The Relationship between Mental Workload and Occupational Stress among Aircraft Maintenance Officers at PT X

Hubungan Beban Kerja Mental dengan Stres Kerja pada Tenaga Kerja Bagian Perawatan Pesawat di PT X

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ABSTRACT

Introduction: Aircraft maintenance officer is one of the professions which is prone to work stress, because it requires abundant amount of knowledge and skills, as well as rapidity and accuracy in completing the task. Moreover, poor work environments such as noise, vibration, and extreme temperature also add to more workload and trigger occupational stress. This research aims to identify the relationship between mental workload and occupational stress on the aircraft maintenance officers at PT. X. **Metods:** This research was a descriptive observational research with cross-sectional design. The sample in this research was the total population of officers at PT. X, comprising 21 engineers and 20 mechanics. The total of 41 officers was used as the respondents in this research. The data of mental workload was collected using NASA-TLX method and Brief Job Stress Questionnaire was used to measure occupational stress among aircraft maintenance officers at PT. X. **Results:** The results of this study demonstrated that most officers had a heavy level of mental workload and experienced a moderate level of occupational stress. The Spearman-rho correlation test showed that there was a moderate relationship between mental workload and occupational stress (r = 0.306). **Conclusion:** It can be concluded that there was a relationship between mental workload and occupational stress among aircraft maintenance officers at PT. X.

Keywords: aircraft maintenance officer, mental workload, occupational stress

ABSTRAK

Pendahuluan: *Teknisi dan mekanik yang bertugas memelihara dan merawat pesawat udara merupakan salah satu pekerjaan yang dapat menyebabkan stres kerja, karenapekerjaan ini membutuhkan individu yang kompeten dalam pengetahuan dan keterampilan.Pekerjaan ini juga membutuhkan kecepatan dan ketepatan dalam menyelesaikan tugas-tugasnya.Selain itu, lingkungan kerja yang kurang baik seperti adanya kebisingan, getaran, dan suhu yang ekstrem juga memungkinkan penambahan beban kerja dan memicu munculnya stres kerja.Tujuan dari penelitian ini adalah untuk mengidentifikasi hubungan antara beban kerja mental denganstres kerja pada petugas perawatan pesawat di PT. X.* ***Metode:*** *Penelitian ini merupakan penelitian observasional deskriptif dengan desain cross-sectional. Sampel dalam penelitian ini adalah total populasi dari tenaga kerja bagian perawatan pesawat PT. X yang terdiri dari 21 orang teknisi dan 20 orang mekanik. Responden dalam penelitian ini berjumlah 41 orang. Pengukuran beban kerja mental dilakukan dengan menggunakan metode NASA-TLX dan untuk mengukur stres kerja menggunakan kuesioner The Brief Job Stress Questionnaire.* ***Hasil:*** *Penelitian menunjukkan bahwa sebagian besar tenaga kerja memiliki beban kerja mental yang termasuk dalam kategori berat dan juga sebagian besar tenaga kerja memiliki tingkat stres kerja yang termasuk dalam kategori sedang. Berdasarkan hasil uji statistic Spearman-rho menunjukkan bahwa terdapat hubungan yang termasuk kategori sedang antara beban kerja mental dengan stres kerja (r = 0,306).* ***Simpulan:*** *Terdapat hubungan antara beban kerja mental dengan stres kerja pada tenaga kerja bagian perawatan pesawat di PT. X.*

Kata kunci: *beban kerja mental, petugas perawatan pesawat terbang, stres kerja*

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INTRODUCTION

As time progresses, science and technology are also developed in order to improve the capacity and quality in the working world, though it will be followed suit by an increase in job competition. The competition can take forms in workloads and work demands, and later can generate occupational stress. According to Wijono (2010), occupational stress is non-conformity with someone's capability and skills and his work demands. Mangkunegara (2003) argued that occupational stress is a depressing feeling experienced by workers while encountering their work. The National Institute for Occupational Safety and Health (NIOSH) defines occupational stress as the physical and emotional responses that occur when the work requirements do not match with expertise, resources, or worker's needs. Occupational stress can result in poor health and even injuries.

According to the data of the World Health Organization (WHO), in many countries, as many as 8% of occupational diseases were caused by depression in 2014. Then, according to the study conducted by the Labour Force Survey in England in 2015-2016, there were 488.000 cases of occupational stress with the prevalence of 1.510 per 100.000 workers. Stress contributes 37% of all cases related to occupational health and it is predicted that lost working days caused by stress were as many as 45%. The survey results also stated that the main factors that caused the occupational stress, depression, and anxiety are work pressure and workload, including tight deadlines, too many responsibilities, and less support from the management. The survey data collected by Regus Asia in 2012 mentioned that 64% of workers in Indonesia experienced increased stress compared to 2011.

Wijono (2010) argued that factors causing occupational stress can be related to the workplace, including environment with extreme temperature, noise, and minimal lighting. There are also factors related to the work, such as deadlines, workload, work demands, and work complexity. Other factors like unclear career and interpersonal relationship with colleagues can also cause occupational stress.

The research conducted by the Labour Force Survey in England in 2015-2016 mentioned that one of the factors causing occupational stress is workload. The workload can be classified into two: physical and mental workloads. A physical workload is the workload due to the activities that use human muscle Meanwhile, a mental workload is the workload due to the activities that use the human brain or mind. Physical and mental workloads cannot be entirely separated since there is a close relationship between them. Physical workload emphasizes more physical activities that consume energy, while mental workload emphasizes more thinking.

Tarwaka (2015) defined workload as a difference between a worker's capability and work requirements that should be met. Tarwaka (2015) mentioned several external factors that affect mental workload, such as work complexity and responsibility, working time, resting time, shift work, task delegation, and work environment that can contribute to additional load like noise, lighting intensity, vibration, and so on. Besides that, there are also internal factors that can affect mental workloads, such as psychological factors like motivation, perception, volition, and satisfaction.

Several types of research had been conducted regarding the relationship between mental workload and occupational stress. The research conducted by Fahamsyah (2017) analyzed the relationship between mental workload and occupational stress among the employees at the CSSD Installation of Surabaya Hajj General Hospital. The findings indicated that there was a relationship between mental workload and occupational stress on the employees at the CSSD Installation of Surabaya Hajj General Hospital with the correlation coefficient value of 0.828. It indicated that the relationship was considered as strong unidirectional relationship. Another research with similar concern was conducted by Pertiwi, Denny and Widjasena (2017) with the subject of the study of lecturers in a faculty. This research also indicated that there was a relationship between mental workload and occupational stress among the lecturers in the faculty.

Then, there is also research conducted by González-Muñoz and Gutiérrez-Martínez, (2007) regarding the contribution of mental workload to occupational stress among industrial workers. In the research, out of 95 respondents, as many as 26.3% showed a high level of occupational stress and approximately 17.9% of workers had a high level of mental workload. The results of the study indicated that mental workload could be considered as the risk

factor of occupational stress. Also, there is a study conducted by Beheshti and Hajizadeh (2015) concerning workload, occupational stress, and general health among women workers at a public welfare center. The study concluded that there was a significant relationship between workload, occupational stress, and general health.

PT. X is a company engaged in aircraft repair and maintenance or the Maintenance, Repair, and Overhaul (MRO) business. Engaging in aircraft repair and maintenance, the activities of officers at PT. X focus on controlling and ensuring the aircraft equipment and systems to work as the functions and operations in accordance with the standard, so that the aircraft is in the flight-worthy condition. The aircraft maintenance work requires the individuals who are competence in knowledge, skills, and behavior since this concerns the safety of many people. High workload and work demand like rapidity and accuracy in completing the tasks enable the emergence of occupational stress among the officers. The less friendly work environment due to the exposure of noise, vibration, and high heat also enables the emergence of occupational stress. The handling systems on aircraft are extremely complex and require precision, work shifts are frequently changed, and working with dangerous equipment are factors triggering occupational stress.

Generally, this research aims to identify the relationship between mental workload and occupational stress among aircraft maintenance officers at PT. X. This research specifically identifies the level of mental workload, as well as recognizing the level of occupational stress experienced by the aircraft maintenance officers at PT. X.

METHODS

This research was observational research with interview and questionnaires which were distributed to the aircraft maintenance officers at PT. X. This research was a descriptive research since it aimed to identify, analyze, and describe the relationship between mental workload and occupational stress. Based on data collection period, this research belonged to the cross-sectional study and conducted on May 2018. This research was conducted at PT. X which is located near Juanda International Airport in Sidoarjo. Then, observation activity was conducted by distributing the questionnaire to obtain primary data; while the secondary data was obtained from PT. X about its company profile and the total number of officers.

The population of this research was entire officers at the aircraft maintenance division at PT. X, while the sample of this research was the total population of the aircraft maintenance officers at PT. X. The data collection process was conducted using National Aeronautics & Space Administration Task Load Index (NASA-TLX) to measure the level of mental workload and Brief Job Stress Questionnaire to measure the level of occupational stress. Tarwaka (2010) mentioned that the steps of mental workload measurement using the NASA-TLX method is through Weighing and Ranking.

At the weighing phase, the respondents were asked to choose one of the compared dimensions. The total pair of comparison for the entire dimensions (six dimensions) was 15 pair choices. The total calculation for each dimension became the dimension weight. Meanwhile, at the ranking phase, the respondents were asked to give a score/rating for each mental workload dimension on a scale of 0-100 in accordance with their experienced workload. By summing the total score after the questionnaire filling process to obtain the total score of NASA-TLX mental workload, every weight and rating on each indicator was multiplied then summed and divided by 15. Finally, the total questionnaire was compared to the utilized parameters. The score results of larger than 80 were classified as heavy workload, 50-80 as moderate workload, and less than 50 as light workload.

The results of mental workload measurement and occupational stress questionnaire were then processed and analyzed using the data processing software to discover each frequency distribution of respondent characteristics, mental workload, and occupational stress. Then, to identify the relationship between mental workload and occupational stress, the Spearman-rho correlation test was used since the data had the ordinal data scales.

RESULTS

The Distribution of Individual Characteristics

From the results of the study presented in Table 1, it can be seen that there are three age groups among aircraft maintenance officers at PT. X, from the age group of 21-40 to more than 60 years. As many as 25 officers (61%) are in the age range of 21-40 years.

Table 1. The Distribution of Age Group among Aircraft Maintenance Officers at PT. X in 2018

Age Group	Frequency (n)	Percentage (%)
21-40 Years	25	61.0
41-60 Years	15	36.6
>60 Years	1	2,4
Total	41	100

Table 2. The Distribution of Working Period among Aircraft Maintenance Officers at PT. X in 2018

Working Period	Frequency (n)	Percentage (%)
<5 Years	31	75.6
5-10 Years	6	14.6
>10 Years	4	9.8
Total	41	100

From the results of the study depicted in Table 2, it can be observed that there are three groups of the working period of the aircraft maintenance officers at PT. X, that is from the group of less than five years, 5-10 years, and more than ten years. As many as 31 officers (75.6%) have worked for less than five years.

Table 3. The Distribution of Marital Status of the Aircraft Maintenance Officers at PT. X in 2018

Marital Status	Frequency (n)	Percentage (%)
Single	14	34.1
Married	27	65.9
Total	41	100

From the results of the study in Table 3, it can be seen that there are two groups of marital status of the aircraft maintenance officers at PT. X: single and married officers. As many as 27 officers (65.9%) are married.

The Identification of Mental Workload Levels

Table 4. Identification of Mental Workload Levels of the Aircraft Maintenance Officers at PT. X in 2018

Mental Workload	Frequency (n)	Percentage (%)
Light	0	0
Moderate	11	26.8
Heavy	30	73.2
Total	41	100

Based on the results in Table 4, there are three levels of mental workload among aircraft maintenance officers at PT. X: light, moderate, and heavy. As many as 30 officers (73.2%) experienced heavy mental workload.

The Identification of Occupational Stress Levels

Table 5. Identification of Occupational Stress Levels among Aircraft Maintenance Officers at PT. X in 2018

Occupational Stress	Frequency (n)	Percentage (%)
Low	16	39.0
Moderate	25	61.0
High	0	0
Total	41	100

Based on the results presented in Table 5, it can be seen that there are three levels of occupational stress among aircraft maintenance officers at PT. X: low, moderate, and high. As many as 25 officers (61%) experienced moderate occupational stress.

The Relationship between Mental Workload and Occupational Stress

Table 6. The Relationship between Mental Workload and Occupational Stress among Aircraft Maintenance Officers at PT. X in 2018

Mental Workload	Occupational Stress						Total	
	Low		Moderate		High			
	n	%	n	%	n	%	N	%
Light	0	0	0	0	0	0	0	0
Moderate	7	63.6	4	36.4	0	0	11	100
Heavy	9	30.0	21	70.0	0	0	30	100
Total	16	39.0	25	61.0	0	0	41	100
Correlation Coefficient			0.306					

Based on the cross tabulation between mental workload and occupational stress above, it can be observed that most officers with heavy mental workload experienced moderate occupational stress with the percentage of 70%. The statistical test result using the Spearman-rho correlation test demonstrated correlation coefficient value of 0.306. Based on the level of closeness among research variables by D. A. de Vaus (2002), the correlation coefficient value is included withn moderate category with unidirectional relationship.

Table 7. The Level of Closeness among Research Variables by D. A. de Vaus (2002)

Correlation Value	Interpretation
0,00	No Relationship
0.01-0.09	Less Meaningful Relationship
0.10-0.29	Weak Relationship
0.30-0.49	Moderate Relationship
0.50-0.69	Strong Relationship
0.70-0.89	Very Strong Relationship
>0.90	Almost Perfect Relationship

DISCUSSION

Mental Workload

Based on the results of the mental workload measurement presented in Table 4, it can be seen that most aircraft maintenance officers at PT. X had heavy mental workload. The concept of mental workload is based on the difference in the number of resources and work demands that should be met (Sanders and McCormick, 1993). From ergonomic perspective, every received workload should be compatible with someone's physical capability, cognitive ability, and limitation in receiving the workload.

From the results of mental workload measurement in Table 4, it can be seen that most officers the heavy mental workload with the score of more than 80. Overstressed, exhaustion, injury, accident, and decrease in productivity can occur if the load is too heavy due to excessive energy consumption. Boredom or understressed can also occur from load that is too light (Tarwaka, 2015). It indicates that the higher mental workload experienced by the officers at PT. X is, the higher the risk of occupational stress will be.

Workload comprises of physical and mental workloads. The measurement of mental workload utilizes NASA-TLX method which is conducted through weighting and ranking. In NASA-TLX method, there are six dimensions in it, namely Mental Demand, Physical Demand, Temporal Demand, Own Performance, Effort, and Frustration. Mental Demand dimension refers to the amount of mental and perceptual activities which is employed to see, remember, and find. Physical Demand dimension refers to the number of physical activities like pushing, pulling, and lifting. Temporal Demand dimension refers to the amount of demand for time used during work period. Performance dimension refers to the magnitude of someone's work success and related to the satisfaction of work results. Frustration dimension refers to the amount of despair, insecurity, offense, and tension felt at work. Effort dimension refers to the amount of mental and physical efforts required in overcoming work.

Based on the results of mental workload analysis, it is discovered that most officers had a heavy level of mental workload, scored more than 80. Therefore, the company should consider adding the number of officers to handle the excessive workload experienced by its personnel.

Occupational Stress

From the results of occupational stress measurement presented in Table 5, it can be seen that most officers experienced moderate level of occupational stress. World Health Organization (WHO) defined occupational stress as someone's response in receiving work demands and pressure that are not compatible to his/her knowledge and capability.

In facing work, sometimes a person has the feeling of inadequacy, boredom, inconvenience, and depression; hence, she/he is experiencing occupational stress. Mangkunegara (2003) defined occupational stress as a depressing feeling experienced by employees in facing their work. Occupational stress symptoms can emerge in the form of physiological, psychological, or behavioral symptoms. The physiological symptoms include headache, indigestion, exhaustion, as well as sweaty hands and feet. It also encompasses feeling restless, not relaxed, easily irritated, easily offended, hard to concentrate, and getting sleep disorders. The behavioral symptoms

comprise of drug dependence and excessive smoking.

In this research, the occupational stress measurement was conducted by distributing questionnaire about occupational stress assessment by Brief Job Stress Questionnaire with scoring method. The questionnaire assessment was conducted using the 4-point Likert scale from 57 questions regarding employment, health condition, and satisfaction. The aircraft maintenance officers at PT. X were asked to fill out the prepared questionnaire.

Based on the results of occupational stress analysis among aircraft maintenance officers at PT. X, it is discovered that most officers experienced moderate level of occupational stress. Therefore, improvement is required to prevent the increase in occupational stress in the future.

Occupational stress can be prevented by applying two approaches, namely personal and organizational approaches (Wijono, 2010). The personal approach can be conducted by self-relaxation, counseling, and exercise to reduce the impact of stress. Meanwhile, the organizational approach can be applied by intensifying effective communication among officers and superiors, as well as increasing officers' participation in contributing their ideas to increase their work satisfaction and reduce occupational stress. Moreover, administration of social support from work environment can also provide comfortable feeling toward employees, so that it can reduce anxiety and occupational stress. The social support from the work environment can be achieved from co-workers and superiors. Social support can also be received from the home environment like families, partners, close friends, and relatives.

The Relationship between Mental Workload and Occupational Stress

Based on the conducted research, it can be seen that the aircraft maintenance officers at PT. X experienced moderate and heavy mental workload. The frequency distribution in Table 4 demonstrates that approximately 73.2% of the officers experienceds heavy workload. In Table 6, it is shown that the officers who had moderate level of mental workload mostly experienced low occupational stress about 63.6%. While the officers who had heavy mental workload mostly experienced moderate occupational stress of 70%. Work stress levels among the officers based on mental workload is in accordance with Cooper's theory Munandar (2001), which stated that one of the factors causing occupational stress is excessive workload.

Based on the statistical test result using Spearman-rho correlation test between mental workload and occupational stress variables, the obtained correlation coefficient was 0.306. Therefore, it can be concluded that the relationship between mental workload and occupational stress on the aircraft maintenance officers at PT. X is a unidirectional relationship. It means that the heavier the mental workload is, the higher the occupational stress level will be.

Tarwaka (2015) defined workload as the difference between a worker's capability or competence and the encountered work demands. According to Tarwaka (2015) , workload emerges from the interaction of worker's tasks, work environment, skills, behavior, and comprehension. The workload consists of physical and mental workloads which have their own different levels of loads. The concept of mental workload is based on the difference between the number of resources owned and the number of work demands (Sanders and McCormick, 1993). Overstressed, exhaustion, injury, and a decrease in productivity can occur if the workload level is too high due to excessive energy consumption. On the contrary, boredom or understressed can occur due to extremely low workload intensity (Tarwaka, 2015). International Labour Organization (2016) also mentioned that workload can generate stress if it is too much or too little.

The results which explain about relationship between mental workload and occupational stress among aircraft maintenance officers at PT. X are in line with the research conducted by Fahamsyah (2017). The subject of the study was the employees at the CSSD Installation of Surabaya Hajj General Hospital. The research demonstrated a significant relationship between mental workload and occupational stress with the correlation coefficient value of 0.828. The results of this research are also in line with another research from Pertiwi, Denny and Widjasena (2017) about some lecturers in a faculty. Their research also showed that there was a relationship between mental workload and occupational stress among lecturers in the faculty.

Due to the relationship between mental workload and occupational stress, some efforts are needed to minimize it. For instance, by doing

light exercise before or during working time, so that the body is relaxed. Exercise can improve blood circulation, refresh one's mind, and subside muscle tensions. If work is performed with a clear and fresh mind, the impacts of work pressure and occupational stress can also be reduced. The officers should also be able to use their resting time well, so that they will not bring the previous workload into the next work. In addition, the company is expected to add the number of officers to overcome the excessive workload received by its personnel.

CONCLUSION

From the research conducted to the aircraft maintenance officers at PT. X, it is known that as many as 30 officers (73.2%) experienced heavy mental workload and 25 officers (61%) experienced moderate occupational stress. There was a moderate relationship between mental workload and occupational stress among aircraft maintenance officers at PT. X with the unidirectional relationship. It indicates that the heavier the mental workload is, the higher the occupational stress will be.

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