Relationship Between Age, Gender, Job Placement, and Social Relationships with the Mental Workload of Managers

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ABSTRACT

Introduction: Mental workload is one of the most important aspects that affects the health and safety of workers. The Maintenance and Repair Division and Warship Division are divisions in PT. PAL which has a high job demand of the workers in it. **Methods:** This study was an observational analytic study with a cross-sectional design. The independent variables used in this study were age, gender, job placement, and social relationship, while the dependent variable was mental workload. The sample used was the total population of all managers in both divisions, totaling 12 respondents. The data was collected using a general questionnaire and the NASA-TLX method was used to measure mental workload. The data analysis technique used was the correlation test. **Results:** In the Maintenance and Repair Division, most managers were in the age range of 46 – 55 years old (50%) and 4 managers had an overloaded mental workload (66.7%). In the Warship Division, most of the managers were 46 – 55 years old (66.6%) and 4 managers (66.7%) had a moderate workload. Age has a relationship with mental workload in the Maintenance and Repair Division (0,612) and Warships Division (-0,316). Gender shows no relation with mental workload in the Warship Division (0,196). Job placement (-0.632) and social relationship (0.316) have a relation with mental workload in the Warship Division. **Conclusion:** Age has a relationship with mental workload in both divisions while there is no relationship between gender and mental workload among the managers in the Warship Division. Job placement has a strong negative relationship while social relationship has a strong positive with the mental workload in the Warship Division.

Keywords: managers, mental workload, NASA-TLX

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INTRODUCTION

Human resources play an important role when running a company or organization in any kind of industry. It can be stated that the employees are one of the most valuable assets that contribute to achieving the company's vision, mission, and value. Furthermore, it cannot be denied that the company is also responsible for protecting and providing for the needs of its workers so then they able to work more productively and achieve the company targets. Regulation Number 36 Year 2009 explained that it is the responsibility of the workplace manager to protect the workers from health problems and from the bad effects of work (Indonesia Government, 2009). Each worker has a different job description and responsibility. Each type of work will generate its own workload that varies between the workers. Thus, all parties in the company are required to make an effort to create a physically and mentally healthy work environment.

Dewi and Riana (2019) defined workload as the perception of workers regarding a set of activities that must be completed within a certain time limit in the form of both a physical and psychological workload. Mental workload is the amount of effort made by the mind when performing a task that requires input, including control, memory, decision-making, and notifications (Candra and Fitriani, 2019). Human responsibilities affect both the physical and mental aspects of the worker. If the workload is too high, it will result in too much energy expenditure that later will result in work stress and a defective product, violations of the health and safety protocol, and a high worker

Cite this as: Hananingrum, P., Athqia, A. A., and Wahyudiono, Y. D. A. (2022) 'Relationship Between Age, Gender, Job Placement, and Social Relationships with the Mental Workload of Managers', *The Indonesian Journal of Occupational Safety and Health*, 11(3), pp. 377-389.

 doi:10.20473/ijosh.v11i3.2022.377-389
Received April 16, 2021, received in revised form July 19, 2021, Accepted July 22, 2021, Published: December 2022

turnover ratio. Conversely, if the workload is too low, it allows boredom and results in low productivity and not being able to achieve the company targets. Therefore, the workload needs to be balanced and optimal as it can affect both the company and the worker positively. It can be concluded that the workload is the difference between the capacities, resources, skills and abilities of the workers and the job demands that must be faced.

According to Wihardja, Haryati and Garyatri (2019) and Harmen, Amanah and Harahap (2020), workload is influenced by two groups of factors, specifically external factors and internal factors. External factors are the factors that cause the workload that come from outside the workers themselves that usually can be modified and improved to make a more suitable environment for the worker. This includes the workspace layout, the work tools and facilities, and the working conditions. Meanwhile, mental tasks, such as the complexity of the job or the level of difficulty of the job, affect the emotional level of the workers and the work responsibilities.

The next is the work organization. This includes the length of work, rest time, work shift, wage system, work system, work music, organizational structure model, assignment of tasks, and authority. The work environment can also provide additional burdens for workers such as the physical, chemical, and biological working environment.

Internal factors are the factors that come from within the body itself because of reactions to the external workloads. Aspects that are included in the internal factors are somatic factors (gender, age, body size, health condition, and nutritional status) and psychological factors (motivation, perception, belief, desire, and satisfaction).

Supported by the previous research, internal factors make a significant contribution to mental workload. For instance, López-López *et al*. (2018) stated that age has a moderate to significant affect on worker workload. Another study conducted by Şeker (2014) showed that many demographic factors such as age, marital status, education level, and gender have a significant effect on worker workload. The most recent study that was conducted by Rodríguez-López, Rubio-Valdehita and Díaz-Ramiro (2021) added the COVID-19 situation to their study. They showed that there are various factors that can affect the worker's mental workload such as environmental changes, work overload, insomnia, negative job expectations, and gender.

Companies tend to divide the position of their workers into several levels of position to carry out the work process as a whole. Rozalena and Dewi (2016) classify the education, training, and development in an organization into three levels, specifically the manager level, supervisor level, and staff level. Supervisors and managers do not have a significant difference in terms of the minimum education, training received, and self-development. This is different compared to the staff where there is quite a significant difference. Managers and supervisors are required to have a big level of responsibility related to the work results, therefore the workload received in terms of their mental workload is usually greater than that of the rest of the staff. Research conducted by Anwar and Mutiara (2015) showed that mental workload differs significantly according to position level. A higher mental workload was found among employees who occupy relatively high positions (Supervisor and Superintendent). This can be traced to the point that work in this position level requires a high level of mental ability and related efforts such as analyzing, making plans, making decisions, and other activities that can affect the overall condition of the department and company.

The heaviness or lightness of the workload received by the workers can be used to determine how long a worker can carry out their work activities for according to their abilities and work capacity (Tarwaka, 2014). The heavier the workload, the shorter a person's working time will be without fatigue and significant physiological disturbance. Based on the work demands, the workload can be divided into two types, namely mental workload and physical workload (Winarsunu, 2008). Thus, it is important to measure the worker's mental workload to ensure their health and safety.

There are several ways to measure the mental workload of workers such as NASA-TLX (National Aeronautics and Space Administration Task Load Index), SWAT (Subjective Workload Assessment Technique), the Cooper Harper workload, Subjective Workload Dominance, and the Bedford workload. One of the more commonly used methods is NASA-TLX, cited in over 10.000 journals on Google Scholar (Grier, 2015). The Task Load Index (NASA-TLX) is a mental workload assessment method that was proposed by Hart and Staveland (1988). NASA-TLX is a method used to measure mental workload by weighting the workload, giving a rating, and then interpreting the results of the score based on the predefined dimensions.

PT. PAL Indonesia (Persero) is the largest shipbuilding company in Indonesia. To sharpening the Vision and Mission that has been carried out by the company, PT. PAL divides the work into several divisions, one of which is the Maintenance and Repair Division. This is where the business core is about the products and services including ship maintenance and repair services as well as submarine overhauls with a docking capacity of 894,000 DWT per year.

The demands of the Maintenance and Repair Division's duties are quite high because it is a division where ships are anchored for the carrying out of repairs and maintenance. Based on an interview with the head of the Maintenance and Repair Division, the working demands are quite high because of the high number of ships anchored in the division. This means that it is almost never closed off which means that a lot of workers do overtime. The ships anchored in the Maintenance and Repair Division come from various sectors including the military, the private sector, and government. The number of ships that stop at and anchor total approximately up to 6,800 ships per year. Furthermore, there is another division called the Warship Division that relates to fast ship products and special ships that will be marketed domestically and abroad, especially to meet the needs of warships and state ships according to both local and overseas orders. Therefore, it is necessary to do further research looking into the mental workload of the two divisions that have an important role in the company, especially at the manager level due to the high demands and targets that must be achieved by the divisions.

The purpose of this study was to analyze the mental workload as well as the relationship between age, gender, job placement, and social relationships with mental workload among the managers of both division, specifically the Managers of the Warship Division and the Managers of the Maintenance and Repair Division of PT. PAL. This research is intended to provide a deeper knowledge and reference for policymakers in PT. PAL to determine the most feasible tasks by considering the mental workload of its workers.

METHODS

This research was an observational analytical study with a cross-sectional design. This research was conducted using the managers of the Maintenance and Repair Division and Warships Division of PT. PAL. The determination of the sample was done using the total population method and this way obtained as many as 12 people at the managerial level from the Maintenance and Repair Division and Warships Division of PT. PAL. This research took place in February 2019 in the Maintenance and Repair Division and Warships Division of PT. PAL. This research got ethical approval number 43/EA/KEPK/2019.

The independent variables used in this research were the age, gender, job placement, and social relationship of the managers in the Maintenance and Repair Division and Warships Division of PT. PAL. The dependent variable was mental workload.

The data collection in this research involved a questionnaire for the internal factors (age and gender), job placement, social relationship, and mental workload. The mental workload of the managers was measured using the NASA-TLX method via its questionnaire. NASA-TLX determined the workload through weightlifting,

Table 1. NASA-TLX Dimensions

Dimensions	Descriptions
Mental Demand	How much mental and perceptual activity was required (thinking, deciding, calculating, remembering, looking, searching, etc.)? Was the task easy or demanding, simple or complex, exacting or forgiving?
Physical Demand	How much physical activity was required (pushing, pulling, turning, controlling, activating, etc.)? Was the task easy or demanding, slow or brisk, slack or strenuous, restful or laborious?
Temporal Demand	How much time pressure did you feel due to the rate or pace at which the task occurred? Was the pace slow and leisurely or rapid and frantic?
Performance	How successful do you think you were at accomplishing the goals of the task set by the experimenter (or yourself)? How satisfied were you with your performance when accomplishing these goals?
Effort	How hard did you have to work (mentally and physically to accomplish your level of performance?
Frustration Level	How insecure, discouraged, irritated, stressed and annoyed versus secure, gratified, content, relaxed, and complement did you feel during the task?

rating, and interpretation. In the weighting stage, the workers were asked to compare two different dimensions using the pairwise comparison method. The total pairwise comparison for all 6 dimensions was 15. The number of tallies for each dimension resulted in the weight of the dimension (Widyanti, Johnson and Waard, 2012).

This method used six dimensions for its assessment, namely mental demand, physical demand, temporal demand, performance, effort, and frustration. According to Susetyo, Simanjuntak and Wibisono (2012), the rating stage for each dimension was given a scale of 1-100, then the employees were provided with a respective weight that has been determined by a worker experienced in their work. The result of each dimension was obtained by multiplying the weight by the rating. The results of the multiplication of each dimension were summed up to obtain the Weighted Workload (WWL). Finally, the WWL was divided by 15 to obtain the final NASA-TLX score, where 15 was obtained from the total number of weighted comparison combinations. If the score value is more than 80, it indicates a heavy workload. If the score value is 50 - 80, the workload is moderate. If the score value is less than 50, the workload is rather light.

The data analysis used SPSS version 26 with bivariable analysis in the form of a correlation test by reading the correlation coefficient (contingency coefficient for nominal data and Spearman correlation for ordinal data) which was used to determine the relationship between age and gender with mental workload.

RESULT

The results were obtained using an instrument in the form of a questionnaire related to individual characteristics (age and gender), job placement, social relationship, and mental workload. The distribution of the variables can be seen in the following table and explanation.

Respondent Characteristics

Maintenance and Repair Division

Table 2 shows the age distribution of the managers of the Maintenance and Repair Division of PT. PAL. Based on Table 2, most of the managers in the Maintenance and Repair Division are 46-55 years old, totaling 4 people (66.6%). The others ranged from 36-45 and 56-65 years old with one person each (16.7%). The distribution of gender in Table 2 shows that all of the managers in this division are men.

Warship Division

Table 3 shows the age distribution of the managers in the Warship Division of PT. PAL. Based on Table 3, most of the managers in the Maintenance and Repair Division are 46-55 years old, totaling 4 people (66.7%). The rest range from 36-45 years old, as many as 2 people (33.3%). The distribution of gender shows that most of the managers in this division are men (83.3%) with only one female manager (16.7).

Job Placement

Table 4 shows the job placement distribution of the managers in the Maintenance and Repair Division and Warship Division of PT. PAL. Based on Table 4, all of the managers in the Maintenance and Repair Division (100%) showed that they have a very good job placement. Furthermore, most of the managers in the Warship Division, as many as 5 managers (83.3%), showed that they have a very good job placement with only one manager showing a good job placement (16.7%).

Table 2. Distribution of the Characteristics of the Respondents in the Maintenance and Repair Division of PT. PAL 2019

Age (years)	Frequency (n)	Percentage (%)
36-45	1	16.7
46-55	4	66.6
56-65	1	16.7
Gender	**Frequency (n)**	**Percentage (%)**
Female	0	0
Male	6	100

Table 3. Distribution of the Characteristics of the Respondents in the Warship Division of PT. PAL 2019

Age (years)	Frequency (n)	Percentage (%)
36-45	2	33.3
46-55	4	66.7
56-65	0	0
Gender	**Frequency (n)**	**Percentage (%)**
Female	1	16.7
Male	5	83.3

Social Relationship

Table 5 shows the social relationship distribution of the managers from the Maintenance and Repair Division and Warship Division of PT. PAL. Based on Table 5, all of the managers in the Maintenance and Repair Division (100%) showed that they have very good social relationships. Furthermore, most of the managers in the Warship Division, as many as 5 managers (83.3%), showed that they have very good social relationships with only one manager in the good category of social relationship (16.7%).

Mental Workload

Table 6 shows the result of measuring the mental workload using the NASA-TLX method. The result was calculated by multiplying the weight and rating that later will be divided by 15. The mental workload of 4 managers (66.7%) in the Maintenance and Repair Division was found to be overloaded while the other 2 managers (33.3%) were in the moderate category. Furthermore, it also shows that there were no managers that showed the level of physical workload as being in the underloaded category. The mental workload of the managers in the Warship Division was mainly in the moderate category for 4 managers (66.7%), while the other 2 managers (33.3%) were in the overloaded category. Furthermore, the table also shows that there were no managers that showed the level of physical workload in the underloaded category.

Picture 1 shows the calculation of each dimension that measured the mental workload of the managers in the Maintenance and Repair Division. The picture shows that the most significant number was found in the dimension of Performance (PO), followed by the dimensions of Mental Demand (MD) and Effort (EF).

Picture 2 shows the calculation for each dimension that measured the mental workload of the managers in the Warship Division. The picture

Table 4. Distribution of Job Placement in the Maintenance and Repair Division and Warship Division PT. PAL 2019

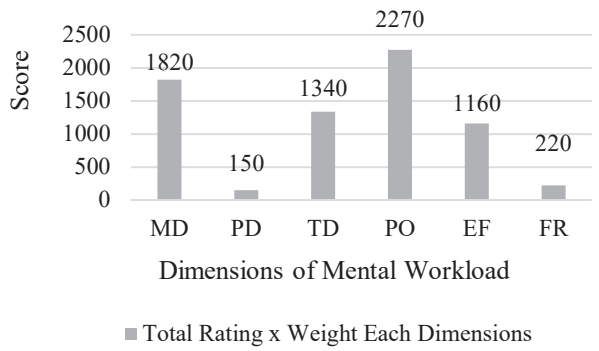
Maintenance and Repair Division PT. PAL		
Job Placement	**Frequency (n)**	**Percentage (%)**
Good	0	0
Very Good	6	100
Total	6	100
Managers at Warship Division PT. PAL		
Job Placement	**Frequency (n)**	**Percentage (%)**
Good	1	16.7
Very Good	5	83.3
Total	6	100

Table 5. Distribution of Social Relationship in the Maintenance and Repair Division and Warship Division PT. PAL 2019

Maintenance and Repair Division PT. PAL		
Social Relationship	**Frequency (n)**	**Percentage (%)**
Good	0	0
Very Good	6	100
Total	6	100
Managers at Warship Division PT. PAL		
Social Relationship	**Frequency (n)**	**Percentage (%)**
Good	1	16.7
Very Good	5	83.3
Total	6	100

Table 6. Distribution of Mental Workload in the Maintenance and Repair Division and Warship Division PT. PAL 2019

Maintenance and Repair Division PT. PAL		
Mental Workload	**Frequency (n)**	**Percentage (%)**
Underload	0	0
Moderate	2	33.3
Overload	4	66.7
Total	6	100
Managers at Warship Division PT. PAL		
Mental Workload	**Frequency (n)**	**Percentage (%)**
Underload	0	0
Moderate	4	33.3
Overload	2	66.7
Total	6	100

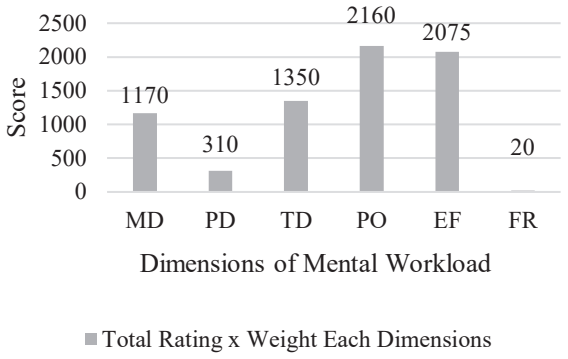


Picture 1. Dimensions of Mental Workload in the Maintenance and Repair Division of PT. PAL 2019

shows that the most significant numbers were for the dimensions of Performance (PO), Effort (EF), and Temporal Demand.

Cross Tabulation between the Respondent Characteristics and Mental Workload

Table 7 shows that most of the respondents from the Maintenance and Repair Division's managerial level have an overloaded mental workload. Managers aged 46-55 with an overloaded mental workload totaled as many as 3 people (50%) and 1 person had a moderate mental workload (16.6%). The most overloaded category for mental workload was within the range of 46-55 years old. The results of the research correlation test show that the variables of age and mental workload have a correlation coefficient of 0.612. Based on the results of the correlation test, it can be concluded that there is a strong relationship in a positive direction between age and the mental workload of Managers in the Maintenance and Repair Division of PT. PAL. Age has a relationship with the mental workload of managers in the Maintenance and Repair Division of PT. PAL.



Picture 2. Dimensions of Mental Workload in the Warship Division of PT. PAL 2019

The Warship Division's managers mostly had a moderate mental workload. The managers aged 46-55 that have a moderate mental workload totaled as many as 3 people (50%) and 2 people had an overloaded mental workload (16.6%). There was one manager aged 36-45 who had a moderate mental workload (16.6%). Most managers in the Warship Division were in the moderate category for mental workload. The results of the research correlation test show that the variables of age and mental workload have a correlation coefficient of -0.316. Based on the results of the correlation test, it can be concluded that there is a strong enough relationship in a negative direction between age and the mental workload of the managers in the Warship Division of PT. PAL. Age has a relationship with the mental workload of the managers in the Warship Division of PT. PAL.

Table 8 shows that all respondents at the managerial level in the Maintenance and Repair Division totaling 4 male managers had a moderate mental workload (66.7%), while 2 male managers had an overloaded mental workload (33.3%). Statistical analysis could not be performed due to

Table 7. Cross tabulation between Age and the Mental Workload of Managers in the Maintenance and Repair Division and the Managers in the Warship Division of PT. PAL 2019

Maintenance and Repair Division PT. PAL							
Age (years)	Mental Workload						Spearman Correlation
	Underload		Moderate		Overload		
	n	%	n	%	n	%	
36-45	0	0	0	0	1	16.6	0.612
46-55	0	0	1	16.6	3	50	
56-65	0	0	1	16.6	0	0	
Total	0	0	2	33.3	4	66.7	
Warship Division PT. PAL							
Age (years)	Mental Workload						Spearman Correlation
	Underload		Moderate		Overload		
	n	%	n	%	n	%	
36-45	0	0	1	16.6	0	0	-0.316
46-55	0	0	3	50	2	33.4	
56-65	0	0	0	0	0	0	
Total	0	0	4	66.7	2	33.3	

the lack of data variety because all managers in the Maintenance and Repair Division were male.

Cross tabulation between gender and mental workload in the Warship Division presented in Table 8 shows that there was one female manager in the Warship Division with a moderate mental workload level (16.7%), 2 male managers with a moderate mental workload (33.3%), and 3 male managers with an overloaded mental workload (50%). The results of the research correlation test shows that the variables of gender and mental workload have a correlation coefficient of 0.196. It can therefore be concluded that there is a weak relationship in a positive direction between gender and mental workload. The gender differences have no relationship with the mental workload of the managers in the Warship Division of PT. PAL.

Cross Tabulation between Job Placement and Mental Workload

Table 9 shows that all respondents at managerial level in the Maintenance and Repair Division had a very good job placement. As many as 4 managers who had a very good category for job placement had a moderate mental workload (66.7%) and 2 of the male managers who had a very good category of job placement had an overloaded mental workload (33.3%). Statistical analysis could not be performed due to the lack of data variety because all managers

Table 8. Cross tabulation between Gender and the Mental Workload of Managers in the Maintenance and Repair Division and the Managers in the Warship Division of PT. PAL 2019

Maintenance and Repair Division PT. PAL							
Gender	**Mental Workload**						**Contingency Coefficient**
	Underload		**Moderate**		**Overload**		
	n	**%**	**n**	**%**	**n**	**%**	
Female	0	0	0	0	0	0	
Male	0	0	4	66.7	2	33.3	-
Total	0	0	4	66.7	2	33.3	
Warship Division PT. PAL							
Gender	**Mental Workload**						**Contingency Coefficient**
	Underload		**Moderate**		**Overload**		
	n	**%**	**n**	**%**	**n**	**%**	
Female	0	0	1	16.7	0	0	
Male	0	0	2	33.3	3	50	0.196
Total	0	0	3	50	3	50	

Table 9. Cross tabulation between Job Placement and the Mental Workload of the Managers in the Maintenance and Repair Division and the Managers in the Warship Division of PT. PAL 2019

Maintenance and Repair Division PT. PAL							
Job Placement	**Mental Workload**						**Contingency Coefficient**
	Underload		**Moderate**		**Overload**		
	n	**%**	**n**	**%**	**n**	**%**	
Good	0	0	0	0	0	0	
Very Good	0	0	4	66.7	2	33.3	-
Total	0	0	4	66.7	2	33.3	
Warship Division PT. PAL							
Job Placement	**Mental Workload**						**Contingency Coefficient**
	Underload		**Moderate**		**Overload**		
	n	**%**	**n**	**%**	**n**	**%**	
Good	0	0	0	0	1	16.7	
Very Good	0	0	4	66.7	1	16.7	-0.632
Total	0	0	4	66.7	2	33.3	

in the Maintenance and Repair Division of PT. PAL were in the very good job placement category.

Cross tabulation between job placement and mental workload in the Warship Division as shown in Table 9 shows that there was 1 manager who was in the good job placement and an overloaded mental workload level (16.7%). The manager who was in the very good job placement category also had an overloaded level of mental workload (16.7%). As many as 4 managers who were in the very good job placement category had a moderate mental workload. The results of the correlation test show that the variables of job placement and mental workload have a correlation coefficient of -0.632. It can therefore be concluded that there is a strong relationship in a negative direction between gender and mental workload. Job placement has a relationship with the mental workload of the managers in the Warship Division of PT. PAL.

Cross Tabulation between Social Relationship and Mental Workload

Table 10 shows that all the respondents at the managerial level in the Maintenance and Repair Division has a very good social relationship. As many as 4 managers who had a very good category of social relationship had a moderate mental workload (66.7%) and 2 male managers who had a very good category for social relationship had an overloaded mental workload (33.3%). Statistical analysis could not be performed due to the lack of data variety because all managers in the Maintenance and Repair Division of PT. PAL were in the very good job placement category.

The cross tabulation between the social relationship and mental workload for the Warship Division also presented in Table 10shows that there was one manager who was in the good social relationship category with an overloaded mental workload level (16.7%) and that there was another manager who had a very good social relationship who had an overloaded mental workload (16.7%). As many as 4 managers who had a very good social relationship had a moderate mental workload. The results of the correlation test show that the variables of job placement and mental workload have a correlation coefficient of 0.316. It can therefore be concluded that there is a strong enough relationship in a positive direction between social relationship and mental workload. Social relationship has a relationship with the mental workload of the managers in the Warship Division of PT. PAL.

DISCUSSION

Respondent Characteristics

Based on the results of the managers in the Maintenance and Repair and Warship Divisions of PT. PAL, for age distribution, both divisions show that most of the managers were of an age ranging between 45 - 55 years old. It shows that the majority of managers started their career path at the entry level staff position. Novitasari (2014) also explained that generally the top management are in the 45 years old and above category, that middle managers are in the 33 years old and above category, and of course, that most of the staff are at a much younger age, between the ages of 20 and 30.

Table 10. Cross tabulation between Social Relationship and the Mental Workload of the Managers in the Maintenance and Repair Division and the Managers in the Warship Division of PT. PAL 2019

Maintenance and Repair Division PT. PAL							
Social Relationship	Mental Workload						Contingency Coefficient
	Underload		Moderate		Overload		
	n	%	n	%	n	%	
Good	0	0	0	0	0	0	
Very Good	0	0	4	66.7	2	33.3	-
Total	0	0	4	66.7	2	33.3	
Warship Division PT. PAL							
Social Relationship	Mental Workload						Contingency Coefficient
	Underload		Moderate		Overload		
	n	%	n	%	n	%	
Good	0	0	0	0	1	116.7	
Very Good	0	0	4	66.7	1	16.7	0.316
Total	0	0	4	66.7	2	33.3	

The age of the managers of both divisions was also influenced by their career promotions. The company tends to use its internal human resources to fill in any empty spots in terms of the managerial seats. This can happen from the same management level through cross division transfer (horizontal promotion) and through a promotion from the staff level to the managerial level (horizontal promotion). Setiani (2013) explained that most companies more often use internal human resources in their managerial position recruitment because they already know the job specifications and want to provide promotion opportunities for existing employees.

The respondent characteristics also took gender into account. PT. PAL is one of the companies with a high risk nature. Darwis *et al*. (2020) stated that male workers tend to work in high-risk environments more compared to women. Furthermore, there are still companies that hold to the paradigm that men are more responsible in high-risk environments. The managers in the Maintenance and Repair Division are all male and the other division, the Warship Division, is majority male with only one female manager.

Mental Workload

Syafei and Primanintyo (2016) explained that working at the managerial level tends to incur a higher mental workload due to the job description as it is dominated by mental work, especially in terms of decision-making and minimizing the risks to do with decision-making. Managers are also forced to engage in dynamic critical thinking, to be creative, and to be visionary in order to maintain the company sustainability. Anwar and Mutiara (2015) explained that a higher mental workload can be found in employees who occupy relatively high positions. This can be traced to the work at this position requiring higher mental abilities such as analyzing, making plans, and making decisions.

Based on the NASA-TLX data processing, it can be seen which aspects are the most dominant, as shown in Picture 1 for the Maintenance and Repair Division of PT. PAL. Based on the sum of each aspect, the aspect that most influences the amount of mental workload in the Maintenance and Repair Division of PT. PAL is the performance aspect (2270), followed by mental demand (1820) and effort (1160). It was not much different when the results for the Warship Division of PT. PAL were examined. As shown in Picture 2 for the Warship Division, regarding the sum of each aspect, the aspect that most influences the amount of mental workload is the performance aspect (2160), followed by effort (2075) and mental demand (1170). This research is aligned with the research conducted by Achmad and Farihah (2018) that shows that the highest dimension of mental workload that was found was the performance dimension.

The performance aspect shows how much success has been achieved when completing the work in accordance with the predetermined goals. In the Maintenance and Repair Division of PT. PAL, workers must be able to meet their daily workload in one day. The demands of the Maintenance and Repair Division are quite high compared to the other division because it is where ships are anchored for repairs and maintenance. The work that needs to be done is also higher because the number of ships that stop at and anchor totals approximately up to 6,800 ships per year. If the demand is high and the workers are unable to complete their work according to the working hours available, these workers must work overtime to meet the demand. On the other hand, in the Warship Division of PT. PAL, there is an abundant amount of work to be done since they must meet the seasonal goals. As the divisions itself works based on custom orders, in their peak season, they have a lot of work to be done and this forces the workers to meet the deadline.

Other aspects with a high result were mental demand and effort. The mental demand aspect shows how much mental and perceptual activity (such as seeing, remembering, seeing) are required to do the work while the effort aspect shows how much mental and physical activity it takes to achieve the desired performance.

Cross Tabulation between the Respondent Characteristics and Mental Workload

Based on the results of the managers in the Maintenance and Repair and Warship Divisions of PT. PAL, each division shows that there is a relation between worker age and the mental workload result. This aligns with the theory put forward by Manuaba (2000) which explains that age is a somatic factor that can affect the level of mental workload felt by a person. This result also in line with the research conducted by Anisa (2020) when analyzing what caused mental workload using the NASA-TLX method in a pharmaceutical company in Indonesia. Their results showed that the age variable has a significant relationship with mental workload. The study by Kazemi *et al*. (2017) showed that, by studying the relationship between mental workload and cognitive failure through the

chosen factors using NASA-TLX and the CFQ questionnaire for the data collection method and various statistical methods, the age demographic had a significant effect on mental workload. Another study by López-López *et al*. (2018) analyzed mental workload in multiple sectors in Spain through a cross-sectional study. The results showed that age was independently associated with a higher risk of developing a moderate to significant mental workload. This is also similar to the study conducted by Nasirizad Moghadam *et al*. (2019) that evaluating the worker's mental workload according to various factors that used the NASA-TLX and various statistical methods. The results showed that age has a significant contribution towards the worker's workload which in turn shows that younger workers have a higher workload that the older ones.

Pandiangan *et al*. (2019) explained that workers aged older than 50 years old tend to be given more jobs and responsibility. This is because this age is included in the senior age group where they are considered to have more abilities and experience. Therefore the distribution of tasks rests more on the managers within that age range. PT. PAL itself is a company where assignments are given based on age, experience, and adaptability. Hardiyanti *et al*. (2020) explained that in the current research, the job distributions in PT. PAL also consider the age of the worker and an increased age means that the job given also increases.

The managers in PT. PAL between the ages of 45-55 years old and who are more than 55 years old tend to be responsible for taking control of bigger projects compared to the younger managers. Furthermore, managers have double role which not only includes achieving the goals set by the upper management, but also leading the staff below them in order to achieve their goals. Moreover, the managers are in the age range that is close to the time for retirement, so naturally they need time for the retirement process. Biya and Suarya (2016) explained that the rejection of retirement generally occurs because retired individuals do not want to admit that they must retire. They are afraid of not being able to meet certain needs, fear losing their social role in society, fear losing power and social contact, and experience low self-esteem, stress, depression, anxiety, and unstable emotions. This factor can explain why the older managers have a higher mental workload compared to the younger managers.

As for the gender variable, based on the results of the managers in the Warship Division, there is a relation between worker gender and the results for mental workload. This was different from the results in Maintenance and Repair because all of the respondents were men. This meant that the data had no variation that later meant it could not be analyzed using statistics. This result for Warship Division is aligned with the research conducted to see what was affecting the mental workload result in the work of Aniţei, Chraif and Ioniţă (2015). They tested to see whether gender differences affect the level of workload using correlational statistical methods. The results showed that there were significant differences between men and woman in terms of workload, which was characterized by the women having a significantly higher workload than men. Another study by Rodríguez-López, Rubio-Valdehita and Díaz-Ramiro (2021) that analyzed the level of workload according to various individual factors during the COVID-19 pandemic using regression and ANOVA analysis stated that there is a significant effect due to gender differences on mental workload. This is similar to the research conducted by Şeker (2014) that used the NASA-TLX method which stated that demographic factors such as gender have a significant effect on mental workload.

This is not aligned with the research by Widiastuti, Purnomo and Nur (2017) which stated that statistically, there is no significant difference between gender and the mental workload result. However, even if it was not statistically different, the result states that there were still differences in the mean value of the lateral deviation. These differences could be the result of several factors such as the number of participants, the data collecting procedure, the data processing method, and the data validation and verification. It can be affected by the respondents being mostly men where the data variation is not that different. Therefore, a further evaluation, comparison and improvement is needed to get the most optimal results.

This phenomenon happened because the production process in the two divisions requires technicians such as naval electricians, welding professions and others. These are jobs that are dominated by men in both academic and practitioner domains. It is also influenced by the field of work which is a scientific field that is dominated by men and less attractive to women. This means that the work in this field is also dominated by men. The

number of male workers increases the chances of promotion vertically which causes most of the managerial seats to be filled by workers of the male gender.

Cross Tabulation between Job Placement and Mental Workload

In this research, the job placement variable result was obtained by measuring how the manager appraises the company, which includes their working time, working condition, and the working area. It is an external variable that can be influenced by other factors depending on the company culture, values, and working system. Based on the cross tabulation result for the managers in the Maintenance and Repair Division PT. PAL, the cross tabulation between job placement and mental workload could not be conducted because there was no variation between the results of the respondents. However, for the managers of the Warship Division, there was a strong negative correlation which indicates that the worse the location the manager is in, the higher the perceived mental workload.

This research result is aligned with a study conducted by Kurniawan, Handoko and Adriantantri (2020) that analyzed the relationship between job placement and mental workload in a cleaning service in a certain hospital. The research stated that a working placement that is not suitable for the worker means that the workers will have a higher mental workload as shown by their results not being either optimal or productive. This is supported by the research conducted by Yovi *et al*. (2006) in a plantation facility that measured the factors affecting workload. The results stated that working placements in an area that has a different condition, especially in a working environment where there is elevation, humidity, temperature, and other things to consider, can affect the level of workload. Another research conducted by Dewi (2018) that measured the relationship between certain factors and worker fatigue using the cross tabulation statistical test showed that the more discomfort that the worker perceives their work to be, the more their work will not be optimal and also be unproductive.

Cross Tabulation between Social Relationship and Mental Workload

In this research, the social relationship variable was obtained using a questionnaire that measured several subfactors such as other's people perceptions of the workers, teamwork satisfaction level, appreciation, and interactions with every stakeholder. Based on the cross tabulation results for the managers in the Maintenance and Repair Division of PT. PAL, the cross tabulation between social support and mental workload could not be conducted because there was no variation between the results of the respondents. However, for the managers in the Warship Division, there are a strong positive correlation between social relationship and mental workload, which indicates that the higher the social relationship condition for the worker, the higher the mental workload that they perceive.

This research result is contradictory to the results of the research conducted by Peters *et al*. (2018) that analyzed the social relationship among employees and their mental workload within various sectors. Their results showed that a high social relationship was able to lessen worker stress, improve mental health, and maintain work ability, while low social support was a risk factor for poor mental health and work ability. Another study that was conducted by Hauck, Snyder and Cox-Fuenzalida (2008) that analyzed the effect of social relationship on the sample of workers showed that a higher social relationship will result in lower stress and a lower workload. This is supported by the research conducted by Hsieh and Tsai (2019) that showed that workers that have more social support from their supervisors and colleagues will be less likely to have a higher workload, poor mental health, and physical issues. The contradictory results between this research and previous results can be caused by several factors, such as the data collection method, statistical method, culture, the variety of respondent results, and the number of respondents. Therefore, further experimentation is needed, especially increasing the number of participants to obtain more variety in the results. This is because all of the previous research accommodates a large number of samples.

CONCLUSION

Managers in the Maintenance and Repair Division have a slightly higher mental workload than the managers in the Warship Division of PT. PAL. Most of the respondents aged 46-55 have the highest percentage in terms of mental workload. The dimension that the managers felt the weight of the most was the performance dimension where they pushed the company's goals forward. The results of

this research show that there is a relation between worker age and mental workload in both divisions, specifically the Maintenance and Repair Division and the Warship Division of PT. PAL. There is no relation between worker gender and mental workload in the Warship Division of PT. PAL. Whether there was a relationship between gender and mental workload in the Maintenance and Repair Division could not be determined because all of the respondents were male, therefore bivariable tests could not be carried out due to the absence of data variation. The job placement variable shows that there is a strong negative correlation with mental workload in the warship division, and that social relationship has a strong positive correlation with mental workload in the same division as well. The relationship of job placement and social relationship with mental workload in the Maintenance and Repair Division could not be determined because there was no variation in the respondent results.

ACKNOWLEDGEMENTS

The researcher would like to show their highest praise and gratitude to all parties involved in this research as well as the study readers. The researchers believe that it is still open for further improvement and kindly ask for suggestion to showing enhancement in this field of study.

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