

How to Cite:

Talakua, F., Etnis, B. R., Nasedum, I. R., Bambang, Y. M., & Lerebulan, E. F. (2022). Analysis on ergonomic factors and workload of female civil government employees in the local government offices of Sorong. *International Journal of Health Sciences*, 6(S1), 11525–11533.
<https://doi.org/10.53730/ijhs.v6nS1.7791>

Analysis on ergonomic factors and workload of female civil government employees in the local government offices of Sorong

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Abstract--Background: Based on the initial survey conducted by researchers, ergonomic problems were found in the female Civil Government Employees (Pegawai Negeri Sipil, PNS), including the fact that most female Civil Government Employees are old. Most female Civil Government Employees went to the office without having breakfast. The desks and chairs at work were not designed ergonomically. The work station was located in the fourth floor without an escalator, causing fatigue. The room temperature and lighting are unfitting. These problems are disadvantageous for their workloads. Objectives: The objective of this research is to find out the influence of ergonomic factors on female Civil Employees' workloads in the Local Government Offices of Sorong City. Methods: The method

applied in this research is the analytical survey with a cross-sectional design. The applied sampling method was random sampling stratification, with 104 samples. The data is collected using questionnaires. The data analysis includes univariate, bivariate, and multivariate, applying the Chi Square (X^2) test and multivariate analysis with logistic regression. Research Results: The bivariate test result shows that workloads are influenced by the following factors: age ($p=0.002$), nutritional status ($p=0.002$), working behavior ($p=0.003$), tools layout ($p=0.001$), working environment ($p=0.001$). Multivariate analysis with logistic regression shows coefficient determination value of $R^2=0.16$. There are also collective effects between age ($p=0.03$), nutritional status ($p=0.01$), tools layout ($p=0.04$), working environment ($p=0.02$), and workloads on the female Civil Employees in the Government Offices of Sorong. Conclusion: There are influences from ergonomic factors of age, nutritional status, working behavior, tools layout, working environment on the workloads of the female Civil Employees in the Local Government Offices of Sorong.

Keywords---Ergonomic Factors, Workloads, Female Civil Government Employee.

Introduction

In today's globalized era, countries are expected to be capable of facing competitions in every field. Indonesia is not an exception. The competition among countries does not only revolve around buying and applying science and technology, but also increasing and developing the human resources capabilities. According to the Central Bureau of Statistics (Badan Pusat Statistik, BPS), the number of Indonesian labors in 2003 reached 100.316.007 people, with 64,63% male labors and 35,37% female labors. Despite the positive effect of the increasing numbers of productive labors, it is not yet thoroughly scrutinized which will likely impact the inefficiency of production cost and the decrease of productivity.

In addition to the industrial sector, women also work on the government offices as Civil Employees. According to the data from National Civil Service Agency (Badan Kepegawaian Nasional) (2013) in the book of data and development information in 2004 – 2012, the numbers of civil employees based on gender in 2012 were 2.332.549 males and 2.135.433 females. Based on the data from West Papua Province Government, the number of Civil Employees in West Papua in 2013 were 17.270 male employees, or 58,7%, and 12.147 female employees, or 41,3%.

Meanwhile, the number of Civil Employees working in the Government Offices in Sorong City until July 2015 was 3.785; with 1.638, or 43,3%, male employees and 2.147, or 56,7%, female employees. These female employees work for 47 Regional Work Units (Satuan Kerja Peringkat Daerah, SKPD). From all of the SKPDs located in Sorong, there are 12 SKPDs located under the same four-floor office building. In this building, there are 269 employees consisting of 124, or 46%, male employees and 145, or 54%, female employees.

According to the preliminary study in twelve SKPDs sharing the same office environment in the Sorong Government Offices comprising the Health Department, Cooperative and SMEs Department, Local Staff Agency, Regional Development Planning Agency, inspectorate of Sorong and Regional Secretary of Sorong, which consists seven part, namely general affairs department, governance affairs department, legal department, organizational affairs department, local ordinance administration department, development administration department and public relations department; it is found that most of the female Civil Employees between the ages of 20 - >45 years old go to the office without having breakfast, which impair the fulfillment of their nutritional needs. The desks and chairs at the office are designed with the same model, which is not in accordance to ergonomic values. The work station is located on the fourth floor without an escalator, causing fatigue. The layout of the work station is also disorganized and narrow, resulting in the cramped space to move during work. Location wise, the office is surrounded by the main roads, in which the traffic noise disrupts the working hours.

These preliminary study data show that there are ergonomic problems occurring to female Civil Employees in their working environment negatively affecting their workloads.

Research Method

This is an analytical survey research with cross-sectional design. This research aims to analyze the ergonomic factors and the workloads of female Civil Employees in the Local Government Office of Sorong. The sample of this research is 104 female Civil Employees, with inclusive criteria, namely married, present during data collecting process, not under any medication, and willing to be respondents. The tools used to measure variables in this research is a questionnaire. The questionnaire used are divided into four parts: individual, working behavior, tools layout, working environment, and workloads questionnaire. The data analysis is conducted with Stata statistic program version 12, consisting of univariate and bivariate analyses with Chi Square statistic test, and multivariate analysis with logistic regression statistic.

Results and Discussion

The univariate analysis is conducted in order to obtain an illustration of the frequency distribution of the characteristics of the research subjects (education, marital status, years of service, position) and the frequency distribution of research variables (age, nutritional status, working behavior, tools layout, working environment and workloads). The illustrations are presented in the following Tables 1 and 2.

Table 1
Frequency Distribution of the Characteristics of the Research Subjects

Characteristics	Frequency (n)	Percentage (%)
Education		
- High School	15	14.4
- Higher Education	89	85.6
Total	104	100
Marital Status		
- Married	96	92.3
- Widowed	7	6.7
- Divorced	1	1
Total	104	100
Years of Service		
- < 10 Years	35	33.6
- ≥ 10 Years	69	66.4
Total	104	100
Position		
- Head of Division	4	3.8
- Head of Department	34	32.7
- Staff Members	66	63.5
Total	104	100

Based on the frequency distribution of the characteristics of the research subjects presented in Table 1, it can be seen that the frequency distribution of education has the higher number in higher education or university group with 89 people (85.6%), and the high school group is lower in number with 15 people (14.4%). The frequency distribution of subject's marital status has the highest number in "married" group for 96 people (92.3%) and the lowest in the "divorced" group for 1 person (1.0%). The frequency distribution of subject's working time is higher in the ≥ 10 year-group with 69 people (66.4%) and the <10 years group is lower in number with 35 people (33.6%). The frequency distribution of subject's position has the highest number in staff members with 66 people (63.5%) and the lowest as head of division with 4 people (3.8%).

Table 2
Frequency Distribution of Research Variables

Characteristics	Frequency (n)	Percentage (%)
Age		
- < 30 Years Old	37	35.6
- ≥ 30 Years Old	64	64.4
Total	104	100
Nutritional Status		
- Normal	41	39.4
- Excessive (Obese)	63	60.6
Total	104	100

Working Behavior		
- Ergonomic	28	26.9
- Unergonomic	76	73.1
Total	104	100
Tools Layout		
- Ergonomic	48	46.2
- Unergonomic	56	53.8
Total	104	100
Working Environment		
- Ergonomic	32	30.8
- Unergonomic	72	69.2
Total	104	100
Workload		
- Light	23	22.1
- Medium	37	35.6
- Heavy	44	42.3
Total	104	100

Based on the frequency distribution of research variables presented in Table 2, it can be seen that the age group of ≥ 30 years old has the higher number with 67 people (64.4%) and the age group of < 30 years old is lower in number with 37 people (35.6%). The frequency distribution of subject's nutritional status is higher in the more body mass index group (obesity) with 63 people (60.6%) and the normal body mass index is lower in number with 41 people (39.4%). The higher frequency of subjects' working behavior is seen in the unergonomic group, with 76 people (73.1%) and the ergonomic group is lower in number with 28 people (26.9%). The frequency distribution of subjects' tools layout is highest in number in the unergonomic group with 56 people (53.8%) and the ergonomic group is lower in number with 48 people (46.2%). The higher frequency of subject's working environment is in the unergonomic group with 72 people (69.2%) and the ergonomic group is lower in number with 32 people (30.8%). The highest frequency of subject's workloads is in the heavy group with 44 people (42.3%) and the lowest in the light group with 23 people (22.1%).

Table 3
Result of Chi Square Test in the Effects of Age, Nutritional Status, Working Behavior, Tools Layout, Working Environment and Workload

Variable	<i>p</i>
Age	0,002*
Nutritional Status	0,002*
Working Behavior	0,003*
Tools Layout	0,001*
Working Environment	0,001*

Table 3 shows the statistic test results of the effects of age and workload using Chi Square test, which is $p=0.002$, and $OR=3.91$ smaller than $\alpha<0,05$. From this result, it can be concluded that there is a relation between the age factors and

workloads. The older the age, the higher the fatigue level is. Because there are more old employees than the young, the physical fitness decreases as well. Generally, the older employees are less fit than the younger ones. The aging process will be accompanied by the lack of work capability, caused by the changes within the organs; cardiovascular system and hormones . The research has shown that female civil employees older than 30 years old are given more assignments and tasks because they are considered more capable and experienced. Older employees and those with more years of service are used to the work, and they have a better understanding of the job descriptions, which allows them to overcome the problem regarding workloads . The results of this research is in accordance with the research on Lower Waist Pain Complaints of the Eggplants Traders in Makassar. This research confirms the relations between age and ergonomic disruptions, which is mostly found in the group with older people, with 66 respondents (83.3%).

Based on the rest results, nutritional status has a significant role with $p=0,002$ and $OR=3,76$. It can be concluded that nutritional status affects workloads. The labor's nutritional status is strongly related to their health status and productivity. If the nutritional status is deficient or excessive, it will affect their productivity due to the decreasing working endurance. With poor nutritional status, employees tend to suffer from fatigue, which can be seen from the low level of haemoglobin. On the other hand, excessive nutritional status causes cardiovascular and blood vessels diseases. Especially for employees, these factors influence their workloads . This research does not prove the previous research conducted at the Pasti Pas! Petrol Stations (SPBU) in Makassar, which shows no relation between Body Mass Index with work fatigue in the examined 83 operators.

The Chi Square statistic test result of the working behavior effects and workloads is $p=0,003$ and $OR=2,96$. This result shows that working behavior does affect the workload. The wrong working behavior is the main cause of fatigue and the muscle ache complaints which are mostly overlooked, especially regarding working behavior that has become a habit. The habit of sitting, standing, and bowing could cause fatigue, muscle tension, and eventually pain. Besides, they also cause crooked spine, with strained muscles, vertebra, and ligaments. Working behavior is essential in determining the emergence of fatigue, which will affect workloads . This result is in accordance with the previous research conducted towards rice farmers in Tabanan, Bali, showing that there is a significant increase in the workers' pulse after planting rice on the fields. A research in the American agricultural sector in 2007 shows that farmers and workers in agriculture tend to report complaints about neck and shoulder pain, caused by the activities they usually do such as lifting, bowing, and pushing. This research also confirms another agricultural sector research in the United Kingdom stating that manual handling activities are the number one cause of most non-fatal injuries.

The Chi Square test result of tools layout with $p= 0.001$ and $OR=4,73$ value shows that layout also affects workloads. This explains that an office layout should consider the nature and type of activities conducted by the working units. This does not confirm the previous research about Effects of Office Layout Effectivity

towards Employees' Performance in the General Affair and Supplies Secretariat Bureau of Banten Province. According to this research, the task implementation and completion are not affected by the existing room layout. This means that the finished task is affected by the employees' performance and quality, instead of the room layout.

Working environment variable has a significant value of $p=0.001$ and $OR=4,20$, which leads to the conclusion that workloads are influenced by environmental factors. Observations conducted through the research period have shown that noises of motor vehicles are heard every 3-5 minutes. This is due to the fact that the mayor's office is surrounded by highways. The intensity of these noises could cause sensorineural hearing loss, a type of deafness that occurs as the result of permanent damage in the inner sensorineural organs of the ear caused by the accumulation of noises in a certain period of time. Therefore, the factors that could cause hearing loss must be reduced. This result supports the theory that physical problems at the workplace, such as hot or cold temperature, could affect workloads. The result of this research is different from another research stating that there is not significant relations between temperature and workloads based on the measurements of KAUPK2 dan WCR on the employees of the Laundry Installation of Sardjito Hospital Yogyakarta.

Table 4
Results of Logistic Regression of Ergonomic Factors Analysis Model
(age, nutritional status, working behavior, tools layout, working
environment) and Workload

Variable	Model 2		
	Workload		
	P	OR	CI95%
Nutritional Status	0.01*	5.27	1.48-18.71
Working Environment	0.02*	4.61	1.27-16.72
Age	0.03*	4.5	1.33-15.24
Tools Layout	0.04*	4.02	1.06-15.19
R ²	0.1556		
N	104		

With:

R² = coefficient of determination

N = numbers of sample

P = probability

OR = odds ratio

CI95% = conf. interval

* = $p < 0.05$

The results of multivariate analysis using the test of logistic regression statistic presented in Table 4 show variables of nutritional status ($p=0.01$ and $95\%CI=1.48-18.71$), working environment ($p=0.02$ and $95\%CI=1.27-16.72$), age ($p=0.03$ and $95\%CI=1.33-15.24$), and tools layout ($p=0.04$ and $95\%CI=1.06-15.19$). all of the variables on the final model are considered significant because the ranges of value do not exceed $R^2=0.1556$, the value of $p < \alpha$, with $\alpha = 0,05$.

The total effective contribution of the independent variables to the dependent variables results in the R² value of 0.1556, which means that this model can explain 15.56%. Therefore, it can be concluded that the variables of age, nutritional value, working behavior, tools layout and working environment have 15.56% of influence on workloads, while the remaining 84.44% is influenced by other factors excluded from this research, namely: stress, psychosocial, anthropometry, muscle strength, domestic workloads, etc.

Conclusion and Suggestions

Based on the results of this research, it can be concluded that the factors of age, nutritional status, working behavior, tools layout, and working environment to affect the workloads of female Civil Government Employee in the Local Government Office of Sorong.

Therefore, the researcher suggests that the Regional Work Unit take into consideration factors such as age, physical ability and technology literacy when assigning tasks and responsibilities. The Regional Government of Sorong needs to organize health examinations and fitness exercises for their employees, especially the women, as an effort to reduce the number of obese employees. Ergonomic chairs and desks must be provided to encourage ergonomic working behavior, which will increase productivity. Every room must be equipped with an air conditioner to create a comfortable working environment. Additionally, the office must be made soundproof to avoid the noises from motor vehicles. Further researches on ergonomic factors and workload should look into other variables such as stress, psychosocial, anthropometry, muscle strength and domestic workloads.

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