Artikel Penelitian

The Effect of Snack Intervention toward Working Duration among Helper Workers in Container Company

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Abstract

Introduction*: Good nutrition in the workforce can affect work productivity, but many workers have not paid attention to their nutritional balance, including helper workers in container company. Based on data from the International Labor Office (ILO) in 2005, unbalanced diet on labor can reduce productivity by up to 20%. The purpose of this study was to find out the effect of snack intervention toward working duration among helper workers in container company.*

Method*: This study used pre-experimental design which was conducted for four weeks. Eighteen respondents who were helper workers were given 300 kcal snack once a day for four weeks. The respondent's food intake was recorded with food record every week (two working days and one day off) and analyzed by Nutrisurvey application and manual calculation.*

Result*: There was significant mean difference in total working duration (reduced two hours and eight minutes) before and after intervention (p <0.001).*

Conclusion*: Once a day snack intervention for four weeks can shorten the working duration of helper workers.*

Keywords: *working duration; helper workers; snack intervention*

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Pengaruh Pemberian Makanan Selingan terhadap Lama Pengerjaan pada Pekerja Helper di Perusahaan Peti Kemas

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Abstrak

***Pendahuluan**: Asupan gizi yang baik pada tenaga kerja dapat memengaruhi produktivitas kerja. Namun, banyak pekerja yang tidak memerhatikan kecukupan asupan gizi mereka, termasuk pekerja helper di perusahaan peti kemas. Berdasarkan data International Labor Office (ILO) tahun 2005, diet yang tidak seimbang dapat menurunkan produktivitas sampai 20%. Tujuan penelitian ini adalah untuk mengetahui pengaruh pemberian makanan selingan terhadap lama pengerjaan pada pekerja helper di perusahaan peti kemas.*

***Metode**: Desain penelitian ini adalah pra-eksperimen yang dilakukan selama empat minggu. Sebanyak delapan belas responden yang merupakan pekerja helper diberikan makanan selingan satu kali sehari, sebesar 300 kkal selama empat minggu. Asupan makanan responden dicatat dengan food record setiap minggu (dua hari kerja dan satu hari libur) dan dianalisis dengan aplikasi Nutrisurvey serta perhitungan manual*

***Hasil**: Terdapat perbedaan rerata yang bermakna pada lama pengerjaan total (berkurang dua jam delapan menit) sebelum dan sesudah intervensi ($p < 0,001$).*

Kesimpulan: *Pemberian makanan selingan satu kali sehari selama empat minggu dapat mempersingkat lama pengerjaan pada pekerja helper.*

***Kata kunci**: Lama pengerjaan; pekerja helper; pemberian makanan selingan*

Introduction

Good nutrition in labor can affect work productivity due to the adequacy and distribution of balanced calories. Unfortunately, many workers have not noticed their nutritional intake, including helper worker. Based on data from the International Labor Office (ILO) in 2005, unbalanced diet on labor can decrease productivity by up to 20%.[1] One of the interventions that can be done to improve work productivity is through supplementary feeding. Some studies, such as Gummerson study, report worker's productivity increased significantly after supplementary feeding.[2-5] However, according to the literature review by Jensen,[6] dietary intervention in workers only increased work productivity by 1-2%. Helper workers are high physical activity workers, thus requiring greater energy to work. Therefore, every helper worker needs to have a balanced nutritional intake. The purpose of this study was to find out the effect of snack intervention toward working duration among helper workers in container company.

Method

Study design and participant selection This study used pre-experimental design (one group pre-test and post-test design). Snack intervention was conducted for four weeks at 10:00 a.m. There were twelve menus variation that were given with total calories of 300 kcal. Respondents' food intake was recorded every week (two working days, one day off) by using food record (total = twelve food records). Before having snack intervention, the respondent participated in a food sample demonstration using food model led by two nutritionists. The sociodemographic characteristics of respondents were recorded using a questionnaire. The working duration of helper workers before and

after intervention was recorded using the initial/final working duration observation sheet. The inclusion criteria of this study were male workers who were willing to participate and signed the informed consent form, having a normal BMI, and not suffering from chronic disease. We excluded workers who were absent at initial data collection. The dropout criteria was workers who did not follow all study procedures.

Sample size

Eighteen helper workers that participated in this study were selected by total sampling technique.

Data Collection

The data collected in this study were primary data, which included sociodemographic data, disease history, body mass index (BMI), nutritional intake and working duration data. The sociodemographic data and worker disease history were taken by interview using a questionnaire. The body mass index was measured using weight and height scale. The nutritional intake was taken using food record and converted into calories by Nutrisurvey application. Working duration data was taken by initial/final working duration observation sheet.

Statistical Analysis

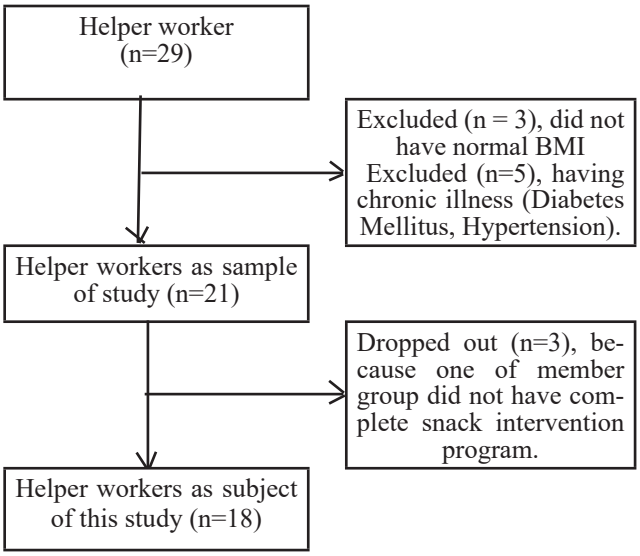
SPSS Statistic 20.0 was used as data processing software. Univariate and bivariate analysis was done. Univariate analysis was used to analyze sociodemographic data and nutritional intake descriptively. Nutritional intake analysis using the Nutrisurvey application, then the amount of nutrient intake (in grams) listed in the nutritional survey results was calculated manually (compared to the percentage of requirements according to the 2013 Nutrition Adequacy Rate standard). Bivariate analysis was used to determine the difference between the working duration and nutritional intake after the snack intervention. This study used paired T-test to determine mean difference after the snack intervention. Some data (BMI, energy intake, carbohydrate intake, calorie intake, working duration) were normally distributed while others (age, working period, fat intake) were not.

Ethics Approval

The study protocol was approved by the ethics committee of the Faculty of Medicine, University of Indonesia (No. 0481/UN2.F1/ETIK/2018).

Result

This study used eighteen helper workers as sample of study.



Picture 1. Process of sample selection.

Table 1. Subject Sociodemographic Characteristics

Subject Sociodemographic Characteristics	Frequency n (%)	Median (min-max)
Age		
- 19-29 years old	4 (22.2%)	35.5 (20-60) years old
- 30-49 years old	11 (61.1%)	
- 50-64 years old	3 (16.7%)	
Marital Status		
- Single	4 (22.2%)	
- Married	14 (77.8%)	
Level of Education		
- Senior High School	7 (38.9%)	
- Junior High School	11 (61.1%)	
Working Period	13 (72.2%)	6 (0.67-15) year
- >1 year	5 (27.8%)	
- < 1 year		

Table 1 showed 61.1% respondents age were 30-49 years old. Table 2 showed significant difference in body mass index in first and fourth week ($p = 0.026$).

Table 2. Mean Differences of BMI in the First and Fourth Week of Study

Variable	Week I	Week IV	Mean Differences (CI 95%)	p value
	($\bar{x}$ ± SD)			
BMI	21.27±1.89 kg/m^2	21.42±1.80 kg/m^2*	-0.15±0.26 (-0.28- -0.02)	0.026*^{t}

*t=Dependent Paired T test

Table 3. Subject Nutritional Intake in the First and Fourth Week of Study

Nutritional Intake	Week I	Week IV
	Frequency n (%)	
Energy Intake		
• Adequate	7 (38.9%)	8 (44.4%)
• Less	11 (61.1%)	10 (55.6%)
Carbohydrate Intake		
• Adequate	3 (16.7%)	7 (38.9%)
• Less	15 (83.3%)	11 (61.1%)
Protein Intake		
• Over	4 (22.2%)	3 (16.7%)
• Adequate	9 (50%)	10 (55.6%)
• Less	5 (27.8%)	5(27.8%)
Fat Intake		
• Over	2 (11.1%)	2 (11.1%)
• Adequate	7 (38.9%)	3 (16.7%)
• Less	9 (50%)	13 (72.2%)

Table 3 showed 38.9% respondents had adequate energy intake in first week of the study and in fourth week the number increased to 44.4%.
The respondent's nutritional intake was below the requirement during four weeks of study. The lowest energy and fat intake respondent recorded in second week, whereas the lowest carbohydrate and protein intake respondent recorded in third week of study.
There was significant difference in the carbohydrate intake of respondents in first week compared to fourth week (table 4). The number of average calories needed by respondents (2449 kcal) was obtained by calculating the individual needs based on the 2015 Indonesian Endocrinology Association guidelines, then averaged.[7] The calorie intake of respondents in four weeks intervention was below the requirement. Calorie intake per week were 1778 kcal (first week), 1713 kcal (second week), 1686 kcal (third week) and 1832 kcal (fourth week).
After four weeks intervention, the working duration for each container unit was measured and compared with the working duration before intervention. All respondents (100%) had shorter working duration after the intervention when compared to the working duration before intervention in all activities (hitting the parts of the container that were dented, caulking, and sanding). There were significant differences in working duration of hitting the dented, caulking, sanding and total working duration in pre intervention and post intervention ($p < 0.001$). Before intervention, mean of hitting the dented part of container duration was 343 minutes, mean of caulking duration was 927.3 minutes, mean of sanding duration was 804.3 minutes and total working duration was 2074.7 minutes. After intervention, mean of hitting the dented part of container duration was 312 minutes, mean of caulking duration was 884.2 minutes, mean of sanding duration was 750.3 minutes and total working duration was 1946.5 minutes.

Table 4. Profile of Changes in the Percentage of Energy, Carbohydrate, Protein and Fat Intake in First and Fourth Week of Study

Variabel	Week I	Week IV	Mean Differences (CI 95%)	P value
	(x ± SD) or Median (min-max)			
Energy	72.9±11.3%	75.1±12.5%	-2.2±9.4 (-6.9–2.5)	0.341*^{t}
Carbohydrate	65.9±11.7%	74.3± 9.9%	-8.4±10.4 (-13.7- -3.2)	0.003*^{t}
Protein	85.5±15.4%	84.1 (58.1-117.8)%		0.845**^{w}
Fat	74.7(43.1-164.9)%	61.2 (31.4-172.8)%		0.014**^{w}

*t=Dependent Paired T test
**w=Wilcoxon test

There were no significant differences in total working duration between pre- and post-intervention based on level of education and working period variables, whereas in the age variable, there was significant difference in total working duration in pre intervention (table 5).

Table 5. Impact of Internal Factors toward Total Working Duration in Pre and Post Interventions

Subject Characteristics	Total Working duration (minutes)		*p value*
	Pre Intervention	Post Intervention	
	X ± SD	X ± SD	
Age			
- 19-29 years old (4)	2103 ± 49.5	1972.2 ± 66.3	0.001***
- 30-49 years old (11)	2055.9 ± 30.2	1926.2 ± 39.3	< 0.001***
- 50-64 years old (3)	2105.7 ± 26.6	1986.7 ± 23.1	< 0.001***
p value	0.036*	0.078*	
Level of Education			
- Senior High School (7)	2077 ± 48.3	1948.1 ± 56	< 0.001***
- Junior High School (11)	2073 ± 37.2	1945.4 ± 47.8	< 0.001***
p value	0.852**	0.915**	
Working Period			
- >1 year (13)	2067.3 ± 36.8	1940 ± 45.6	< 0.001***
- < 1 year (5)	2093.8 ± 47.6	1963 ± 60.7	< 0.001***
p value	0.224**	0.385**	

* = *Anova test*
** = *Independent paired t test*
*** =*Dependent paired t test*

Discussion

Many studies had shown that snack intervention could made a significant difference in BMI.(8)-(10) Changes in the respondent's BMI existed because the intervention increased the respondents' frequency of eating. In addition, it was also due to the snack components were high in carbohydrates. High carbohydrate snacks which were given for four weeks resulted in excess fat in the form of triglycerides in adipose tissue under the skin or in the abdominal cavity. This causes an increase in body weight. This is because of the increasing number of fat cells in the body (hyperplastic) and the increasing size of existing fat cells (hypertrophic).

The significant difference in respondents' BMI existed because there was changes in macronutrient (carbohydrate) intake that occur significantly.[12] Significant carbohydrate intake will affect renal sodium excretion which then causes changes in extracellular fluid and subsequently causes respondents to gain weight.[12]

According to Bellisle study,[13] snack intervention could increase the occurrence of overweight and obesity because it facilitated excessive food consumption and weight gain related to food choice quality, consumption frequency and environment. A similar study conducted by Devine et al.[14] states that the excess weight that occurs in workers was caused by consumption of high-energy foods during the workday. Therefore, the selection of food with good nutritional composition needs to be done in providing snack for workers, considering that being overweight can also affect work productivity.

However, a different result was found in a study conducted by Herlinawati[5] which stated that there was no significant difference in body weight for respondents who received snack intervention for one month (p = 0.2).

At the end of the study (fourth week) the respondents' mean energy intake was 75.1%. This intake increased compared to the first week, but not statistically significant. This result was similar to the 2014 Total Diet Study data from the Indonesian Ministry of Health, which stated that the Indonesian population's energy sufficiency rate in the age group 19-55 years was 73.8% and in the age group> 55 years was 78%.[15] Insignificant energy intake according to Hall[12] is due to meal to meal compensation mechanism. If there

is an excess or lack of energy in one meal, then the intake of compensation occurs in the next meal on the same day.

The lack of energy, carbohydrate, protein and fat intake of respondents at the end of study should be concerned. The main function of carbohydrates is as an energy source for the needs of body tissue cells. Fat serves as a backup source of energy stored in the body, a media for transporting some fat-soluble vitamins, cell formation, sources of essential fatty acids, saving protein, maintaining body temperature and others. While protein functions for the tissue regeneration in the body, forming enzymes, hormones, and as an energy source when energy from carbohydrates and fats is insufficient.[16]

The condition of carbohydrate, protein and fat intake of respondents which were still inadequate could affect workers' productivity because carbohydrates, proteins and fats were needed by workers to supply energy. In addition, inadequate monounsaturated fatty acid (MUFA) and polyunsaturated fatty acid (PUFA) intake can also cause an increased risk of chronic diseases for workers resulting in an increase in lost work time due to illness.[17]

Respondents' ignorance of the importance of balanced nutrition for their work activities, economic factors, food availability and health conditions of respondents who can interfere food intake, maybe some were causes of their inadequate nutrional intake. Unfortunately, in this study these things were not assessed.

The snack that given was high carbohydrate because the aim was to achieve energy sufficiency. However, actually workers also need micronutrient to maintain their fitness. Further research that also considers micronutrient content may be recommended. An overview of the nutritional intake habits at a certain time period could be assessed using a sheet of the Food Frequency Questionnaire (FFQ), but this study was not conducted.

Calorie intake of respondents during the intervention was below the requirement. If the respondent's calorie intake is inadequate, the body will break down glycogen into an energy source. Furthermore, if the energy needs are still lacking, the body will use the fat reserves stored in the body and in the end if it is still not fulfilled, then the protein will be used to produce energy. Thus the protein will leave its main function as a builder substance. If this condition continues, then the state of energy and protein deficiency is unavoidable. This certainly can harm both the company and the workers themselves.

The cause of low calorie intake of respondents, as the forementioned above, probably due to the ignorance of respondents about the importance of balanced calorie intake for their work activities, economic factors (especially in the second and third week, seen lower energy intake compared to the first week because the respondent had not received monthly wage), the availability of food ingredients and the health conditions of the respondents that could interfere with food intake. Besides, it can also be due to compensation from the previous intake. This is as said by Hall in his study that there is a meal to meal compensation. After consumption of high-energy foods, then there will be a feeling of fullness and then it will affect the specific sensor of satiety which can affect the subsequent food intake, so that the difference in calorie intake does not occur significantly.[12]

After 300 kcal snack intervention for four weeks, the working duration of the container unit was shorter for all respondents. There was significant difference in the working duration in pre- and post-intervention. After the intervention, the total working duration decreased by 6.18% and thus the hypothesis of this study was proven (one a day snack intervention for four weeks could shorten the working duration of helper workers). This result was in accordance with the study by Jensen[6] which stated that dietary intervention in workers could increase work productivity by 1-2% and study by Astuti[3] which stated that supplementary feeding in the lunch menu as much as 200 kcal for two weeks for employees could increase work productivity by 6.9% (p value = <0.001).

With USD 179 for cost of this study, the company could save 2 hours 8 minutes and it was certainly very beneficial for the company. It certainly could be a strong reason for the company to realize a snack intervention program in order to increase worker productivity.

The improvements in respondents' calorie intake are still needed to improve physical fitness and concentration of workers, This is in accordance with the study of Mahyuni et al.[18] which states that there is a significant relationship between daily energy consumption and work productivity ($p < 0.05$).

Snack intervention can help to fulfill worker's energy adequacy, therefore the body is able to accept the workload well, delaying fatigue, increasing accuracy due to increased concentration and therefore able to finish the job faster. Indirectly, the snack intervention can increase loyalty because workers feel that their welfare is concerned, making workers more motivated to do their jobs and make good relations between workers and the company and finally impact on productivity (shorter working duration).

The shorter working duration made more container units produced and the amount of pro-

duction costs can be reduced. Another advantage that can be obtained after snack intervention is that the company can prevent the loss of work time due to illness, because workers can get better balanced nutrition and so workers can be more productive.

In this study, the age of the respondent did not have a significant role in the change in total working duration after the intervention. This was probably caused by the age of respondents was not normally distributed. Another reason was because the age of all respondents in this study was still included in the Indonesian productive age category (15-64 years).[19] This result was similar with the study conducted by Selvia[20] which stated that age did not affect worker productivity ($p = 0.231$). Aisyah and Endang[21] revealed different things from the results of their study. Aisyah and Endang stated that age was significantly associated with worker productivity ($p<0.05$). The difference in significance of some results above was likely due to the different number and distribution of samples.

In this study, level of education also showed no significant difference in the total working duration between pre- and post-intervention. This was similar with the study by Astuti[3] which stated that there was no significant relationship between the level of education and work productivity ($p = 0.423$). This was likely because the helpers' tasks did not require high skills and workers who had better education did not necessarily translate the information they received in the form of good work behavior. Maria[22] stated that there was a significant association ($p <0.05$) between the level of education and the work productivity of employees.

Working period also showed no significant difference in the total working duration between pre- and post-intervention. This result was similar with the study conducted by Selvia[20] which stated that working period did not affect worker productivity ($p = 0.845$). This was probably because the helpers' tasks did not require special skills and the distribution of the working period of the respondent was not normal. Novianti, et al[23] stated that there was a significant relationship between working period and productivity ($p = 0.028$), in accordance with the study of Novianti, Kotur and Anbazhagan.[24] The longer working period is in line with the ability of someone to do their job. However, after twenty years working period, the performance has decreased due to the boredom experienced by workers. The decrease was also because after twenty years of work, these workers become older so their performance also decreases.[24] From this study we knew that snack intervention was the only cause that made change in working duration.

Conclusion

The hypothesis of study was proven (once a day snack intervention for four weeks could shorten the working duration of helper worker). There was significant difference in the BMI of respondents before and after the intervention. There were no significant differences in energy and protein intake in the first week compared to the fourth week. There were significant differences in carbohydrate and fat intake in the first week compared to the fourth week. The number of calories consumed by respondents to carry out their work activities at the beginning and end of the study were below the requirement. The total working duration per container unit after intervention was decreased compared to before intervention.

Recommendation

For workers, to regulate their diet with a comparison between carbohydrates, proteins, and fats according to their caloric needs. For company, to conduct health counseling on work nutrition routinely, make a snack intervention program as an alternative to increase the productivity of helper workers with regular monitoring, providing lunch independently by the company, working with nutritionists to calculate nutrient balance which is needed by workers and the company canteen for its supply, cooperating with the nearest health facility to overcome the problem of imbalance of workers' nutritional intake. For researchers, further research needs to be done with a larger number of study samples and better study designs, by extending the intervention time and using the control group as a comparison.

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