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IMPROVEMENT OF THE WORKING SYSTEM IN MR. WASH LAUNDRY USING ERGONOMIC PARTICIPATORY METHOD

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ABSTRACT

Mr. Wash laundry is one of the Small and Medium Enterprises (SME) located in Yogyakarta. This business was founded in 2015 with 2 workers. In work operations, many involve physical activities that can cause fatigue and musculoskeletal complaints, causing decreased productivity and miscommunication to consumers. Therefore, this research was conducted to improve the work system to minimize these impacts. The method in this study uses an ergonomics participator. This method involves a participatory team, namely ergonomists, owners, and workers. The result of this research is the design of an ironing table and chair using the anthropometric specifications of workers which can reduce fatigue and musculoskeletal complaints.

Keywords: work system; musculoskeletal; anthropometry; participatory ergonomics.

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1. INTRODUCTION

The times are very significant, encouraging people to find instant and practical ways to complete their daily tasks. One of them is the problem of washing clothes. These problems can usually take up human time and increase one's workload. The solution that recently emerged is the presence of laundry (Soewardi. Et al., 2015; Husain, et al, 2013). Laundry is a service company that serves washing and washing in a very short time (Dewi et al., 2014). Currently, there is laundry in big cities (Husain, et al, 2013), especially Yogyakarta with a population that has high mobility, and many students are land benefits that can be taken.

Mr. Wash laundry is one of the Small and Medium Enterprises (SME) located on Jalan Kaliurang KM 15 Degolan, Sleman, Yogyakarta. This business was founded in 2015 with 2 workers. Operational hours

start from 08.00 - 20.00 WIB divided into 2 shifts. Shift 1 at 08.00 - 16.00, while shifting 2 at 13.00 - 20.00 WIB without holidays. Based on the interview, there were several obstacles experienced by workers. Workers feel tired, uncomfortable, painful, and sore when doing their work. Work attitudes and the equipment used cause musculoskeletal complaints which have an impact on decreased work productivity (Nugraha et al., 2013). This can interfere with productivity at work

The problem at Mr. Wash Laundry is caused by the work system not working optimally. Based on observations many obstacles are detrimental to consumers. In 2017, within 1 month of inconsistent settlement to consumers, there were 4-6 times. Losing clothes 4-5 times and changing the color of consumers' clothes occurs 5-8 times.

The research method used for improvement is participatory ergonomics. Repairs are carried out by actively involving workers, owners, and ergonomists. Several studies related to this method include Paripatory ergonomics for redesigning the family circle health process, aiming to redesign the complex health care process of a family-centered around (FCR) in a children's hospital (Carayon, et al., 2014)). The impact of participatory ergonomics on working conditions, quality, and productivity, aims to improve working conditions, quality, and productivity in medium-sized manufacturing companies by utilizing a team of support experts (Motamedzade, et al, 2015). Participatory ergonomics to reduce injury costs and increase production in New South Wales mines (Newton, 2015). Ergonomics interventions in the Iranian Tire manufacturing industry with participatory ergonomics methods that aim to improve working conditions (Motamedzade, 2013). Ergonomics design of cafe chairs with participatory design, aimed at product comfort for cafe chairs (Wajdi, et al., 2014). The application of Participatory Ergonomics in improving the K3 system in the laminating and cutting sections aims to maximize employee potential, environmental conditions and adapt appropriate technology to improve work safety (Sukapto, et al., 2016). Based on the above studies, the researchers tried to improve the work system at Mr. Wash Laundry using ergonomics to reduce fatigue and musculoskeletal complaints.

2. METHOD

2.1. Research Design

The research method used to improve the work system Mr. Wash laundry at Jalan Kaliurang KM 15 Degolan, Sleman, Yogyakarta, namely ergonomics partisipatori. The concept of this method applies to the impact of complaints and solutions desired by workers. The sample population of this research is 2 workers, 1 owner, and 1 ergonomist.

2.2. Research Variables

There are 3 variables used in the study, namely (1) independent variables, namely improvement of the work system; (2) dependent variable, namely the level of worker productivity; (3) the intervening variable, namely the level of fatigue and musculoskeletal complaints among workers

2.3. Method of Collecting Data

Data collection is carried out in research, among others (1) direct survey to determine the real working system conditions; (2) direct owner interviews; (3) direct interviews and distributing questionnaires to workers. The material in question was related to discomfort, fatigue and musculoskeletal complaints; (4) direct interviews with ergonomists. Interview material related to improvements that must be made.

2.4. Research Stages

2.4.1. Stage I

Conduct field surveys on issues that are crucial and need fixing.

2.4.2. Stage II

Carry out a participatory process by conducting interviews and Focus Group Discussions (FGD) on owners, workers, and ergonomists. The steps taken include:

a. Identification of Complaints
   Identification is carried out for each worker to determine the condition of the complaints that are felt against the existing work system.
b. Ask the participatory team for suggestions.
   This suggestion is to improve worker complaints on work station conditions, work environment, working hours, and breaks based on their respective expertise. The work team consists of researchers, owners, employees, and ergonomists.
c. Improved design
   The improvement design is carried out to redesign the work system so that employees are more comfortable and productive to produce satisfactory service quality for consumers.
d. Implementing remedial alternatives.
   Alternative applications are carried out to determine the best by the wishes and needs of workers that have an impact on consumer satisfaction
e. Implement a corrective plan
   Conducting a working system comparison test before repairs are made and after repairs are made.

2.4.3. Stage III

Determine improvements to the new work system that will be carried out in a participatory manner with the agreement of the owner

2.4.4. Stage IV

Conducting interviews with workers after changes to the new work system are carried out, namely the level of comfort to increase productivity. As well as distributing questionnaires using the Nordic Body Map to workers to find out musculoskeletal complaints.

3. RESULT AND DISCUSSION

Based on the results of the identification process of Mr. Wash Laundry's work system which is carried out by a participatory team. As for the improvement of the work environment which can be explained in Table 1

Table 1. Before and After Repair

Factors	Before	After
Physical Environment		
Lighting	2 lamps that do not meet the standard, namely 11 watts	Replacing 2 lamps with 23 watts
Temperature	The fan is not functioning optimally because it is dirty and dusty	Fan cleaning regularly and periodically
Air	Consumers' dirty laundry that has just arrived is not immediately handled	Fostering workers in handling queues with a first come-first out system
Space for Movement	Laying unused items are not returned immediately	Fostering workers to put items that are no longer in use neatly
Ironing Table	Causes musculoskeletal disorder, such as: • Elbow left and right shoulder • Left and right shoulders	Recommends repairing the ironing board according to the worker's

	• Right arm • • Right wrist	anthropometry and giving a 30 minute break
Ironing chair	Causes musculoskeletal disorder, such as: • Lower neck • Back • Back waist • Back hips • Left and right thigh • Left and right knee • Left and right calves • Ankle	Recommends repairing the ironing chair according to the worker's anthropometry and giving a 30-minute break
Non-physical environment		
	The absence of operational standards regarding written services, resulting in miss-communication between consumers, such as changes in clothing color and loss	Creating and fostering workers to perform operational standards regarding service to consumers
	Employees feel tired without a day off from work	Make a day off schedule by using shifts and adding part-time workers

Based on Table 1. repairs are carried out in stages that have been approved by the participatory team. In reducing fatigue, complaints of musculoskeletal disorders, and increasing worker productivity, the participatory team proposed designing an ironing table and chair to reduce complaints by using interviews and questionnaires for the Nordic Body Map which were distributed to workers. The design specifications include:

a. Chair height, using the average popliteal height of workers with the 5th percentile. 5th percentile so that short workers do not hang (Parcells, et al, 1999); TayyariF, et al, 1997); Purnomo, et al, 2016). The height of the chair is 41 - (1,645 x 2.83) + 2 (allowance) = 38 cm.
b. The depth of the base, using the average popliteal length of workers with the 5th percentile so that workers with small bodies do not experience complaints in the knee (Milanese, et al, 2004); Lee, et al, 1998); Pheasant, 1991); Helander, 1997); Purnomo, et al, 2016). The size of the base depth is 34 - (1.645 x 2.83) = 29 cm.
c. The width of the chair base, using the average hip width of the workers with the 95th percentile. The goal is that workers who have large hips do not experience narrowing, this is by the opinion of TayyariF, et al, (1997); Purnomo, et al, (2016). The seat width is 30 + (1,645 x 1.41) = 32 cm.
d. The height of the back of the chair uses the average back height of the worker when sitting because large workers do not feel comfortable. The size of the back of the chair is 50 - (1.645 x 1.41) = 48 cm.
e. The width of the chair back, using the average shoulder width of the workers with the 95th percentile. The 95th percentile value is used so that workers who have large shoulders do not feel tired while resting (Purnomo, et al, 2016). The width of the seat back is 41 - (1,645 x 1.41) + 2 (allowance) = 41 cm.
f. The height of the table (from the elbow to the seat of the seat), uses the average height of the workers' thigh thickness in the sitting condition and is added 10 cm so that they do not experience pressure when ironing (Purnomo, et al ., 2016). Size table height 26 + 10 + 38 = 74 cm

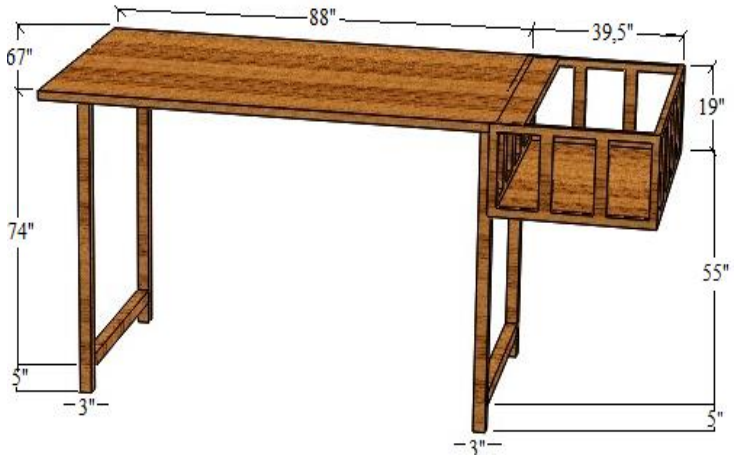
g. Table length, using the average shoulder width of workers with the 95th percentile. Using the 95th percentile aims to prevent large workers from experiencing complaints. this is by the opinion of Mokdad, (2009); Chaffin, et al, (1991); Purnomo, et al, (2016). The length of the table is 41 + (1,645 x 1.41) + 45 = 88 cm

h. The width of the table, using the average reach of workers with the 5th percentile. The purpose of using the 5th percentile is so that jobs with small bodies can be reached freely (Purnonomo, et al, 2016). The width of the table is 65 - (1,645 x 2.12) + 5 (allowance) = 67 cm.

i. Basket length is determined based on the average length of the plastic basket in the laundry. The length of the basket is 39.5

j. Basket height is determined based on the average height of the plastic basket in the laundry. The height of the basket is 19 cm.

Based on the results of measurements using the anthropometric design of the ironing table and chair which can be seen as follows

Ironing Table	Iron Chairs
	

Picture 1. The design of the ironing table and chair use anthropometry

4. CONCLUSION

The conclusion from this research is the design of an ironing table and chair using the anthropometric measurements of Mr. Wash laundry with specifications, namely [a] The height of the front seats is 38 cm; [b] The depth of the base is 29 cm; [c] Seat width is 32 cm; [d] The upper edge of the hostage is 48 cm; [e] The length of the back is 41 cm; [f] The height of the front desk is 74 cm; [g] The length of the table is 88 cm; [h] The width of the table is 67 cm; [i] The width of the basket is 39.5 cm and [j] the height of the basket is 19 cm.

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