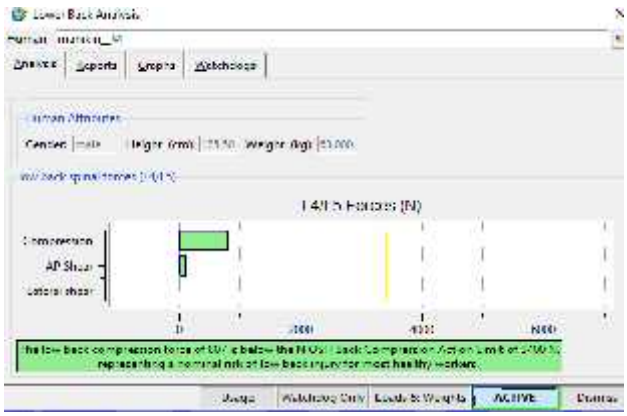
Figure 7. The result of RULA & OWAS

The results of the posture evaluation index of Milkfish Satay burning process

Figure 8. The process of burning milkfish

The results of the posture evaluation index of Milkfish Satay burning process





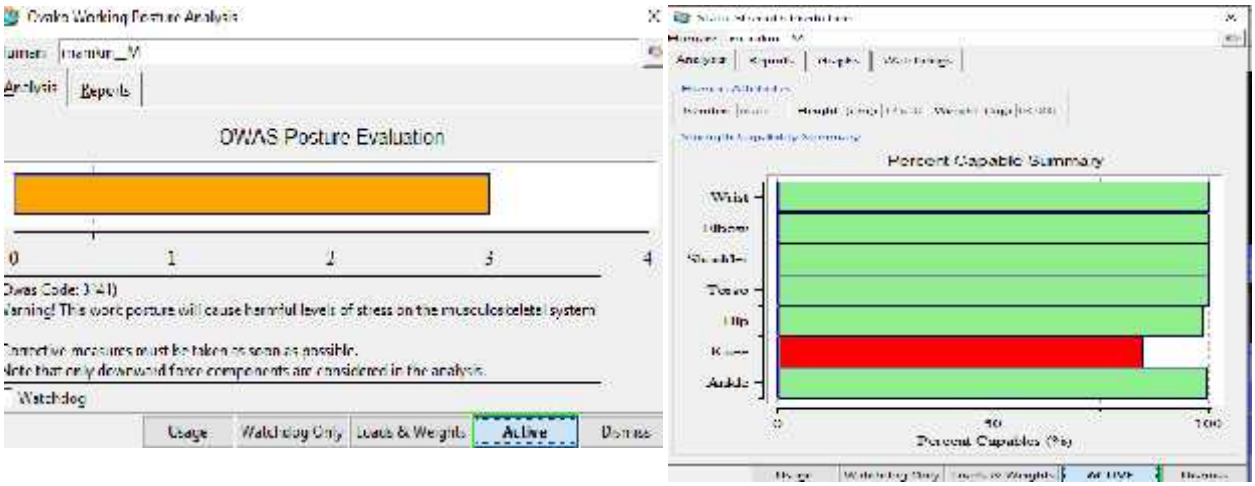


Figure 10. The result of RULA & OWAS

Based on the results of data processing and simulation of actual work posture using Software Jack, the results showed that in the first worker who process of refining had a value of RULA 7 and OWAS 3 which meant that needed repairs at this time and workers were at risk of musculoskeletal disorder while the second worker has the results of RULA and OWAS which are not much different, namely 6 and 3. So it needs to be improved now.

Improvements are made by designing tables and chairs that are tailored to the work done so that the work posture is more ergonomic. The following is a table and chair design for improving work posture.

4. Conclusion

The results of the research can be summarized as follows:

From this study it was found that the current working method is less ergonomic because the testing with RULA and OWAS the majority of the indicators are on a scale of 4 and must be changed how it works, because:

1. While testing the refining of milkfish with OWAS in the actual design ie 3. This shows that this design is quite dangerous to the musculoskeletal system of people using milkfish refiner and requires evaluation in the existing design. Then the RULA value shows a value of 7. This is the maximum value of RULA. A value of 7 states that the risk must be immediately investigated for possible risks of injury.
2. Judging from PEI the results of the actual design value of table chairs for milkfish 2 smoothing craftsmen currently have testing with LBA of 1612. This LBA shows that the design is quite safe and provides a fairly small risk of spinal cord injury based on the NIOSH 3400 N standard. refining test of milkfish 2 with OWAS in the aual design ie 3. This shows that this design is quite dangerous to the musculoskeletal system of people using milkfish refiner. and requires evaluation in the existing design. Furthermore, the RULA value shows a value of 6. Value 6 states that the risk must be immediately investigated further against the possible risk of injury.
3. The LBA shows that the design is safe and provides a very small risk of spinal injury based on the NIOSH 3400 N standard. with OWAS on the actual design, namely 3. This shows that this design is quite dangerous to the musculoskeletal system of people making satay and requires evaluation in existing designs. Furthermore, the RULA value shows a value of 4. Value 4 states that the risk must be investigated because in order to minimize the possibility of injury risk.

4. This LBA shows that the design is safe and very infrequent injury based on the NIOSH 3400 N standard. namely 3. This shows that this design is quite dangerous for people who are doing the burning of satay milk. Furthermore, the RULA value shows a value of 4. Value 4 states that the risk must be investigated because in order to minimize the possibility of injury risk.

References

[1] Chuan, Tan Kay, Hartono, Markus, Kumar, Naresh. International Journal of Industrial Ergonomics.
[2] Anthropometry of the Singaporean and Indonesian populations. National University of Singapore. 2010.
[3] Kalawsky, R. The Science of Virtual Reality and Virtual Environments. Gambridge: Addison Wesley Publishing Company. 1993.
[4] The International Ergonomics Association. The Discipline of Ergonomics. www.iea.cc. 2000