

PROFILE OF CARDIOPULMONARY ENDURANCE, MUSCLE STRENGTH AND FLEXIBILITY OF THE EMPLOYEES IN PT. KERETA API INDONESIA

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Abstract

PT. Kereta Api Indonesia is the largest transportation company in Indonesia. To maintain company productivity, employees need good physical fitness as the components of physical fitness are cardiopulmonary endurance, good muscle strength, and flexibility. Technicians, conductors, and machinists very much need this component of good physical fitness due to the high workload.

A descriptive study with a cross-sectional design was conducted on secondary data, with 163 employees from PT. KAI DAOP 1 Jakarta in May-August 2017 using the Total Sampling method. The variables measured were cardiopulmonary endurance with the Young Men's Christian Association (YMCA) bench test, muscle strength with a dynamometer, and flexibility with a pleximeter. Prevalence of the very poor category was found in cardiopulmonary endurance (35.58%), right-hand grip strength (69.33%), left-hand muscle strength (71.78%), back muscle strength (53.37%), and leg muscle strength (55.21%). However, there are also some variables dominated by the moderate category, namely push strength (39.88%), pull strength (36.2%), and interestingly flexibility showed a very good category (76.69%). It is necessary to carry out a physical fitness program with principles that are following the physical activity itself, namely the FITT principle. This is because there are components of fitness that are dominated by the very poor category, namely cardiopulmonary endurance, right-hand and left-hand muscle strength, and back and leg muscle strength. The types of exercise that can be done in the physical fitness program are moderate-intensity aerobics, walking, cycling, lifting weights, and stretching.

Keywords: *Cardiopulmonary Endurance, Employee, Flexibility, Muscle Strength*

INTRODUCTION

PT Kereta Api Indonesia (KAI) is a transportation company that requires excellent employee productivity because it is related to the needs and smooth transportation of the community.^{1,2} In this regard, the role of employees who have cardiopulmonary endurance, good muscle strength, and flexibility, play an important role so that the transportation service process can run well. However, previous research conducted by Lesmana (2018) shows the prevalence of physical fitness of employees of PT. KAI shows the physical fitness of employees in the low category as much as 46.38%.³ This shows that there is a relationship between workload and the degree of fitness in employees with the work productivity of employees of PT. KAI. We are observing aspects of the type of work employees of PT. KAI is apparently related to, among other things: completing train maintenance, carriages that must be cleaned every day, and repairing railroad tracks.⁴ The maintenance of railway facilities consists of series and locomotives carried out at Locomotive Depot.⁵ In connection with the description describes that the employees of PT. KAI has good work productivity, which requires, among other things, good physical conditions, namely cardiovascular endurance, good muscle strength, and flexibility.

Low cardiorespiratory endurance indicates low physical fitness, and this will cause employees of PT. KAI quickly experiences fatigue at work, so that it can negatively impact on the work performance of PT. KAI. Low physical fitness can also interfere with concentration at work, decrease work efficiency and productivity, and the incidence of human error.⁶ In addition to cardiopulmonary endurance, muscle strength and flexibility also have an important role to play in improving employee performance, for example, when maintaining train repairs, cleaning train cars, and repairing railroad tracks.⁴ Good muscle strength and flexibility are needed to reduce and overcome the incidence of Musculoskeletal Disorder (MSD) in workers.⁷ This is due to excessive energy expenditure at work, static posture, inadequate

recovery time due to overtime, and working in cold temperatures.⁸ Low flexibility can result in excessive muscle tension, and muscles will be more susceptible to the risk of injury, for example, work accidents.^{7,9}

The purpose of this study was to determine the profile of cardiopulmonary endurance, muscle strength, and flexibility of PT. Kereta Api Indonesia as evaluation material for companies in developing better physical fitness programs and as a reference for further research.

METHODS

The research was conducted using a cross-sectional descriptive method—the data was used in the form of secondary data. The research was conducted in May–August 2017. The place of research is PT. Indonesian Railways Operational Area (DAOP) 1 Jakarta. The research sample was 163 employees of PT. KAI. The sample was determined by the total sampling method.

The inclusion criteria of this research were employees of PT. Kereta Api Indonesia working as technicians, conductors, and machinists, aged 45–60 years, male and undiagnosed with high uric acid (normal uric acid level 4.0–8.5 mg/dL). The exclusion criteria were medical records of employees of PT. KAI with variable data sought are cardiopulmonary endurance, muscle strength, and incomplete flexibility.

This research has been approved by the Ethics Committee of the Faculty of Medicine, Universitas Padjadjaran, which is written in letter 958/UN6.KEP/EC/2021. The physical examination procedure for all participants was informed by previous studies.

RESULT

The results of this study show the profile of cardiopulmonary endurance, muscle strength, and flexibility. Employees of PT. Indonesian Railways Operational Area (DAOP) 1 Jakarta. Based on secondary data on the physical fitness of employees of PT. Kereta Api Indonesia DAOP 1 Jakarta, there were 163 research subjects who meet the inclusion and exclusion criteria. The subjects included rail transportation employees, a total of 163 men

with an age range of 45 and 60 years.

The results of this study are listed in Table 1, the profile of cardiopulmonary endurance, muscle strength, and flexibility of employees of PT. KAI conducted with the Young Men's Christian Association (YMCA) Bench Test, Dynamometer, and Sit and Reach

Test using a Flexometer.

The measurement results of each variable will be displayed in a table, and then grouping is carried out: categories of components of physical fitness, namely as listed; cardiopulmonary endurance, muscle strength and flexibility which will be shown in table 1.

Table 1 Profile of Cardiopulmonary Endurance, Muscle Strength and Flexibility of The Workers in PT. Kereta Api Indonesia

Ability	Category Percentage(%)				
	Very Poor	Poor	Fair	Good	Very Good
Cardiopulmonary Endurance	35.58	28.84	33.13	2.45	0
Muscle Strength					
Right Grip Strength	69.33	25.77	4.9	0	0
Left Grip Strength	71.78	16.56	11.66	0	0
Back Muscle	53.37	43.56	2.46	0.61	0
Leg muscle	55.21	24.54	13.5	0.61	6.14
Push strength	3.07	34.36	39.88	19.02	3.67
Pull strength	11.04	33.74	36.2	9.82	9.2
Flexibility	0	2.45	7.36	13.5	76.69

Based on the percentages listed in table 1, the profile of the components of physical fitness studied are cardiopulmonary endurance in the very poor category of 35.58%, the ability of the right-hand muscle strength in the very poor category of 69.33%, the ability of the left-hand muscle strength in the very poor category of 71.78%. , the ability of the back muscle strength in the very poor category was 53.37% and the leg muscle strength in the very poor category at 55.21%, the push strength in the moderate category was 39.88%, the pull strength in the moderate category was 36.2% and the flexibility in the very good category was 76.69%.

DISCUSSION

Based on the results of the study, the component of cardiopulmonary endurance based on the Young Men's Christian Association (YMCA) Bench Test found that most of the employees of PT. KAI is included in the very poor category (35.58%). The maximum ability of cardiopulmonary endurance is closely related to physical fitness or Endurance, which is very much needed by

employees of PT. KAI, especially to employees of PT. KAI who work as technicians, conductors, and machinists. Endurance of employees is required when carrying out strenuous activities such as driving rail transportation, operating signals and switches on rail yards, traffic management, monitoring all transportation movements, setting up maintenance services, repairing vehicle, and operating locomotives.³

The condition of low level cardiopulmonary endurance is often associated with health problems that affect a person's sedentary lifestyle. A sedentary lifestyle can increase the risk of cardiovascular disease (CVD), hypertension, diabetes and obesity. Cardiopulmonary endurance itself is a strong health index and it is also the most relevant aspect to determining cardiovascular disease risk factors. Therefore, low level cardiopulmonary endurance component appears to be a strong risk factor and a stronger predictor of all-cause morbidity and mortality than other risk factors for cardiovascular disease and problems. Parameters for

measuring the degree of cardiopulmonary endurance based on the pulse from the YMCA Bench Test results.¹⁰ In an effort to improve the cardiorespiratory endurance of PT. The category of KAI is very poor enough that it needs to be improved with aerobic exercises such as running, jogging, swimming, and others. An effective training program to improve cardiovascular endurance in adults, according to the Centers for Disease Control and Prevention (CDC) guidelines, is carried out with aerobic exercise with a minimum duration of 150-300 minutes per week.¹¹

The physical fitness program in order to increase cardiopulmonary endurance/fitness can also be done using the FITT principle (Frequency, Intensity, Time, and Type of Activity). Exercise-based on the FITT principle, F: The frequency of exercise is at least 3-5 times a week, I: moderate-intensity exercise, T: Timing 30-60 minutes per day per training session, and T: Type of Exercise is Aerobic. Moderate-intensity physical activity, according to the CDC, is defined as physical activity that targets 64% to 76% of a person's maximum heart rate of 200 minus age.¹²

The results of the muscle strength components indicate that the ability of the push strength of the muscles of most of the employees of PT. KAI is included in the sufficient category (39.88%) and most of the employees of PT. KAI has sufficient pull strength (36.2%). However, there are components of muscle strength that are still dominated by the very poor category, namely right-hand grip muscle strength (69.33%), left-hand grip muscle strength (71.78%), back muscle strength (53.37%), and leg muscle strength (55.21%). This can be a serious problem because muscle strength is needed by employees of PT. KAI to move, lift and move a load.^{3,4} This component is certainly very important for employees in the field of technicians and machinists of PT. KAI has a heavy workload.¹³ In addition, weak muscle strength can increase the potential for high injury. For example, weak back muscle strength can cause employees to be more susceptible to back pain because the back muscle is one of the body's supporting muscles

that are at the center of the human body.¹⁴ The low ability of hand grip muscle strength describes upper extremity muscle weakness, and low leg muscle strength describes lower extremity muscle weakness. Low hand muscle strength can reduce employee productivity at work because the hands become difficult to move and lift heavy loads. Likewise, the ability of low leg muscle strength makes it difficult for employees to walk.¹⁵

Based on observations, the company PT. KAI has a joint gymnastics program that is held every week. However, to maximize the muscle strength of employees, especially those belonging to the category of less and very less, the gymnastics program carried out by employees can use the principle of exercise 2-3 times a week with an intensity of 8-12 RM (Repetition Maximum) and do as many as 2-4 sets.¹² RM stands for Repetition Maximum, which is the maximum weight a person can lift for a certain number of repetitions of an exercise (e.g., 8-RM is equal to the maximum weight that person can lift for eight repetitions).¹⁶ Examples of muscle-strengthening activities are lifting weights that can be modified with resistance bands as well as doing exercises that use body weight (such as push-ups and pull-ups).¹²

The results of the flexibility component show that almost all employees of PT. KAI is in the category of very good flexibility (76.69%), followed by good category (13.5%), moderate category (7.36%), and poor category (2.45%). This can be due to a large number of mobile jobs and the heavy workload in the rail transportation industry, which causes the employees to be active in moving. It has been shown that inactive people tend to be less flexible than active people.¹⁷ This is due to the shortening of muscles (contractures) and connective tissue, which in turn can limit joint mobility. Moving joints and muscles in a repetitive pattern or maintaining a normal posture can limit ROM due to tightening and shortening of muscle tissue. For example, an employee who sits in a chair for long periods of time needs to stretch the hamstrings and lower back muscles to

counteract the strain that develops in these muscle groups.¹²

In maintaining the maximum flexibility of the body, regular flexibility exercises are needed. Stretching exercises are proven to be good for increasing or maintaining body flexibility because they increase ROM in the joints.¹⁸ When stretching, the muscle stretch is expected to exceed its normal resting length but not to exceed pain-free ROM. Periodically, the total stretch time needs to be increased by increasing the duration or number of repetitions of each stretch to ensure the overload required for further ROM increase.¹⁶ Flexibility exercises should be done at least two days/week for at least 10 minutes, but preferably every day.¹⁹ Flexibility training should be performed after moderate or vigorous physical activity and is often an integral part of the cool-down segment of aerobic exercise and resistance training.¹⁶

The conclusion of this study, fitness is very important for employees of PT. KAI is mainly in the field of technicians and machinists because of the demands of the work and workload. However, it is necessary to carry out a physical fitness program with principles that are in accordance with the physical activity itself, namely the FITT principle. This is because there are components of fitness that are dominated by the very poor category, namely cardiopulmonary endurance, right-hand and left-hand muscle strength, back and leg muscle strength. The types of exercise that can be done in the physical fitness program are moderate-intensity aerobics, walking, cycling, lifting weights, and stretching.²⁰

The limitation of this study is that the medical record data with the variables studied were incomplete and limited to only a few components of physical fitness. Therefore, it is necessary to conduct research that measures muscle mass, agility, and muscle endurance.

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