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Effectiveness Of Giving Additional Food With Stretching Exercise And Short Breaks On Work Fatique And Musculoskeletal Disorder Of Production Workers PT. Rekaindo Global Jasa

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ABSTRACT

Work fatigue and musculoskeletal disorder lead to work accidents, and decreased work productivity. Additional food, short breaks and stretching exercises can reduce work fatigue and musculoskeletal disorder. The purpose of this study was to determine the effect of additional food along with stretching and short resting exercises on work fatigue and musculoksletal disorder at PT. Rekaindo Global Jasa Production Section. This research method uses True Experiment with Non Equivalent pretest posttest Control Group Design. The sample was 52 production section workers. The Nordic Body Map questionnaire was used to measure musculoskeletal disorder and the Subjective Selft Rating Test Questionnaire was used to measure work fatigue. Data were tested by t-paired test and ANOVA test with significance level α = 0.005. The results of work fatigue research in treatment group 1 showed p value = 0.002 and treatment group 2 p value = 0.003, which means there were differences in work fatigue before and after treatment. The results of the musculoskeletal disorder treatment group 1 showed p value 0,000 and treatment group 2 p value = 0,000 which means there were differences in musculoskeletal disorder before and after treatment. The research results of work fatigue between groups showed p value = 0.012 which means there was a difference in work fatigue between the control and treatment groups. While the study of musculoskeletal disorder between groups p value = 0.001 which means there are differences in musculoskeletal disorder between the control and treatment groups. Analysis of the results of the study showed supplementation, short breaks and stretching exercises could reduce work fatigue and musculoskeletal disorder. Therefore supplementation with supplementary stretching and short breaks in the production workers of PT. Rekaindo Global Jasa need to be provided to reduce work fatigue and musculoskeletal disorder of production workers in PT. Rekaindo Global Jasa.

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INTRODUCTION

One of the issues of Occupational Safety and Health (K3) that can trigger occupational accidents is work fatigue and musculoskeletal disorders. Work fatigue is a condition where a person's efficiency and endurance at work decreases. Work fatigue leads to the weakening of the workforce to carry out an activity resulting in a reduction in work capacity and endurance. (Mariani Juliana et al, 2018)

Factors causing fatigue and musculoskeletal disorders in the workplace vary greatly, that is determined from external factors and internal factors. Internal factors that cause labor fatigue are age, gender and nutritional status. While the factors that cause work fatigue from external factors are workload, work period and long work environment (Dwi Medianto, 2017). Work fatigue and musculoskletal complaints can lead to decreased performance, work productivity and morale. Therefore we need a problem solving to overcome work fatigue. There are several ways to overcome work fatigue and musculosletal complaints, namely by working according to physical capacity, redesigning the ergonomic work station, redesigning the work environment, balanced calorie requirements and rest accompanied by stretching every two hours with a little snacks (Tarwaka, 2004).

In the preliminary study, initial data collection from work fatigue and musculoskeletal disorders was performed on 10 respondents in the production section of PT. Rekaindo Global Services using a 30 Item Rating Scale and Nordic Body Map questionnaire. The initial research results of work fatigue are 1 (one) low fatigue, 2 (two) moderate fatigue, 3 (three) high fatigue, and 2 (two) high fatigue. While the results of preliminary research on musculoskeletal disorders were Normal 0 (zero), moderate 3 (three) people, high 4 (four) people and very high 3 (three) people. Therefore it is necessary to conduct research to reduce work fatigue and musculoskeletal disorders. This study aims to determine the effect of additional food accompanied by stretching and additional food accompanied by short rest on work fatigue and musculoskeletal disorders of Production Workers of PT. Rekaindo Global Services.

Additional food accompanied by stretching exercises is the process of inserting nutrients into the body of the worker outside the habit of eating heavy meals three times a day and proceed with stretching exercises. Additional food accompanied by short breaks is the process of inserting food substances into the body of workers outside of heavy eating habits three times a day followed by short breaks outside of the specified rest. Work fatigue is a feeling of subjective weariness of PT. Rekaindo Global Services before and after doing work activities. Musculoskeletal disorders are complaints of the musculoskeletal system from discomfort to pain, in the form of disorders of the skeletal muscular system caused by work factors.

A physiological review of the benefits of additional food on work fatigue and musculoskeletal disorders is. Sugar levels and muscle efficiency will decrease after 3 hours of work. If muscle activity is carried out continuously and no additional food is given, it will proceed with the breakdown of food reserves. The process of metabolism by using food reserves will cause the formation of pyruvic acid which will be converted to lactic acid. Lactic acid will cause fatigue and pain in the muscles. Therefore, administration can reduce work fatigue and musculoskeletal disorders because muscles do not need to use food reserves for metabolism (Tarwaka, 2014).

The continuous contraction of muscle fibers causes blood circulation obstruction. Circulation obstruction will cause muscles to become fatigued, spasm and pain. Stretching aims to lengthen the muscle structure that is shortened due to continuous contraction. This stretch is able to make the blood flow smoothly so that the muscles return to relaxation and vasodilation. Stretching also serves to reduce muscle spasms that cause pain by closing the pain control gate. (Sarwi, 2016)

In jobs with moderate workloads, short breaks of 10 to 15 minutes are required. Short breaks provide an opportunity for the worker's body to return to the initial performance of work so that the heart load is reduced (Widjasena, 2004). A 10-minute break is the minimum amount of time needed for a group of muscle tendons to restore musculoskeletal function after experiencing fatigue due to continuous contractions. This time is used for vasodilation of blood vessels in muscle fibers. (Andriani, 2016)

METHODS

The research method used is True Experiment with the design used is Non-Equivalent pretest posttest Control Group Design that is true quasi experiment by looking at the difference in pretest and posttest between the experimental class and the control class. In this research.

The population of this research is the workers of PT. Rekaindo Global Services, amounting to 60 people. The sample used in this study uses the Slovin formula of 52 people. The data collection tool was the Nordic Body Map Questionnaire used to measure musculoskeletal disorders and the Selft Rating Test Questionnaire was used to measure work fatigue.

The procedure of this study was that the sample was divided into 3 groups: the control group, treatment group 1 and treatment group 2. On day 1 the control group, treatment 1 and treatment 2 were measured at work fatigue and musculoskeletal disorders before work. After that, they were given treatment for 3 days starting on day 1. In the control group, the treatment was not given anything. In the treatment group 1 was given 1 banana bolen and 1 cup of sweet tea accompanied by stretching exercises for 10 minutes every 10:00 and 15:00 hours. In treatment group 2 was given 1 bolen banana and 1 glass of sweet tea accompanied by a short break of 10 minutes every 10:00 and 15:00 hours. On day 3, work fatigue and musculoskeletal disorders were measured in the control and treatment groups after work. The data obtained were then tested by t-paired test to test differences in work fatigue and musculoskeletal disorders before and after treatment in each group. Anova test was used to test differences in work fatigue and musculosletal complaints between control and treatment groups.

RESULTS

1. Measurement of Work Fatigue

Table 1 Results of Work Fatigue Measurement

Group	Variable	N	Average	SD	*Range*
Control	Fatigue before treatment	18	78,55	10,80	58 - 93
	Fatigue After treatment	18	77,33	6,71	65 - 87
Treatment 1	Fatigue before treatment 1	17	79,65	6,59	69 - 88
	Fatigue After treatment 1	17	72,29	6,81	60 - 88
Treatment 2	Fatigue before treatment 2	17	76,59	11,22	58 - 94
	Fatigue After treatment 2	17	69,06	4,29	60 - 76

Table 1 shows that the average control group fatigue before treatment was 78.55 while after treatment was 77.33. In the study group 1 treatment before treatment an average of fatigue79.65. While the fatigue range of treatment group 1 after treatment was 72.29. In the study group 2 treatment before the average treatment of fatigue76, 59. While the treatment group fatigue 1 after the treatment is an average of 69.06 fatigue.

2. Measurement of Musculoskeletal Disorder

Table 2 Difference Test of Musculoskeletal Disorder

Group	Variabel	N	Average	SD	Range
Control	Complaints before treatment	18	71,55	12,76	37 - 94
	Complaints after treatment	18	73,17	15,90	40 - 95
Treatment 1	Complaints before treatment 1	17	71,23	15,08	54 - 103
	Complaints after treatment 1	17	59,47	14,50	34- 80
Treatment 2	Complaints before treatment 2	17	71,18	16,80	54 - 90
	Complaints after treatment 2	17	61,41	11,74	36 - 70

In table 2 shows the musculoskeletal disorders of control group research subjects before the average treatment of 71.55 and after the average treatment of 73.17. In the study group the treatment before the treatment of musculoskeletal disorders averaged 71.23. after an average of 59.47. In the

study group 2 treatment before the average treatment of musculoskeletal disorders 71.18. While the fatigue range of the treatment group 2 after the treatment was an average of fatigue of 61.41.

3. Different Test Results for Each Group

Table 3 Difference Test of Work Fatigue

Group	Variable	N	Average	SD	*Sig.*	Information	Rate of change
Control	Fatigue before treatment	18	78,55	10,80	0,473	No difference	-
	Fatigue After treatment	18	77,33	6,71			
Treatment 1	Fatigue before treatment 1	17	79,65	6,59	0,002	There is a difference	Work fatigue decreased 9.24%
	Fatigue After treatment 1	17	72,29	6,81			
Treatment 2	Fatigue before treatment 2	17	76,59	11,22	0,003	There is a difference	Work fatigue decreased 9,83%
	Fatigue After treatment 2	17	69,06	4,29			

The results in table 3 show that there was no difference in work fatigue before and after measurement in the control group with a p value of 0.473. In the treatment group 1 shows p value = 0.002 which means there are differences before and after treatment while in the treatment group 2 p value = 0.003 which means there are differences before and after treatment.

Table 4 Difference Test of Musculoskeletal disorders

Group	Variabel	N	Average	SD	*Sig.*	Information	Rate of change
Control	Complaints before treatment	18	71,55	12,76	0,473	No difference	-
	Complaints after treatment	18	73,17	15,90			
Treatment 1	Complaints before treatment 1	17	71,23	15,08	0,000	There is a difference	Musculoskeletal disorder decrease 16,51%
	Complaints after treatment 1	17	59,47	14,50			
Treatment 2	Complaints before treatment 2	17	71,18	16,80	0,000	There is a difference	Musculoskeletal disorder decrease 13,72%
	Complaints after treatment 2	17	61,41	11,74			

The results in table 4 show that there were no differences in musculoskeletal disorders before and after measurement in the control group with a p value of 0.473. In the treatment group 1 shows p value = 0,000 which means there are differences before and after treatment while in the treatment group 2 p value = 0,000 which means there are differences before and after treatment.

4. Intergroup Difference Test

Table 4.7 Difference Test of Work Fatigue between Groups

Dependent Variable	Group	Sig. Anova	Information
Work fatigue	Control	0,001	There is a difference
	Treatment 1		
	Treatment 2		

Anova statistical test results showed a significance value of 0.001 <0.05, which indicates a difference in the average work fatigue between treatment groups.

Table 4.7 Difference Test of Musculoskeletal Disorder between Groups

Dependent Variable	Group	Sig. Anova	Information
Muskuloskeletal Disorder	Control	0,012	There is a difference
	Treatment 1		
	Treatment 2		

The research hypothesis would also examine whether there were differences in musculoskeletal disorders between the control group, treatment group 1, and treatment group 2. The ANOVA statistical test results showed a significance value of 0.012 < 0.05 indicating a difference in the mean of musculoskeletal disorders between treatment groups.

DISCUSSION

A. Analysis of Work Fatigue Before and After Treatment in Each Treatment Group

1. Treatment Group 1

From the different test before and after treatment in treatment group 1, the p value was 0.002, which means there was a difference in work fatigue before and after the workers were given additional food in the form of banana bolen and sweet tea and stretching exercises.

Static work attitude on the production workers at PT. Rekaindo Global Jasa causes muscles to contract continuously causing spasm and fatigue. Sugar levels and muscle efficiency will decrease after 3 hours of work. If muscle activity is carried out continuously and no additional food is given, it will proceed with the breakdown of food reserves. The process of metabolism by using food reserves will cause the formation of pyruvic acid which will be converted to lactic acid. Lactic acid will cause fatigue and pain in the muscles. Therefore the provision of additional food in the form of sweet tea and banana bolen to production workers at PT. Rekaindo can reduce work fatigue and musculoskeletal disorders because muscles do not need to use food reserves for metabolism. (Tarwaka, 2014)

Stretching aims to lengthen the muscular structure that is shortened as a result of continuous contractions. This stretch is able to make blood flow smoothly again. Stretching also serves to reduce muscle spasms that cause pain by closing the pain control gate. (Sarwi, 2016)

Whereas in the research conducted on 86 Occupational Therapy Polytechnic Surakarta students stated that Working Streching Exercise had an effect on reducing fatigue of respondents. (Hastuti, 2017)

2. Treatment Group 2

From the different test before and after treatment in treatment group 2, the p value was 0.003, which means that there were differences in work fatigue before and after the workers were given additional food in the form of banana bolen and sweet tea and short rest.

Health and work power are closely related to a person's nutritional level. The body needs substances from food for the maintenance of the body, repairing damage from cells and tissues and for growth, which at least requires a lot depending on age, sex, environment and the burden suffered by a person. These substances are also needed to do work. The work carried out will require labor whose source is food (Suma'mur 1967). Giving calories before work is important because it will be converted into energy. These calories will decrease after working continuously for 3 to 4 hours, so that when the body is not given additional calories, the energy produced will be reduced and the body feels tired. (Soenarso Soenardi, 2004)

In jobs with moderate workloads, short breaks of 10 to 15 minutes are required. Short breaks provide an opportunity for the worker's body to return to the initial performance of work so that the heart load is reduced (Widjasena, 2004). A 10-minute break is the minimum amount

of time needed for a group of muscle tendons to restore musculoskeletal function after experiencing fatigue due to continuous contractions. This time is used for vasodilation of blood vessels in muscle fibers. (Andriani, 2016)

Several studies regarding the provision of short breaks to workers, among others, were carried out by Widjasena who stated that the provision of salt sugar and short breaks for 10 minutes can reduce the workload on 26 workers in the bakery company "X" Semarang. Research by Setyawan et al states that short breaks can reduce work fatigue in 20 cigarette rolling workers at PT. Djitoe Indonesia Tobacco (Setyawan, 2012).

B. Work Fatigue Analysis Between Control and Treatment Groups

The results of this study stated that between the control group and the treatment group p value was 0.001, which means experiencing differences in work fatigue after being treated. ANOVA statistical test results showed that there were differences in the mean between treatment groups, which means that post hoc tests were needed to observe which groups were different. Post hoc tests use Fisher Least Significant Difference (LSD), which is commonly used to find out which average pair is the most different among the existing pairs. Significance value <0.05 indicates an average difference in the paired groups. In the LSD statistical test showed the control group and treatment group 1 with p value 0.018, while between the control group and treatment group 2 with a p value of 0,000. This shows that there are differences in the average work fatigue in the control group, treatment 1, and treatment 2.

Production workers who use muscles for work and activities will experience long-term contractions with forces that adjust the workload. This condition is ongoing so that it will result in muscle fatigue. The spread of nerve signals through neuromuscular contact will decrease after prolonged muscle activity which can reduce muscle contraction. Barriers to blood flow to the muscles that are contracting result in almost perfect muscle fatigue for a minute or more due to loss of food supply, especially loss of oxygen (Guyton, 2006). Fatigue experienced by workers also occurs due to the existence of organs that continuously receive external workloads with no chance of resting or getting workloads that exceed their capacity (Adiputra, 2003). Work fatigue caused by static muscle work requires further treatment. The way to overcome this is to provide muscle stretching exercises. Giving stretching exercises can reduce spasms because of proprioceptor muscle or muscle spindles that are activated when stretching occurs (Budiono, 2003).

In this study the provision of supplementary food in the form of banana bolen and sweet tea after 3-4 hours of work accompanied by short breaks and stretching exercises can reduce work fatigue scores for workers. This means that the treatment given can reduce fatigue. Additional food is able to produce energy intake that is provided in between work hours with short breaks for recovery of muscle fatigue and removal of metabolic waste, while stretching in reducing muscle fatigue. This stretch is able to improve the focus of work and correction of posture because at that time the muscles have begun to experience fatigue and spasm so that at such times stretching accelerates recovery from spasm and accumulation of metabolic waste.

In the results of statistical tests it can be concluded that the treatment of additional food with short breaks to work fatigue can reduce work fatigue greater than the treatment of additional food with short breaks. Provision of supplementary food accompanied by short breaks can reduce work fatigue by 8.27451, while additional food accompanied by stretching exercises can reduce work fatigue by 5.03922. The results of this study are in accordance with research conducted on the blacksmith workers' community blacksmith Wesiaji Donorejo said that there was an effect of short breaks and the provision of sweet tea on increasing worker productivity.

This research in line with research on giving bananas, short breaks and stretching to work fatigue, musculoskeletal disorders and productivity carried out on 16 workers using the East Kalimantan Palm Plantation plantations, where the results of the study show that prior to treatment the control group and the treatment group were not given there are differences in work fatigue, but after treatment there is a difference in work fatigue between the control group and the treatment group (Damantalm, 2018)

C. Analysis of Musculoskeletal Disorder Before and After Treatment in Each Treatment Group

1. Treatment Group 1

From the different tests before and after treatment in treatment group 1, p value was 0,000, which means there were differences in musculoskeletal disorders before and after workers were given additional food and stretching exercises.

At work, the muscles will contract. Each contraction process requires energy obtained from ATP (adenosine triphosphate) which is broken down to form ADP (adenosine diphosphate). The process of metabolism is obtained from food reserves, so food reserves will decrease after 3-4 hours after work. When food reserves in the body decreases and there is no additional food intake, the body will use other food reserves to be processed into energy which will eventually produce lactic acid which causes pain (Sumakmur, 2009). Continuous static muscle contractions result in increased pressure in the muscles resulting in obstruction of blood flow in the blood vessels and muscle spasms. Muscle spasm will cause pain.

Supplementary food in the form of sweet tea and banana bolen is able to provide the calories needed by workers after the food calories decrease during working 3 hours continuously. Workers who are given extra food will experience a decrease in musculoskeletal disorders because there is no need to process food reserves that produce lactic acid causing musculoskeltal complaints. Dynamic muscle contraction, one of which is stretching exercises makes the blood flow return smoothly and provides oxygen supply to the muscles (Hastuti, 2016). The muscle that regains supply of oxygen will decrease in pain.

This research is supported by the results of research from Hastuti (2016) which states that stretching at the workplace can reduce musculoskeletal disorders in sewing workers at CV. X Sukoharjo, Central Java.

2. Treatment Group 2

From the different tests before and after treatment in treatment group 2, the p value was 0,000, which means there were differences in musculoskeletal disorders before and after workers were given additional food and short breaks.

The work attitude of the production department workers of PT. Rekaindo Global Jasa is not physiological so it is not comfortable, the workload is quite heavy and there are often musculoskeletal disorders. This condition when done repeatedly can increase the risk of cumulative trauma disorders (Manuaba, 2003). Workers who work like these conditions have the potential to experience musculoskeletal disorders, fatigue and the risk of workplace accidents. To overcome these problems, organizational improvement is carried out by applying short breaks to reduce the workload and musculoskeletal disorders through a participatory approach. Through this approach, it is expected to create conditions and working environment that is healthy, safe, comfortable and efficient (Manuaba, 1996). In jobs with moderate workloads, short breaks of 10 to 15 minutes are required. Short breaks provide an opportunity for the worker's body to return to the initial performance of work so that the heart load is reduced (Widjasena, 2004). The results of this study stated that the average work fatigue in this group before being treated was 76.59 while after being treated was 69.06. So additional food and short breaks can reduce fatigue in workers by 9.83%.

Several studies regarding the provision of short breaks to workers, among others, were carried out by Widjasena who stated that the provision of salt sugar and short breaks for 10 minutes can reduce the workload on 26 workers in the bakery company "X" Semarang. Research by Setyawan et al states that short breaks can reduce work fatigue in 20 cigarette rolling workers at PT. Djitoe Indonesia Tobacco (Setyawan, 2012).

D. Intergroup Musculoskeletal Disorder Analysis

The results of this study stated that between the control group and the treatment group the p value was 0.012 which meant experiencing differences in musculoskeletal disorders after being treated. ANOVA statistical test results showed that there were differences in the mean between

treatment groups, which means that post hoc tests were needed to observe which groups were different. Post hoc tests use Fisher Least Significant Difference (LSD), which is commonly used to find out which average pair is the most different among the existing pairs. Significance value <0.05 indicates an average difference in the paired groups. In the LSD statistical test showed the control group and treatment group 1 with p value 0.006, while between the control group and treatment group 2 with a p value of 0.018. This shows that there are differences in the average work fatigue in the control group, treatment 1, and treatment 2.

Musculoskeletal disorders in production workers occur due to excessive muscle contraction due to heavy workloads with a long duration of loading. This causes decreased oxygen supply, carbohydrate metabolism is inhibited and lactate acid accumulation occurs. Not yet given additional food to the workers resulting in decreased oxygen supply cannot be replaced immediately and fulfilled their needs, causing pain and discomfort in the muscles (Wijaya, 2011).

In this study the provision of supplementary food in the form of banana bolen and sweet tea after 3-4 hours of work accompanied by short breaks and stretching exercises can reduce the score of musculoskeletal disorders in workers. Supplementary food is able to produce energy intake that is given in between work hours with short breaks for recovery of muscle fatigue and disposal of metabolic waste materials so that the body does not need to take food reserves to be processed into energy that will produce lactic acid.

Musculoskeletal disorders caused by prolonged static muscle work require further treatment. The way to overcome them is by giving short breaks. Short breaks for 5-10 minutes make work readiness above the threshold. A short 10-minute break can restore the musculoskeletal function of the muscle tendon group because the muscles that experience excessive contraction again relaxes so that blood flow returns smoothly. Blood circulation that returns smoothly will cause oxygen supply to return to normal and disposal of metabolic waste that can cause pain can be re-done so that it will reduce musculoskeletal disorders (Sutjana 2008).

Regular stretching interrupted work reduces muscle tension, improves blood circulation, reduces anxiety, feeling depressed, fatigue. Giving stretching can reduce spasm due to muscle proprioceptor or muscle spindles that are activated when stretching occurs. (Daryono, 2016.).

Giving stretches can also stimulate thick nerve fibers (Aalpha and Abeta) so that they can close the pain control gate. The stretching mechanism is included in the category of mechanical stimulation that can activate the function of thick non-nociceptive nerve fibers (A alphadan Abeta) and close the control gate so that the pain carried by thin section nerve fibers (A delta and C) cannot be transmitted to the brain (Coury, 2009). This stretching is expected to improve work focus and posture correction because at that time the muscles have begun to experience fatigue, spasm, lactic acid buildup so that at such times stretching accelerates recovery from spasm and accumulation of metabolic waste.

This study is in line with research on 20 workers on stretching and resting training that can reduce mesculoskeletal complaints and improve the concentration of the performance of employees of Sanglah Hospital Denpasar Hospital. The results showed that active stretching and resting training decreased musculoskeletal disorders, eye fatigue, and increased the work concentration of BRM Sanglah Hospital employees. Stretching training has been proven to reduce musculoskeletal disorders, eye fatigue, and increase employee work concentration (sensory, 2017)

In the results of statistical tests it can be concluded that the treatment of additional food accompanied by stretching exercises against musculoskeltal complaints can reduce musculoskeletal disorders greater than the treatment of additional food with short breaks. Additional food accompanied by stretching exercises can reduce musculoskeletal disorders by 13.69608, while additional food accompanied by short breaks can reduce musculoskeletal disorders by 11.754.

CONCLUSION

From the results of the analysis and discussion described previously, it can be concluded that:

1. There is a difference in the work fatigue of PT. Rekaindo Global Services before and after additional food accompanied by stretching exercises with p value = 0.002.
2. There is a difference in the work fatigue of PT. Rekaindo Global Services before and after additional food accompanied by short breaks with p value = 0.003.
3. There are differences in musculoskeletal disorders from PT. Rekaindo Global Services before and after additional food accompanied by stretching exercises with p value = 0,000
4. There are differences in musculoskeletal disorders from PT. Rekaindo Global Services before and after additional food accompanied by short breaks with p value = 0,000.
5. There is a difference in work fatigue between the control group and the treatment group with a p value of 0.001.
6. There were differences in musculoskeletal disorders between the control group and the treatment group with a p value of 0.012.

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