

## DESIGN OF ARRANGEMENT OF WORKING TIME TO INCREASE PRODUCTIVITY OF THE WORKERS BY USING FLAT IRON AT GARMENT “A”

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**Abstract.** The garments businesses in Bali grow quickly in line with the growth of tourism industry. These are proven by presence of many garment businesses in big scale investment with hundreds of workers or small -scale investments of home industries. However, the level of awareness and the failure of the business managers to seek for comfort, health, and safety for their workers remains very low. One of many problems that important in garment business for the workers in flat iron is musculoskeletal disorder. Generally, the working position is in the standing position for long time, and the hot temperature of environment resulted in the flat iron radiation. Workers that use flat iron work 9 hours per day including the lunch break and 7 day a week, except for the big holidays or when there is less order. They start working at 08.00 a.m. until 17.00 p.m. with lunch break at 12.00 until 13.00 p.m. Arrangement for the working time and the break time, holiday, working shifts, are one of the many aspects in organization that needs to be paid attention because by arranging the working time, it may make them comfortable, safe, healthy, so it can increase the work productivity. Increasing the working time will cause the accumulating fatigues and in turn, it will decrease the productivity. Therefore, to solve that problems, this research has been done experimentally by arranging the working time, namely by providing 10 minute-breaks every two hours of working time while drinking tea. This research was conducted to 12 female workers who used flat iron in “A” garment, of Tabanan Regency, Bali, with treatment by subject design. The indicated workload was measured by heart rate with pulse meter. Musculoskeletal disorder was predicted by Nordic Body Map questionnaire. Data were analyzed by t test on 5% significant. The result of analysis showed that there was a decrease of workloads and the subjective disorders significantly before and after treatment as well as the increase of the working productivity significantly ( $p < 0,05$ ).

*Keywords* : arrangement of the working time, work load, musculoskeletal disorders, work productivity.

### 1. INTRODUCTION

In Bali, the garment businesses developed rapidly along with the development of the tourism industry. This is proven by the number of garment companies ranging from large-scale investment with hundreds of workers to garment companies as home industry. Nevertheless, the level of awareness and the company managers fault in taking any efforts to protect workers by assuring comfort, health and safety is still very low.

In preparing a job, unnatural posture should be avoided; an unnatural working position can be a cause of various disorders of the musculoskeletal system [1], [2]. One of the important problems in the garment business especially in ironing is the musculoskeletal complaints. Musculoskeletal groups, based on the location consists of a group of muscles of the neck, back, chest, shoulders, upper arms, forearms, hands, buttocks, pelvic floor, thighs, calves and feet. By knowing the function and location of

musculoskeletal, it is known which parts are experiencing pain or musculoskeletal disorders of the group, mainly due to inadequate working conditions, causing muscle fatigue and discomfort. The average working hours of the workers in the garment ironing section is 9 hours per day including lunch break, 7 days a week except on national holidays or other public holidays or when there is little order. They work from 08.00 pm until 17.00 pm with a break at 12:00 pm until 13:00 pm. The working conditions are in hot ambient temperatures, due to the influence of heat radiation from the ironing tool. The working position of the ironing workers in the garment is with the position of standing, bending and sitting. The poor working position and lengthy working hours cause the strain (reaction) of the musculoskeletal system and as well as causing negative effects to health. The ability of humans is determined by the profile factors, physiological capacity, the psychological and biomechanical capacity, while the demands of the task are influenced by the characteristics of the material work, and the tasks to be performed, the organization and the environment in which the work being performed [3], [4].

The arrangements of working hours and breaks, holidays, job rotation are one of the many important aspects of the organization, because the regular working time arrangements that can provide security and comfort, efficiency and health so as to increase productivity. The increase in working hours will lead to the accumulation of fatigue, which in turn could reduce productivity. So to address the above issues, some efforts needs to be done to harmonize these works with the human resources through research on the appropriate timing of work, so that complaints on the musculoskeletal of the ironing garment workers who work in the village of Kediri of Tabanan Regency can be reduced.

## 2. METHODS

The research was performed experimentally by applying the design of "Treatment by Subject" (the design of similar subject). This research was conducted in the Tabanan Regency. The research samples were 12 ironing workers given two treatments namely P0 group (ironing with the old system) and P1 group (ironing with additional short break). The predicted workload of the pulse rate which was calculated by the pulse meter. The ambient temperature is measured with a sling Psychrometer. Indication of the level of of fatigue and musculoskeletal disorders obtained through questionnaires, 30 items of fatigue, and the Nordic body map, before and after work. While the labor productivity was calculated based on the ratio of the output (the amount of clothes that were ironed) to the input (the average of pulse of labor and time used). The statistical analysis to determine the significance of differences between the data obtained P0 and P1, were analyzed by t- Paried test, at a significance level of 5%.

## 3. RESULTS AND DISCUSSION

### 3.1 Microclimate in the Workplace

The results of the average microclimatic measurements in the workplace of the ironing garment workers in the village of Kediri, Tabanan is as follows.

Table 1 The Results of Analysis of the Working Environment Measurement during the Research

No.	Variable	P0		P1		t	p
		average	SD	average	SD		
1	Wet Temperature (°c)	27,74	0,31	27,82	0,24	1,892	0,219
2	Dry Temperature (°c)	32,34	0,15	32,69	0,22	2,465	0,421
3	Relative Moisture (%)	75,12	2,38	74,89	1,92	3,362	0,392
4	ISBB (°C)	28,19	0,59	28,69	0,42	0,813	0,473
5	Light intensity (Lux)	467,86	13,84	475,22	17,02	2,621	0,266
6	Sound Intensity (dBA)	78,12	1,96	78,86	1,26	94,729	0,319

Note : SD = Standard Deviation

Table 1 above shows that the environmental conditions between the two treatments did not differ significantly ( $p > 0.05$ ) or can be declared to be the same. wet temperature, dry temperature, humidity, WBGT, light intensity, and the intensity of the sound were still considered to be in the normal range for the work environment. The threshold for the intensity of the sound / noise is 85 dB [5].

The work environment can affect the workload of workers [6], [7]. The temperature of the hot working environment resulted in the decreasing work performance. Warmer temperatures reduce agility, prolong reaction time and decision-making time, disrupting the accuracy of the brain, disrupting the coordination of sensory and motor nerves, and make it easy to be stimulated. Therefore, the intervention of ergonomics is needed namely to be performed by arranging the time for a lunch break or a short break. In this study, the workers were given a 60-minute lunch break for recovery from fatigue, provided that the workers take a short 10 minutes break (break) while drinking tea in the morning (at 10.00 pm) and afternoon (15:00 pm).

### 3.2. Workload

The workload is determined by calculating the pulse rate of work on the subject before work and after work. The pulse rate before working is referred to as the pulse rate of breaks. The measurement results of the pulse rate are as follows.

Table 2. The results of the calculation of the pulse rate the workers

Variable	Control		Treatment		t	p
	Average	SD	Average	SD		
Break time Pulse rate	71,69	4,144	71,84	4,269	-0,910	0,393
Working Pulse rate	126,84	2,113	119,14	1,291	5,935	0,001

The Table 2 above shows that the pulse rate of the workers during the break time both in the control and treatment groups did not differ significantly ( $p > 0.05$ ). This suggests that the initial condition of the workers' pulse rates are the same. While the pulse rates of working between control and treatment groups were significantly different ( $p < 0.05$ ). Seen from the average of pulse rates of work, there was a decline of 126.84 beats per minute into 119.14 beats per minute.

By doing arrangements of working hours namely by the provision of a short break of 10 minutes, while drinking tea every two hours. It was found a decrease in workload, as shown in table 2. The average pulse rate before the improvement of working arrangements on workers working hours in the ironing section of the garment company is 126.84 ( $\pm 2.113$ ) pulse / minute which is considered as a heavy workload category [8]. The volume of work was due to workers worked continuously without a break and under hot working environment due to hot radiation from the ironing tools resulted in increased workload. After the improvement by providing a short break every two hours while drinking tea, it was obtained decrease in pulse rates of 119.14 ( $\pm 1.291$ ) or a decline of 6.1%. heavy workloads must be reduced and improved with ergonomic interventions [9], [10].

### 3.3. Subjective complaints

The subjective complaints were predicted from the skeletal musculoskeletal disorders and the general fatigue. Complaints of musculoskeletal was measured by using a questionnaire of Nordic Body Map, whereas fatigue was measured by the 30 item questionnaires of general fatigue. The results of the analysis of subjective complaints are presented in Table 3 below:

Table 3: Results of Analysis of the subjective complaints

Variable	Control		Treatment		z	p
	Average	SD	Average	SD		
General fatigue	69,00	2,390	53,88	2,100	-1,333	0,009
Musculoskeletal Complaints	79,88	5,194	65,75	3,655	-2,521	0,012

The difference of significance between the untreated and treated were tested with non-parametric statistics by using the Wilcoxon test with the results as shown in Table 3 above. It can be seen from the table that there was a significant difference between the control and treatment groups, either on the general fatigue or the musculoskeletal complaints. Seen from the average scores, there was

decrease of fatigue and muscle complaints. General fatigue scores decreased from 69.00 into 53.88 or decreased by 21.9%. There was decline of musculoskeletal disorders from a score of 79.88 into 65.75 or decreased by 17.69%.

Some studies mention that the work posture, equipment, and work environment will give effect to worker fatigue from mild to severe, and need for intervention in order to suppress or decrease the fatigue [11]–[13].

### 3.4. Working Productivity

The working productivity in the ironing section of garment “A” in Tabanan was calculated based on the number of pieces of clothing that can be divided by the workload and working time. The significance difference test between the control group and the treatment group was done by using the t-test pair. The results of the analysis of productivity in the ironing section of the garment company X in Tabanan is shown in Table 4 below.

Table 4 Results of the analysis of working productivity

Variable	Control		Treatment		t	p
	Average	SD	Average	SD		
Work Productivity	0,07884	0,00921	0,10072	0,00821	1,910	0,000

Table 4 showed that there were significant differences in working productivity between the control group and the treatment group ( $p < 0.05$ ). And an increase in working productivity of the control group from 0,07884 into 0.10072 in the treatment group or an increase of 27.75%.

Manuaba [14] mentions that the intervention of ergonomics is needed in industry or company to be able to increase the productivity of workers. Adiputra [15] also mentions that by ergonomics intervention in small industry, for instance, through the intervention of using appropriate anthropometric work chair and so on will be able to decrease the workload or subjective complaints as well as it can increase work productivity. This research proved that by ergonomics intervention, it is able to increase productivity in the ironing section of the garment company in Tabanan.

## 4. Conclusions and Suggestions

### 4.1 Conclusions

It can be drawn from the results and analysis of this study the following conclusions.

- The arrangements of working hours by providing a short 10 minutes break and tea break every two hours can reduce the workload on the ironing workers of the Garments.
- The arrangements of working hours by providing a short 10 minutes break and tea break every two hours can reduce the subjective complaints on the ironing workers of the Garments.
- The arrangements of working hours by providing a short 10 minutes break and tea break every two hours can increase the working productivity on the ironing workers of the Garments.

### 4.2 Suggestions

- It is suggested to apply a short break and drinking during the working time in the morning and in the afternoon, in addition to the lunch break. It could also be applied to other home industries.
- The needs for further research on the reduction of heat and static working positions on the ironing workers in the garment companies.

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