Differences in the Physical Workload of Technicians and Managers in the Maintenance and Repair Division

[1]Innaha Ilma Wardaya, Ais Assana Athqia[2], Y. Denny A. Wahyudiono[3]

[1]Department of Occupational Safety and Health, Faculty of Public Health, Universitas Airlangga, Indonesia
[1,3]Campus C Mulyorejo, Surabaya, East Java 60115 Indonesia
[2]Dinas Kebersihan dan Ruang Terbuka Hijau, Surabaya, East Java, Indonesia
Jl. Raya Menur No.31A, Manyar Sabrangan, Mulyorejo, Surabya, East Java 60285 Indonesia

ABSTRACT

Introduction: PT. PAL Indonesia (Persero) is a state-owned company in the shipping industry. For running the production cycle, PT. PAL Indonesia (Persero) has several divisions. One of them is the Maintenance and Repair Division. This division involves workers with positions as technicians and managers who have different tasks and functions. These differences will result in unequal physical workloads. The purpose of this study is to analyze the differences in the physical workload of technicians and managers of the Maintenance and Repair Division of PT. PAL Indonesia (Persero). **Methods:** This study used an analytic observational method with a cross sectional design. The independent variable used in this research was the position of workers consisting of managers and technician staff. Meanwhile, the dependent variable was a physical workload. The research respondents were 24 technicians and 6 managers. Data were obtained through questionnaires and calorimeters to measure calorie needs. **Results:** The technicians were aged 20 - 33 years old (62.5%), and the managers were aged 48 - 61 years (83.3%). Technicians' nutritional status was categorized as normal, as many as 21 people (87.5%) and the nutritional status of managers was overweight, as many as 4 people (66.7%). The physical workload of technicians was in the medium category, as many as 22 people (91.7%) and 5 managers had a moderate physical workload (83.3%). **Conclusion:** There was no difference in the physical workload of technicians and managers of the Maintenance and Repair Division. This is because PT. PAL Indonesia (Persero) has implemented cooperation in job completion.

Keywords: managers, physical workload, secure work, technicians

Corresponding Author:
Innaha Ilma Wardaya
Email: innaha.ilma.wardaya-2017@fkm.unair.ac.id
Telephone: +62 8969 9848 695

INTRODUCTION

Labor is a human resource who has an important role in the success of a company. The importance of the role of human resourcesy is as a company sub system in achieving goals. Thus, companies have the responsibility to protect and ensure workers. The Government of the Republic of Indonesia (2003) concerning Manpower states that business providers are obliged to provide protection for workers including welfare, safety, and physical or mental health.

Workers in an organization consist of several levels of positions which are classified based on the level of management in the organizational hierarchy. The management levels are divided into three, namely top managers, middle managers, and first line managers. The top manager level consists of the head and chief of the company. Meanwhile, the middle level consists of the general manager or division manager. The first line manager level consists of managerial workers, namely supervisors and non-managerial workers in the form of staff (Daft, 2012). The determination of the position based on job specifications includes education, training, skills, and others (Dassler, 2006).

A manager is someone who plays a role in providing motivation towards achieving organizational goals (Wijaya and Rifa'i, 2016). Meanwhile, according to DuBrin (2012) a manager is someone who is responsible for the performance of group members. Thus, a manager has an important role for an organization to achieve its goals. Staff members also play a significant role in organization. Staff is an element that helps the leader to do some tasks to achieve organizational goals (Zakaria, 2019). Therefore, both of them work together to achieve the company's goals.

Cite this as: Wardaya, I. I., Athqia, A. A and Wahyudiono, Y. D. A (2022) 'Differences in the Physical Workload of Technicians and Managers in the Maintenance and Repair Division', *The Indonesian Journal of Occupational Safety and Health*, 11(2), pp. 204-214.

 doi:10.20473/ijosh.v11i2.2022.204-214
Received February 22, 2021, received in revised form April 07, 2021, Accepted May 17, 2021, Published: August 2022

Both managers and staff have a specific workload. According to Vanchapo (2020), workload is the body's ability to accept work. One of the body's abilities is the ability to work physically using muscles and physical effort over a certain period of time (Tarwaka, 2004). Work activities that involve all members of the body, muscles and brain can create a workload that includes physical, mental, and social workloads (Suma'mur, 2014).

Physiologically, physical activity causes changes in the work of the muscles, heart and lungs. If the physical workload gets higher, the muscles, heart, and any other body organs will also work harder. Thus, the body's abilities and work demands must be balanced.

Research conducted by Wulandari *et al*. (2019) showed that the physical activities carried out by managers were classified in the mild to moderate category with a category range of 1.40 to 1.99 as measured by the Physical Activity Level. This is because the work of a manager is mostly done indoors. Abadini and Wuryaningsih (2018) stated that physical activity in offices for 471 minutes or nearly 8 hours per day is probably done sedentary. Based on several studies above, it can be concluded that a manager uses less muscle activity.

Meanwhile, the physical workload on the quality control operator staff in the Particle Board Factory division, PT. Kutai Timber Indonesia was in the moderate category with a value range of 0.723 to 1.081 (Maretno, 2015). Similar research was conducted by Fahmy *et al*. (2018) regarding the workload of Rubber Tyred Gantry (RTG) Crane Maintenance technicians measured using the Full Time Equivalent (FTE) method. It was found that as many as 8 people had overloaded workloads ranging from 1.342 to 2.03. The physical workload at the staff level also varied widely. This is based on the type of job and job description a staff has.

Based on various research related to the physical workload of managers and staff, it can be seen that there are differences between them. This is due to differences in the tasks and functions of managers and staff. Managers who are at the hierarchical level are required to have all three managerial skills, namely conceptual, human relations, and technical skills. Meanwhile, a staff demand is more dominant in technical skills such as production or service (Daft, 2012). The manager's tasks and functions cause a lack of muscle activity due to the dominant use of brain activity (Tarwaka, 2013). Research conducted by Syafei and Primanintyo (2016) showed that the average physical workload at the managerial level was 28.40%, while the physical workload at the supervisory level was 44.9%. The research showed that there was a difference in physical workload between middle-level managers and first-line levels.

Workload is influenced by several factors which are divided into internal factors and external factors. Internal factors of workload consist of somatic factors (gender, body size, age, health condition, and nutritional status) and psychological factors (motivation, perception, belief, desire, satisfaction, etc.). Meanwhile, external factors consist of tasks or jobs, work organization, and work environment (Tarwaka, 2004).

Based on research conducted by Andiani (2018), physical workload had a relationship with fatigue with a p-value of 0.040. This relationship was positive with r of 0.307. Another similar research conducted by Larasati (2019) explained that physical workload had a correlation with fatigue with a p-value of 0.006. Thus, excess physical workload can cause fatigue in workers. In addition, excessive physical workload has an impact on decreased work quality due to physical fatigue and loss of concentration. This leads to customer complaints about unsatisfactory products. Workers who are too tired or sick can also increase absenteeism which disrupts the functioning of the organization (Irawati, 2017).

Physical activity requires energy that comes from burning substances. The heavier the activity, the greater the energy required. The number of calorie requirements is one indicator of determining the size of a physical workload (Tarwaka, 2004). Assessment of physical workload by determining calorie needs can be measured using a pedometer.

PT. PAL Indonesia (Persero) is a state-owned company in the shipping industry. To run the production cycle, PT. PAL Indonesia (Persero) has several divisions. One of them is the Maintenance and Repair Division. The division consists of several employees classified based on their position, tasks, functions and abilities. This division makes a group of work that consists of two types, namely managers and technicians.

The Maintenance and Repair Division is a division with high work demands due to the its location where ships are anchored for repairs. In a year, there are 6,800 ships docked. Workers of the Maintenance and Repair Division often work overtime. The large number of ships that are

anchored makes workers have to work quickly and correctly. The job of managers and technicians in completing tasks is interdependent. The quantity of tasks for managers and technicians are almost the same. This causes an increase in physical workload and the potential for work stress for both of them. In addition, working overtime can cause fatigue for workers.

The purpose of this study was to determine the differences in the physical workload of managers and technicians in the Maintenance and Repair Division of PT. PAL Indonesia (Persero). The physical workload in question comes from work activities performed by managers and technicians. The benefit of this research is that the company can know the description of the physical workload at each level of position so that it can be used as a consideration for decision making or for the division of tasks.

METHODS

This research is an observational analytic study with a cross sectional design. This research was conducted on managers and technicians of the Maintenance and Repair Division of PT. PAL Indonesia (Persero). Determination of the sample used the total population method and obtained as many as 6 people in the managerial positions and 24 people in the technician levels from the Maintenance and Repair Division.

The independent variable used in this research was the job position of workers consisting of managers and technician staff in the Maintenance and Repair Division of PT. PAL Indonesia (Persero). Meanwhile, the dependent variable was a physical workload. Data collection in this research used a questionnaire for internal factors such as job position, age, and nutrition status. Meanwhile, the physical workload data collection used the measurement of calorie needs using a calorimeter on a pedometer. This tool is like a watch that wrists the workers' hands while working. After the workers finished working, the pedometer would output the number of calories expended. To find out the calorie requirement per hour, the total calories expended was divided by the length of time worked in hours. The categorization of physical workload was based on the Minister of Manpower Decree Number 13 of 2011 concerning Threshold Value of Physical Factors and Chemical Factors in the Workplace. There are three categories in that regulation which consist of low, moderate, and severe physical workload. The low category of physical workload is figured by the number of calories needed under 200 kcal/hour. The moderate category of physical workload is the calories needed between 200 kcal/hour to 350 kcal/hour. The severe category of physical workload is figured by the number of calories needed up to 350 kcal/hour until 500 kcal/hour (Ministry of Manpower and Transmigration, 2011).

Data analysis method used was chi square to find out the differences in physical workloads on the managers and technicians of the Maintenance and Repair Division. Variables used for the chi square test were physical workload and job position. If the result of this test was more than (p value = 0.5), there were no differences in workload between managers and technicians. This research was held in February 2019 in the Maintenance and Repair Division of PT PAL Indonesia (Persero). This research has got ethical approval with number 43/EA/KEPK/2019.

RESULTS

The results of the study were obtained using an instrument in the form of a questionnaire related to individual characteristics. The instrument for

Table 1. .Distribution of Characteristics of Respondents in the Technician and Managerial Levels in the Maintenance and Repair Division of PT. PAL Indonesia (Persero) 2019

Respondent Characteristics	Frequency (n)	Percentage (%)
Technician Level		
Age (years old)		
17 – 25	4	16.4
26 - 35	11	45.8
36 – 45	5	20.8
46 – 55	4	16.7
Nutritional Status		
Normal	21	87.5
Overweight	3	12.5
Managerial Level		
Age (years old)		
36 – 45	1	16.7
46 – 55	4	66.7
56 – 65	1	16.7
Nutritional Status		
Normal	2	33.3
Overweight	4	66.7

measuring the physical workload was a calorimeter on a pedometer. The distribution of variables can be seen in Table 1 along with its explanation.

Respondent Characteristics

Table 1 shows that the characteristics of respondents at the technician level including age and nutritional status. Most of the technicians in the Maintenance and Repair Division were aged 26 – 35 years old as many as 11 people (45.8%). Based on the nutritional status, respondents at the technician level were divided into two categories, namely normal and overweight. The number of respondents in the technician level in the normal category was 21 people (87.5%) and in the overweight category was 3 people (12.5%). Meanwhile, most of the managers were aged 46 to 55 years old as many as 4 people (66.7%). The nutritional status of managers

Table 2. Distribution of the Physical Workload of Respondents in the Technician and Managerial Levels in the Maintenance and Repair Division of PT. PAL Indonesia (Persero) 2019

Respondent	CalorieNeed (kcal)	Duration	Physical Workload (kkal/hour)	Status
Technician Level				
1	1578	5	316	Moderate
2	1446	5	289	Moderate
3	1122	5	224	Moderate
4	1025	4	256	Moderate
5	856	4	214	Moderate
6	908	4	227	Moderate
7	1025	4	256	Moderate
8	1025	4	256	Moderate
9	1160	4	290	Moderate
10	1038	5	208	Moderate
11	1315	4	329	Moderate
12	1250	4	313	Moderate
13	1404	5	281	Moderate
14	1038	5	208	Moderate
15	1315	4	329	Moderate
16	1068	5	214	Moderate
17	1578	5	316	Moderate
18	1230	4	308	Moderate
19	1028	4	257	Moderate
20	840	4	210	Moderate
21	1315	4	329	Moderate
22	704	4	176	Mild
23	688	4	172	Mild
24	1040	4	260	Moderate
Average	1125	4.3	260	Moderate
Managerial Level				
25	1529	5	306	Moderate
26	1205	4	301	Moderate
27	1309	6	218	Moderate
28	1230	4	308	Moderate
29	748	4	187	Mild
30	1205	5	241	Moderate
Average	1204	4.7	260	Moderate

in the overweight category was 4 people (66.7%) and in the normal category was 2 people (33.3%).

Physical Workload

Table 2 shows the results of the measurements of the physical workload based on calorie needs using a pedometer for 4 to 6 hours of work. The final results shown on the pedometer were divided by the length of work, and afterwards the category was determined. Based on Table 3, it can be seen that the average calorie needed of technicians was 1125 kcal with an average duration of working hours of 4.3 hours. Thus, the average calorie needed was 260 Kcal / hour. Meanwhile, the average calorie needed of managers was 1204 kcal with an average duration of working hours of 4.7 hours. Thus, the average calorie needed was 260 Kcal / hour. Based on the average calorie needs per hour for both of the managers and technicians, the category of physical workload was moderate.

Table 3. Physical Workload of Respondents in the Technician and Managerial Levels in the Maintenance and Repair Division of PT. PAL Indonesia (Persero) 2019

Physical Workload	Frequency (n)	Percentage (%)
Technician Level		
Mild	2	8.3
Moderate	22	91.7
Total	24	100
Managerial Level		
Mild	1	16.7
Moderate	5	83.3
Total	6	100

Table 4. Cross tabulation between Age and the Physical Workload of Workers in the Technician Level in the Maintenance and Repair Division of PT. PAL Indonesia (Persero) 2019

Age (years old)	Physical Workload			
	Mild		Moderate	
	n	%	n	%
17 - 25	0	0	4	100
26 - 35	0	0	11	100
36 - 45	2	40	3	60
45 – 55	0	0	4	100

Similar to data in Table 2, Table 3 shows that the physical workload of respondents in the technician level was mostly in the medium category, as many as 22 people (91.7%) and 2 people were in the low category (8.3%). Meanwhile, the physical workload for respondents in the management level was 5 people in the medium category (83.3%) and 1 person in the low category (16.7%).

Cross Tabulation between Workers' Age and Physical Workload

Table 4 shows that the majority of respondents in the technician level had a moderate physical workload. Technicians aged 26 - 35 years old had a moderate physical workload, as many as 11 people (100%). From these results, it can be seen that young technicians had more moderate physical workloads than other age categories. This means that the younger the technicians, the higher the physical workload they have.

Based on Table 5, it can be seen that most of the respondents in the managerial level had a moderate physical workload. At the age of 46 - 55 years old, there were 3 workers with moderate physical workload (75%). This means that the older a manager is, the higher the physical workload is.

Table 5. Cross tabulation between Age and the Physical Workload of Workers in the Managerial Level in the Maintenance and Repair Division of PT. PAL 2019

Age (years old)	Physical Workload			
	Mild		Moderate	
	n	%	n	%
36 – 45	0	0	1	100
46 - 55	1	25	3	75
56 – 65	0	0	1	100

Table 6. Cross Tabulation between the Nutritional Status and Workload of Workers in the Technician Level in the Maintenance and Repair Division of PT. PAL Indonesia (Persero) 2019

Nutritinal Status	Physical Workload			
	Mild		Moderate	
	n	%	n	%
Normal	2	9.5	19	90.5
Overweight	0	0	3	100

Cross Tabulation between Nutritional Status and Physical Workload

Table 6 shows that the most technicians with normal nutritional status had a moderate physical workload, as many as 19 people (90.5%). Meanwhile, technicians with an overweight nutritional status and a moderate physical workload were as many as 3 people (100%).

Based on Table 7, it can be seen that the majority of managerial level respondents with an overweight nutritional status had a moderate physical workload as many as 4 people (100%). Meanile, respondents with a normal nutritional status had a physical workload with light and moderate categories, with 1 person in each category. These results indicate that workers with excess nutritional status have a higher likelihood of experiencing a moderate physical workload.

Cross-tabulation of the Physical Workload of Respondents in the Technician and Managerial Levels in the Maintenance and Repair Division of PT. PAL Indonesia (Persero)

Based on Table 8, it can be seen the majority of technicians had a moderate physical workload, as many as 22 people (91.7%). Similar to technicians, the majority of managers had a moderate physical workload, as many as 5 people (83.3%). The test results using the chi square showed a p value of 0.501, which means that Ho was accepted or there was no difference between the physical workload of technicians and managers in the Maintenance and Repair Division of PT. PAL Indonesia (Persero).

Table 7. Cross Tabulation between the Nutritional Status and Workload of Workers in the Management Levels in the Maintenance and Repair Division of PT. PAL 2019

Nutritinal Status	Physical Workload			
	Mild		Moderate	
	n	%	n	%
Normal	1	50	1	50
Overweight	0	0	4	100

Table 8. Cross Tabulation Between the Types of Work and the Physical Workload of the Respondents in the Maintenance and Repair Division of PT. PAL 2019

Work	Physical Workload				p-value
	Mild		Moderate		
	n	%	n	%	
Technicians	2	8.3	22	91.7	0.501
Managers	1	16.7	5	83.3	

DISCUSSION

Respondent Characteristics

This research used 2 types of respondents, namely employees of PT. PAL (Persero) Indonesia in the Maintenance and Repair Division both in the technician and management levels. There were 24 workers in the technician levels with varying age distributions. In this study, most of the technicians were young, with a range of 26 to 35 years old as many as 11 workers (45.8%). The largest age range was recorded in the management levels, namely 46 - 55 years old as many as 4 workers (66.7%). One of the reasons about the differences in age distribution of technicians and managers is the recruitment and selection. Based on research of Rosento (2018), there are two types of recruitment sources, namely internal sources and external souces. Both of the sources are used in PT. PAL (Persero) Indonesia to hire the worker.

In the technician levels, the external sources from outside the organization are used. The recruitment process often occurs so that there are several new workers who are young and replace the old workers. Most of the recruitment process for management levels uses internal sources that the workers have been in the organization. The recruitment process rarely occurs because the manager recruitment process sometimes uses a tiered method or exchanges with other divisions. According Setiani (2013), many organizations use internal sources for recruitment in management levels when the human resources exist have a good qualification. Besides, the internal recruitment can be in the form of job rolling or job promotion that provides the workers some opportunities to develop their career.

The recruitment and selection process carried out by PT. PAL (Persero) Indonesia does not only consider intelligence aspects but also physical and health aspects, some of which are posture, height and weight. Wati (2018) said that the body height has a corellation with body mass index (BMI) because the measurement of BMI uses body height dan weight. The results of BMI measurements can be used to determine the nutritional status of workers. In

general, companies want workers with ideal body postures and normal nutritional status. This aims to facilitate the movement of workers while working, which can improve worker performance. Most of the technicians in this study had an ideal body posture evidenced by the results of the nutritional status measurements in the normal category as many as 21 workers (87.5%). Meanwhile, as many as 4 managers had nutritional status in the overweight category (66.7%). The nutritional status is influenced by the physical activity that can burn calories. This is in line with research of Ariani and Masluhiya (2017) which stated that there was an association between physical activities and BMI. Physical activity is known to play a role in the distribution of body fat so as to avoid besity. Technicians tend to do more physical activity than managers. The reason is that a technician's job is directly related to ship maintenance and repair and requires a lot of energy and calorie burning. It is different with managers who work with a combination of sitting activities for a long enough duration. It can be concluded in this study that there was a different physical activity between managers and a technicians.

Physical Workload

Vanchapo (2020) said that workload is the body's ability to accept work. One of the body's abilities is the ability to work physically using muscles and physical effort over a certain period of time. Physical workload is influenced by physical activity performed by technicians and managers. According to the job description, it was found that the type of job for a technician that involves physical activity is higher than that of a manager. Higher the activity carried out, it allows the increasing physical workload in workers. This is in line with the study by Bandono *et al*. (2014) stating that the job description can affect physical activity and the resulting physical workload. In addition, the calculation results shows a high physical workload, corrective action needs to be conducted.

Based on Table 2, it can be seen that the physical workload of technicians and managers was in the same category, namely moderate physical workload. However, there are some workers had a low category of physical workload. This happened because the measurement was held when the workers were doing less physical activity. These results indicate that the overall division of tasks and job descriptions of workers, both for technicians and managers, is appropriate and evenly distributed. There is a similarity in the physical workload category. It is because during the working process, the technicians and managers work together to achieve the goal. This result is in line with the study of Syukron Ginanjar, Indarto and Santoso (2019) stating that the mutual cooperation can ease the work so that the distribution of workload is proportional and works optimally. Wibowo and Mustofa (2018) said that the mutual cooperation can run effectively if there is the same perspective between workers about it. The results of this study show that there was the same perspective about mutual cooperation in the Maintenance and Repair Division of PT. PAL (Persero) Indonesia.

Cross Tabulation between Age of Workers and Physical Workload

Physical workload is influenced not only by the type of work (external factors) but also by internal factors consisting of age, gender, nutritional status, and others. Based on the results of the study, it was found that young technicians had a higher physical workload. It is because they still have a lack of experience or ability that causes an imbalance with job demands. Based on the results of observations on young workers, it was found that young technicians got more physical workload than older technicians. According to Arfani and Damayanti (2019), workers with a young age tend to experience work fatigue because of the work target that must be finished on time.

Meanwhile, the physical workload at the managerial level shows that older ages have a higher physical workload than other ages. this result is in line with research by Kusgiyanto (2017), stating that young people are known to be able to carry out heavy work, and on the contrary, with old age the ability to carry out heavy work will decrease. An imbalance between workload and body's ability or capacity will cause fatigue. This is due to the influence of the physiological conditions of the body.

Age is an indicator of body strength or muscle strength. Human muscle strength is optimal at the age of 20 to 30 years old and will weaken at the age of 51 to 60 years old (Harmawan, 2016). The muscle strength has an impact on a person's strength at work. Weak muscle strength leads to a lack of ability to work. This can lead to a higher physical workload because of imbalance. In addition, inadequate muscle strength causes fatigue due to a nonoptimal muscle contraction and metabolism. Overall, age

has a relationship with physical workload. Similarly, research by Hashiguci (2020) stated that age has a relationship with physical workload.

Cross Tabulation between Nutritional Status and Physical Workload

Based on the results of research on technicians, it was found that the majority of technicians with moderate physical workloads were technicians with normal nutritional status. Nutritional status is related to a person's anthropometric condition through height and weight. PT. PAL Indonesia (Persero) carries out a new worker selection by including the requirements for the ideal height and weight. This aims to facilitate the work of technicians who are required to be nimble and active in carrying out ship repairs and maintenance. The ideal body will facilitate movement during work. Thus, almost all technicians have the same nutritional status.

Managers with overweight nutritional status have a higher chance of physical workload than other categories. This is in accordance with the duties and functions of a manager who has minimal physical activity. BMI or Body Mass Index also describes increased adiposity through height and weight. An increase in a person's BMI is due to an increase in age and fat mass in the body. Based on research by Yunitasari *et al*. (2019), an increase in fat mass will increase a person's pulse rate. In addition, the increase in fat mass also causes the absorption of oxygen in the muscles to decrease. Lack of oxygen in the body causes the metabolism to become anaerobic metabolism, which has an impact on the accumulation of lactic acid. This condition is potential to make the workers feel fatigue more easily. It also causes an increase in calorie needed during working. Mänttäri *et al*. (2019) said that nutritional status as body mass index has a correlation with physical workload.

Based on the Minister of Manpower Decree Number 13 of 2011 concerning Threshold Value of Physical Factors and Chemical Factors in the Workplace, it is stated that a physical workload can be measured from the calories spent. The calories spent will be the same as the calories needed. In that rule, physical workload is classified into three categories depending on the calories needed. The first category is mild physical workload with a calorie requirement of 100-200 kcal/hour. The second category is moderate physical workload with a calorie requirement of up to 200 until 350 kcal/hour. The last category is severe physical workload with a calorie requirement of up to 350 kcal/hour (Ministry of Manpower and Transmigration, 2011). In 8 hours, the calories needed of workers are as much up to 1600 kcal. Rosmalina and Permaesih (2014) stated that for 8 hours of work, workers require energy intake as much as 40% of daily energy needs. The energy needs for men aged 19 to 65 years old are 1800-2650 kcal per day (Ministry of Health of the Republic of Indonesia, 2019). The energy can be fulfilled from food that contains carbohydrate, protein, fat, fiber, etc.

Tarwaka (2010) stated that fatigue is caused by physical activity. This activity creates a physical workload for workers. Increased physical workload can reduce muscle tightness and contraction, which indicates muscle fatigue (Maharja, 2015). As the physical workload increases, there is an increase in oxygen consumption. A decrease in the oxygen level in the body will cause metabolic disorders and a buildup of lactic acid, which makes it difficult for muscles to contract. This condition triggers fatigue. According to Syahfudin (2019), a physical workload has a correlation with work fatigue.

Cross-tabulation of Physical Workloads in the Technician and Managerial Levels in the Maintenance and Repair Division Managers of PT. PAL

Based on the results of research in the Maintenance and Repair Division, it was found that there was no difference in the physical workload between technicians and managers. The result is the same as research by Ita and Mawaddah (2019), which showed that the physical workload on supervisors was46.8% and the physical workload on firemen was 47.8%. Relatively there was no difference in physical workload between management positions and staff in PT. PAL Indonesia (Persero) caused by the good distribution of job and good explanation in job description. Another reason is PT. PAL Indonesia (Persero) has a good teamwork. According to them, the target is a shared responsibility that must be done together as quicky as possible. However, the result of this research is not in line with research of Syafei and Primanintyo (2016) which said that the average physical workload in the managerial level was 28.40%, while the physical workload at the supervisory level was 44.9%. This shows that the physical workload between the two positions was different. The different research results is related to the smaller number of research respondents. Differences in the physical workload may also

occur due to differences in the distribution of job description for each worker (Ajitia and Prasetya, 2017). In addition, the physical workload is not evenly distributed due to the low team work in an organization. According to Pandelaki (2018), good cooperation will ease the workload so that it is resolved on time.

The Maintenance and Repair Division of PT. PAL Indonesia (Persero) has implemented team work in each position. However, the implementation of team work still results in a moderate physical workload. Actually, this condition shows that the personal's physical workload can be higher. Some of the efforts made by PT. PAL to minimize excess physical workload is implementing adjustments to the capacity and ability of the workers. This activity can prevent an imbalance between work demand and work capacity among workers.

CONCLUSION

Technicians and managers of the Maintenance and Repair Division in PT. PAL Indonesia (Persero) had a moderate physical workload. This research showed that there was no difference in the physical workload between technicians and managers. Both of the positions have implemented a good teamwork in doing their jobs. However, the physical workload can decrease to a mild category if other factors such as age and status nutrition are considered. Younger or older workers who are overweight will have a bigger chance in higher physical workload.

ACKNOWLEDGEMENTS

The researchers would like show deepest gratitude to our research advisor, and all of the participants in this research. We also would like to thank the reviewers for insightful review and comments on this paper. This research is far from perfect, but we hope it will be useful for us and all readers.

REFERENCES

Abadini, D. and Wuryaningsih, C. E. (2018) 'Determinan Aktivitas Fisik Orang Dewasa Pekerja Kantoran di Jakarta Tahun 2018', *Jurnal Promosi Kesehatan Indonesia*, 14(1), pp. 15–28.

Ajitia N., M. G. and Prasetya, A. (2017) 'Efektivitas Manpower Planning Dengan Menggunakan Metode Analisis Beban Kerja (Work Load Analysis) Berdasarkan Pendekatan Full Time Equivalent (Studi Pada Divisi Pengembangan Karir, Organisasi, dan Kompetensi di PT. Pupuk Kalimantan Timur Tbk. Bontang, Ka', *Jurnal Administrasi Bisnis S1 Universitas Brawijaya*, 42(1), pp. 27–35.

Andiani, I. P. (2018) 'Hubungan Antara Beban Kerja Dan Asupan Kalori Dengan Kelelahan Kerja pada Tenaga Kerja Bongkar Muat di Pelabuhan Samudera Bitung', *Jurnal Kesmas*, 7(4), pp. 1–8.

Arfani, Y. B. and Damayanti, R. (2019) 'Factors of Subjective Work Fatigue on Service Workers Docking Pt Pal Indonesia (Persero)', *Journal of Industrial Hygiene and Occupational Health*, 4(1), pp. 13–26.

Ariani, N. L. and Masluhiya, S. (2017) 'Keterkaitan Aktivitas Fisik Dengan Indeks Massa Tubuh (IMT) Siswa SD Kota Malang', *Care : Jurnal Ilmiah Ilmu Kesehatan*, 5(3), pp. 457–464.

Bandono, R. B. I. *et al*. (2014) 'Analisis Beban Kerja Dan Jabatan Berdasarkan Job Description dan Factor Evaluation System pada Personel Dislambair Koarmada II', *Jurnal Analisis Sistem & Riset Operasi*, 1(4), pp. 33–42.

Daft, R. L. (2012) *Management*. 11th edn. South Western, USA: Cangange Learning.

Dassler, G. (2006) *Manajemen Sumber Daya Manusia*. 10th edn. Jakarta: PT. Indeks Putri Media.

DuBrin, A. J. (2012) *Essentials of Management*. 9th edn. South Western, USA: Cangage Learning.

Fahmy, A., Rosydah, B. M. and Amrullah, H. N. (2018) 'Analisis Beban Kerja Dengan Metode Full Time Equivalent Untuk Mengoptimalkan Kinerja Pada Teknisi Maintenance Rtg', *Seminar K3*, 2(1), pp. 503–506.

Government of the Republic of Indonesia (2003) Undang - Undang Republik Indonesia No 13 Tahun 2003 tentang Ketenagakerjaan.

Harmawan, T. A. (2016) 'Efek Penuaan Terhadap Ketahanan Otot Tangan pada Masyarakat Laki-laki Dewasa di Sragen', *in Seminar Nasional Fisika dan Aplikasinya*.

Hashiguci, N. (2020) 'Practical Judgment of Workload Based on Physical', *Sensors*, 20(2786), pp. 1–19.

Irawati, R. (2017) 'Analisis Pengaruh Beban Kerja Terhadap Kinerja Operator pada PT. Giken Precision Indonesia', *Jurnal Inovasi dan Bisnis*, 5(1), pp. 53–58.

Ita, C. and Mawaddah, S. (2019) 'Analisis Pengukuran Beban Kerja Supervisor Dan Fireman PT Perta Arun Gas Menggunakan Metode Defence Research Agency Workload Scale', *Industrial Engeneering Journal*, 8(2), pp. 47–52.

Kusgiyanto, W. (2017) 'Analisis Hubungan Beban Kerja Fisik, Masa Kerja, Usia, dan Jenis Kelamin Terhadap Tingkat Kelelahan Kerja pada Pekerja Bagian Pembuatan Kulit Lumpia di Kelurahan Kranggan Kecamatan Semarang Tengah', *Jurnal Kesehatan Masyarakat*, 5(5), pp. 413–423.

Larasati, S. (2019) 'Hubungan Karakteristik Individu, Beban Kerja Fisik dan Beban Kerja Mental dengan Kelelahan Kerja Pada Karyawan Bagian Produksi Di PT. X', *Jurnal Kesehatan Masyarakat,* 7(4), pp. 601–608.

Maharja, R. (2015) 'Analisis Tingkat Kelelahan Kerja Berdasarkan Beban Kerja Fisik Perawat di Instalasi Rawat Inap RSU Haji Surabaya', *The Indonesian Journal of Occuptional Safety and Health*, 4(1), pp. 93–102.

Mänttäri, S. K. *et al*. (2019) 'Activity Level and Body Mass Index as Predictors of Physical Workload During Working Career', *Safety and Health at Work*, 10(4), pp. 527–530.

Maretno, A. (2015) 'Analysis Physical and Mental Workload Uses Work Sampling and NASA-TLX To Decide Operator Number', *Dinamika Rekayasa*, 11(2), pp. 54–62.

Ministry of Health of the Republic of Indonesia (2019) Peraturan Menteri Kesehatan Republik Indonesia Nomor 28 Tahun 2019 Tentang Angka Kecukupan Gizi Yang Dianjurkan Untuk Masyarakat Indonesia. Jakarta: Ministry of Health of the Republic of Indonesia.

Ministry of Manpower and Transmigration (2011) Peraturan Menteri Tenaga Kerja dan Transmigrasi Nomor 13 Tahun 2011 tentang Nilai Ambang Batas Faktor Fisika dan Faktor Kimia di Tempat Kerja. Jakarta: Ministry of Manpower and Transmigration.

Pandelaki, M. T. (2018) 'Pengaruh Teamwork dan Budaya Kerja Terhadap Kinerja Karyawan Yayasan Titian Budi Luhur Di Kabupaten Parigi Moutong', *Katalogis*, 6(5), pp. 35–46.

Rosento (2018) 'Efektivitas Rekrutmen Dalam Kinerja Karyawan Pada Bagian Pemasaran di CV Ikra Cendana Lintang Jakarta', *Jurnal Cakrawala*, XVIII(1), pp. 81–88.

Rosmalina, Y. and Permaesih, D. (2014) 'Aktifitas Fisik dan Penggunaan Energi Pekerja Laki-Laki dengan Jenis Pekerjaan Berbeda', *Gizi Indonesia*, 31(2), pp. 98–106.

Setiani, B. (2013) 'Kajian Sumber Daya Manusia dalam Proses Rekrutmen Tenaga Kerja di Perusahaan', *Jurnal Ilmiah Widya*, 1(1), pp. 38–44.

Suma'mur (2014) *Higiene Perusahaan dan Kesehatan Kerja (HIPERKES)*. Jakarta: Sagung Seto.

Syafei, M. Y. and Primanintyo, B. (2016) 'Pengukuran Beban Kerja Pada Managerial Level Dan Supervisory Level Dengan Menggunakan Metode Defence Research Agency Workload Scale (DRAWS) (Studi Kasus Di Departemen UHT PT. Ultrajaya Milk Industry & Trading Co, TBk)', *Jurnal Rekayasa Sistem Industri*, 5(2), pp. 69–78.

Syahfudin, A. J. (2019) 'Gambaran Faktor Internal dan Faktor Eksternal Kelelahan di Perusahaan Peleburan Baja Sidoarjo', *The Indonesian Journal of Occupational Safety and Health*, 8(3), pp. 336–345.

Syukron Ginanjar, M., Indarto and Santoso, D. (2019) 'Determinan Kinerja Pegawai Dengan Motivasi Sebagai Variabel Intervening', *Jurnal Riset Ekonomi dan Bisnis*, 12(2), pp. 135–144.

Tarwaka (2004) *Ergonomi Untuk Keselamatan, Kesehatan Kerja dan Produktivitas*. 1st edn. Surakarta: UNIBA PRESS.

Tarwaka (2010) *Ergonomi Industri: Dasar - Dasar Pengetahuan Ergonomi dan Aplikasi di Tempat Kerja*. Solo: Harapan Press.

Tarwaka (2013) *Ergonomi Industri*. Surakarta: Harapan Press.

Vanchapo, A. R. (2020) *Beban Kerja dan Stres Kerja*. 1st edn. Edited by N. Arsalan. Pasuruan: CV. Penerbit Qiara Media.

Wati, D. A. (2018) 'Hubungan Rentang Lengan Dengan Tinggi Badan Dalam Menentukan Indeks Massa Tubuh Lansia', *Journal of Hiositic and Health Sciences*, 2(1), pp. 14–18.

Wibowo, P. and Mustofa (2018) 'Effect Of Work Conflict, Work Load, And Work Environment

On Employees Work Stress (Case Study At Pt Indoraya Internasional Di Yogyakarta)', *eCoBuss*, 1(1), pp. 28–36.

Wijaya, C. and Rifa'i, M. (2016) *Dasar-Dasar Manajemen*. 1st edn. Medan: Perdana Publishing.

Wulandari, A. R., Widari, D. and Muniroh, L. (2019) 'Correlation between Energy Intake, Job Stress, Phyisical Activity, and Sleep Duration with BMI in Middle Manage', *Amerta Nutrition*, 3(1), pp. 40–45.

Yunitasari, A. R., Sinaga, T. and Nurdiani, R. (2019) 'Nutritient Intake, Physical Activity, Nutrition Knowledge, Nutritional Status, and Physical Fitness of Elementary School Sport Teacher, *Media Gizi Indonesia*, 14(2), p. 197.

Zakaria, T. (2019) 'Peranan Staf Dalam Menunjang Pelaksanaan Tugas Pimpinan', *Jurnal Lingkar Widyaiswara*, 6(04), pp. 51–55.