

## FACTOR ANALYSIS OF EYE FAILURE COMPLAINTS ON COMPUTER USING WORKERS IN THE K3L ROOM PT PLN (PERSERO) UPK NAGAN RAYA

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### Abstract

*Eye fatigue is an eye discomfort caused by excessive use of the sense of sight when working for long periods of time accompanied by uncomfortable viewing conditions caused by poor lighting. The purpose of this study was to determine and analyze the factors associated with eye fatigue in computer users. In this study the authors conducted research using descriptive qualitative methods, namely by conducting interviews and observations. The data used are primary data obtained from interviews and observations of 5 workers in the K3L room of PT PLN (Persero) UPK Nagan Raya and secondary data obtained by collecting all data related to the study. The results show that among the variables of age, duration of computer use, monitor distance, eye rest and lighting, there are two factors that can be said to be the cause of eye fatigue, namely the monitor distance and lighting variables. The conclusion is that there is a relationship between monitor distance and lighting with eye fatigue, but there is no relationship between age, duration of computer use and eye rest in computer users. It is recommended for companies to provide training to workers on preventing eye fatigue.*

**Keywords:** *Eye Fatigue, Age, Duration of Computer Use, Eye Rest, Monitor Distance, Lighting.*

### 1. INTRODUCTION

Computers have become the most important part that cannot be separated from life in this modern era. The development of technology that grows and supports rapidly various fields of work that requires humans to be involved with computers that can complete work easily and quickly. (Septiansyah, 2014). However, this development can cause various effects for humans, one of which is occupational diseases such as eye fatigue.

The appearance of eye fatigue can be influenced by aspects of work and environmental aspects. Occupational factors can be in the form of refractive errors, age, risky behavior, heredity, and length of work. A number of researchers have shown that visual symptoms occur in 75%-90% of computer users (The National Institute of Occupational Safety and Health, 2014).

According to the Occupational Safety Health Administration (OSHA), eye fatigue factors can be influenced by several factors, namely worker characteristics (age, refractive error, eye rest), work environment factors (lighting, temperature, and humidity), job characteristics factors (eye rest), and the working device factor (distance of view on the monitor).

Eye fatigue is an eye discomfort caused by excessive use of the sense of sight when working for long periods of time accompanied by uncomfortable viewing conditions caused by poor lighting. In accordance with the regulation of the Minister of Health No. 48 of 2016 concerning safety and health standards for office work, such as: Aspects of needs (visual performance) and expectations of office space users, lighting intensity must be met to support performance, feel comfortable, healthy, and not cause health problems. For eye comfort, 300-500 lux lighting is required, 500 lux drawing work, 300 lux meeting rooms, 300 lux receptionists, 100 lux corridors, 200 lux archives.

In Arianti's research (2016), 46.3% of them have experienced complaints of eye fatigue caused by excessive use of computers, such as red eyes, watery eyes, sore eyes and nearsightedness. This is in line with research conducted by Arianti, Bhanderi, et al (2008). The results of the Mappangile study, (2018) found that 7 computer users complained of eye fatigue and took eye breaks every 1 hour with a percentage of 87.5%. As for those who did not complain of eye fatigue, 1 worker and

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took eye breaks every 1 hour with a percentage of 12.5%. For those who did not do eye rest, there was none because most of the respondents did eye rest.

Many previous studies have been carried out related to eye fatigue, but health problems in computer use have not become the center of intensive attention in the community. So that many people are reluctant to pay attention to this health impact because according to him the impact of the impact on health is rarely felt directly in a short period of time. However, within a certain period of time, this health problem will become a serious problem if health awareness is not immediately built.

Based on observations that have been made of workers with their daily activities using computers. It is found that workers experience symptoms of eye fatigue due to prolonged computer use. Where some employees experience symptoms such as sore eyes, watery eyes, dizziness, and feeling of tension in the neck and shoulders. Therefore, the purpose of analyzing the eye fatigue complaint factor is to determine the relationship between age, duration of computer use, eye rest, monitor distance, and lighting with complaints of eye fatigue on computer user workers at the K3L office of PT PLN (Persero) UPK Nagan Raya. The purpose of this study was to determine and analyze the factors associated with eye fatigue on computer users in the K3L room of PT PLN (Persero) UPK Nagan Raya.

## **2. IMPLEMENTATION METHOD**

In this study the authors conducted research using descriptive qualitative methods, namely as a description or analyzing the results of research conducted by conducting interviews, and observations and views of respondents and conducting studies in natural situations.

This research was conducted in the PT PLN (Persero) UPK Nagan Raya company, and was conducted from March to May 2022. The samples were computer users in the K3L office.

In this study, the sources of data obtained are primary data and secondary data. Primary data is data obtained from interviews and observations of 5 workers in the K3L room of PT PLN (Persero) UPK Nagan Raya. While secondary data is data obtained by collecting all the necessary data from companies, government regulations, and journals related to the research conducted.

The sample in this study were the workers who worked at PT PLN (Persero) UPK Nagan Raya as many as 5 workers. While the criteria for the sample taken are the computer users of the K3L section.

This research uses purposive sampling technique method in determining informants in this researcher, purposive sampling technique is a type of data collection technique that is usually used in scientific research by determining certain criteria to be used as informants / resource persons. How to take informants, researchers do with two models, namely:

- a. Main Informants (IU) consist of Junior Technician K3 and Security
- b. Supporting Informants (IP) consist of 4 people including:
- c. IP1. Environmental officer
- d. IP2. K3 & Security Officer
- e. IP3. OHS & Security Officer
- f. IP4. Environmental officer

## **3. RESULTS AND DISCUSSION**

### **3.1 RESULTS**

Based on the results of interviews and observations made, the authors can analyze the factors of fatigue complaints in employees in the K3L section at PT PLN (Persero) UPK Nagan Raya.

### **3.1.1 Informants' Responses to the Relationship of Age Factors with Complaints of Fatigue Eyes on Computer Users in the K3L Room**

Age is a risk factor for eye fatigue. According to Fadillah, (2013) as a person ages, each eye lens will decrease and reduce the power for eye sharpness when seeing clearer objects. Even in old age, the eye loses its elasticity which reduces the ability of the lens to focus on an object, resulting in eye discomfort and strain that accelerates eye fatigue.

The main informant, as a Junior Technician K3 and security official at PT PLN (Persero) UPK Nagan Raya said that age can be one of the causes of eye fatigue depending on whether or not a person works in front of a computer. As we age, each lens loses its ability to make or reduce its accommodation. The average age of workers in the K3L room is 25-35 years. This can be seen from the statement expressed by the main informant at PT PLN (Persero) UPK Nagan Raya, as follows:

"I think there must be a connection, moreover, as we get older, one's vision decreases and there are many other symptoms of eye fatigue complaints, especially not taking care of nutritious food intake. So I think age can be one of the causes of eye fatigue complaints in some computer users" (IU).

In the results of the interview above, the researcher saw that the Main Informant (IU) explained the relationship between the age factor and the cause of eye fatigue complaints for computer users who were in the K3L room of PT PLN (Persero) UPK Nagan Raya.

In addition to the Main Informant (Supporting Informant 1 (IP 1), Supporting Informant 2 (IP2) and informant 3 (IP3) and supporting informant 4 (IP4) also conveyed the same thing, as he said:

"The age factor has an influence. As you get older, the performance of your body, especially your eyes, will decrease. So they will quickly experience eye fatigue or be more sensitive to their eyes" (IP1).

"Yes...because the factors that influence the onset of eye fatigue are age, length of work, and duration of work" (IP2).

"Yes, the older you get, the older you get, the visibility has an effect, especially if people who are over 40 years old are still working in front of a computer screen with a duration of several hours, it really affects the eyes." (IP3.)

"I think so, because in the past, when I was 20 years old, maybe because I played on my cellphone or laptop too often, I didn't really feel it, but now maybe I look at the computer regularly so it also affects eyestrain." (IP4).

The statement above has confirmed the answer from the Main Informant (IU). Seeing that age can affect complaints of eye fatigue on computer user workers in the K3L PLN (Persero) UPK Nagan Raya room.

### **3.1.2 Informant Responses To The Relationship Of The Duration Of Computer Users With Complaints of Eye Fatigue on Computer Users in the K3L Room**

Law no. 13 of 2003 concerning Manpower regulates the working hours for workers with a standard of 8 hours a day or 40 hours in one week (five working days). When viewed at a glance, high or excessive working hours will certainly be profitable for the company, because it will produce high products or services. This is different from the reality, because excessive working hours will make employees' work performance decrease and workers will have a tendency to cause

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other problems such as fatigue, illness, and work accidents, and lead to decreased productivity (Guyton and Hall, 2014).

The optimum duration of computer use is no more than 4 hours a day. If it is more than 4 hours, the eye tends to refract faster. Therefore, to reduce the rapid occurrence of eye refraction when a worker works using a computer more than 4 hours a day, it would be better if he took eye breaks more often (Ilyas, 2005).

According to Putri and Mulyono (2018) Based on the analysis of the relationship between the duration of computer use and complaints of eye fatigue, it can be concluded that there is a relationship between the two. These results are also reinforced by previous research conducted by Sya'ban and Rizki (2014), which stated that the duration of using a monitor was related to complaints of eye fatigue because when the employee was in contact with the monitor, the eye muscles had to work harder to see. object so that it will cause muscle tension and can cause eye fatigue. This can be seen from the statement expressed by the main informant at PT PLN (Persero) UPK Nagan Raya, as follows:

"I think it's related, especially if the light intensity of the monitor (computer) used is as high as 100%, it will make the eyes feel tired faster and so on" (IU).

In addition to the Main Informant (Supporting Informant 1 (IP 1), Supporting Informant 2 (IP2) and Supporting Informant 3 (IP3) as well as supporting informant 4 (IP4) also conveyed the same thing, as he said:

"There is. The longer you stare at the computer without eye protection, the more tired or damaged your eyes will be. So in general, people who often work in front of the computer will use glasses faster than those who work in the field. Therefore, now there are many technologies and innovations to protect the eyes. For example, glasses, blue light filters, or adaptive brightness on gadget screens." (IP1).

"Of course there is. Eye fatigue can occur if the eyes are focused on close objects for a long period of time, because the eye muscles have to work harder to see objects in low light" (IP2).

"Yes, because I have explained before, at least 1 hour of using the computer, then resting your eyes for 15 to 10 minutes or by sleeping, then using the computer again, so you don't have to go straight to the computer." (IP3).

"In my opinion, there must be a connection, because the eyes are used constantly, especially if you focus on them, so the eyes can sting and keep watering. After that, if you spread it too much, it can cause headaches or headaches. I also often experience these symptoms, especially playing games." look at the computer, and look at the cellphone. it's a headache, I think it has an effect." (IP4).

From the interview above, it can be concluded that a very long duration of computer use is thought to be a factor in eye fatigue for computer users. The longer a person is in front of the computer, it can cause eye fatigue. So in general, people who work in front of the computer for too long will wear glasses.



### **3.1.3. Informan Responses to the Relationship between Eye Rest Factors and Complaint of Eye Fatigue in Computer Users in the K3L Room**

According to the National Institute for Occupational Safety and Health (NIOSH), taking a 15 minute eye break for computer users for more than 2 hours will provide high work effectiveness on the eyes. Working for a long time using a computer without resting your eyes will result in a high risk of eye fatigue, because the lens will lose its elasticity caused by the beam of light from the computer screen on an object close to the eye.

According to Anshel (1996) quoted by Nourmayanti (2010) there are three types of breaks for computer users, including micro breaks, mini breaks and maxi breaks. Micro break, which is resting the eyes for 10 seconds every 10 minutes of work, by looking far away (at least 6 meters) followed by a relaxed blink of the eye. This is in line with the statement from the main informant (IU) that:

"Surely that is one of them even though it may not be optimal, because the time lag given to rest is very little" (IU).

In addition to information from the main informant (IU), supporting informant 1, supporting informant 2, supporting informant 3 and also supporting informant 4 strengthened the answers from the main informant:

"Eye rest can reduce eye fatigue, but is not a long-term solution. Still need protection for the eyes." (IP1).

"You can, to keep the eye muscles from straining by closing your eyes and massaging the temples for a few minutes to reduce eye fatigue." (IP2).

"Yes, if we feel heavy in doing a job, we should rest, especially if we work on a computer, it's related to the eyes. By taking a short break." (IP3).

"Yes, there must be, especially the eyes, if you keep your eyes open for work, especially in front of a computer screen that is too close or too close, you should need eye rest. Like me, when my eyes feel sore or sore, sometimes I take them to bed, I close their eyes, then a few minutes after I open them they feel better, or wash my eyes if my eyes often sting. So if it feels heavy in my eyes, I rest my eyes for a moment." (IP4).

From the results of the responses above, it can be concluded that if someone is too long in front of the computer and does not do eye rest, it will cause the eyes to become tired. Therefore, it is recommended to rest your eyes for a while when you feel tired.

### **3.1.4. Informants' Responses to the Relationship between Monitor/Computer Distance Factors and Complaints of Eye Fatigue on Computer Users in the K3L Room**

One of the factors that determine the comfort of working using a computer, especially when looking at objects for a long period of time in accordance with the criteria of office workers, is the distance between the eyes and the computer monitor screen. The distance between the eyes and a good computer monitor screen is 18–24 inches or 46–61 cm, while the ideal distance is 20 inches or about 50–80 cm. Occupational Safety and Health Association (OSHA) (1997).

Good vision of the distance from the monitor screen to the eye to work using a computer between the distance to the monitor screen with the eyes of at least 50 cm. This is in accordance with the reason or cause of eye fatigue, namely the distance between the eyes that are too close to the monitor, so that the eyes work to see at a fairly close distance for a long period of time. The distance of the eye on the monitor screen should not be too far or too close because it can cause the

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eyes to get tired quickly. Setting eye visibility with the right monitor screen will make workers comfortable while working and maintain eye health (Fadhillah, 2013). This can be seen from the statement of the Main Informant (IU) that:

"It's also clearly related, especially according to research according to OSHA 1997, the ideal distance between the eyes and a computer screen is between 50-100 cm, so if you use it below that ideal distance, it will definitely have an effect on the person, whether it's red, watery eyes, or even nausea and dizziness." (IU).

From the Main Informant's statement above, it is also supported by supporting informants 1, supporting informants 2, supporting informants 3 and also supporting informants 4 strengthening the answers from the main informants:

"There is. The less ideal the distance from the monitor to the eye, the less ideal the performance of vision will be. If the distance is ideal, the eye should work normally. But if the distance is too far or too close, the eye/visual system will work abnormally. So that it can cause damage to the system, for example, symptoms of dizziness and tired/watery eyes appear." (IP1).

"There is. Staring at a monitor screen too close will force the eye's ciliary muscle which controls the shape of the lens to keep contracting without resting. This condition can make the ciliary muscle fatigue. Especially when you blink less often when using a computer so that your eyes dry faster" (IP2).

"There is a connection, because eye complaints are many other factors, for example using the distance between the screen and the worker is approximately 30 cm, and if the distance is too close, it can accelerate the occurrence of eye fatigue." (IP3).

"Yes, it depends on the eye condition in question, if for example a person's eyes are minus, farsighted automatically his eyes must be close to looking at the computer. If he's nearsighted, he'll be a bit distant, but in general I think there's a connection. Because the closer we look at the computer screen, the faster the effect will affect the eyes." (IP4).

Based on the statements of the 5 informants above, it can be concluded that the monitor distance that is too close can trigger eye fatigue. Because according to OSHA 1997 the ideal distance between the eyes and the computer screen is between 50-100 cm.

### **3.1.5 Informant Responses to the Relationship between Lighting Factors and Complaints Eye Fatigue on Computer Users in the K3L Room**

According to Suma'mur (2013) Good lighting is lighting that allows or makes workers able to see objects around them clearly. Lighting that is arranged properly and sufficiently can help or make the atmosphere of the work environment feel comfortable so that it adds to the morale of the employees and increases productivity.

According to the Decree of the Minister of Health No. 1405 of 2002 concerning Requirements for the Work Environment and Industry, the minimum lighting intensity for work is 100 lux. However, it is different from the standard lighting for administrative office spaces and workspaces that use computers, which is 300 lux.

Lighting includes the use of both artificial light sources such as lamps, as well as natural lighting using daylight. He also explained about the standard of lighting in the workspace, which is 300 lux. Where this lighting includes natural and artificial lighting. Because the K3L room does not only use natural lighting, but uses artificial lighting such as lamps. In addition to explaining about

lighting and lighting standards, he also explained about the eye fatigue factor in using computers. This can be seen from the statement expressed by the main informant (IU), the following statement:

"So the lighting used in the K3L office room of PT PLN (Persero) UPK Nagan Raya is natural and artificial lighting. An example of natural lighting is the natural light of the sun and for artificial lighting it uses lamps. The lighting factor is clearly very influential, this is the same as what I explained before which if the lighting is too bright or dim, that makes the eyes get tired quickly, the same as using cellphones, just a small cellphone if the screen is too bright it will definitely make our eyes sting especially a computer with a screen bigger than a cellphone screen" (IU).

In addition to information from the main informant (IU), supporting 1, supporting informant 2, supporting informant 3 and also supporting informant 4 strengthened the answers from the main informant:

"It really affects, if the screen is too dark, it will make you more tired because seeing the writing/image is not clear. And if it's too bright, it's not good either, it hurts the eyes" (IP1).

"Yes, because eye fatigue occurs due to the adjustment of the pupil of the eye to the light received by the eye. The pupil of the eye will dilate when it gets less light and shrink when it receives too much light" (IP2).

"Oh, obviously there is, because this computer screen has radiation that affects our eyes, and the lighting of the lamp or room also has an effect, so if for example a bright room must be bright, the room for computer users should not be in the dark because the radiation quickly tires our eyes." (IP3).

"Well, that's very, very influential, so it must match the lighting in the room when working, especially in front of the computer, it must be appropriate, if only the room was darker than the light on the computer itself, it's not very good for eye health, so it's better according to the SOP the lighting, computer lighting, room lighting are regulated in the SOP" (IP4).

Based on the interview above, it can be concluded that the 4 supporting informants support the statement from the main informant, namely that there is an influence of lighting factors with eye fatigue on computer users. There are types of lighting, namely natural lighting such as sunlight, while artificial lighting such as lamps. For the K3L room, PT PLN (Persero) UPK Nagan Raya uses both types of lighting. But even so, the lighting in the room is still lacking, because based on the results of lighting measurements using a lux meter, the lighting results in the room are <300 lux.

## **3.2 DISCUSSION**

### **3.2.1 Age**

Age is a risk factor for eye fatigue. According to Fadillah, (2013) as a person ages, each eye lens will decrease and reduce the power for eye sharpness when seeing clearer objects. Even in old age, the eye loses its elasticity which reduces the ability of the lens to focus on an object, resulting in eye discomfort and strain that accelerates eye fatigue.

Presbyopia or accommodation disorders caused by aging of the lens that occurs after the age of 40 years, which at the age of 40 years will give complaints such as tired, watery eyes, and often feel sore, the lens becomes stiffer with age (Djoni, 2016).

Based on the results of observations and interviews conducted by researchers, the researchers found that the age condition of the K3 and Environmental employees was on average 25-32 years. For this age, it is still young so it cannot be called old. However, at a relatively young age, they

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have experienced symptoms of eye fatigue, such as sore eyes, watery eyes, tired eyes, and dizziness with dizzy eyes. This can be seen from the statements expressed by each informant.

### **3.2.2 Duration of Computer Use**

The optimum duration of computer use is no more than 4 hours a day. If it is more than 4 hours, the eye tends to refract faster. Therefore, to reduce the rapid occurrence of eye refraction when a worker works using a computer more than 4 hours a day, it would be better if he took eye breaks more often (Ilyas, 2005).

According to Putri and Mulyono (2018) Based on the analysis of the relationship between the duration of computer use and complaints of eye fatigue, it can be concluded that there is a relationship between the two. These results are also reinforced by previous research conducted by Sya'ban and Rizka (2014), which stated that the duration of using a monitor was related to complaints of eye fatigue because when the employee was in contact with the monitor, the eye muscles had to work harder to see. object so that it will cause muscle tension and can cause eye fatigue.

In the K3 and Environment room, the employees can spend a long time in front of the computer, which is about 5-10 hours. Due to the long duration of use of this computer, their eyes get tired easily and have symptoms of tired eyes as is often the case, namely watery eyes and sore eyes.

### **3.2.3 Eye Rest**

According to the National Institute for Occupational Safety and Health (NIOSH) taking a 15-minute eye break for computer users of more than 2 hours will provide high work effectiveness on the eyes. Working for a long time using a computer without resting your eyes will result in a high risk of eye fatigue, because the lens will lose its elasticity caused by the beam of light from the computer screen on an object close to the eye.

Eye rest does not have a relationship with the causes of eye fatigue, but by doing eye rest can prevent or reduce the symptoms caused by eye fatigue. The eye rest done by workers in the K3 and Environment section is not to be in front of the computer, but by opening the window, looking at the green trees and breathing air to freshen the eyes, washing your face and closing your eyes or sleeping. This can be seen from the various statements expressed by the informants.

### **3.2.4 Monitor Distance**

Based on the results of interviews and observations that have been made to K3 and Environmental employees, the results obtained from measurements for the average monitor distance are 45cm. The results of this value cannot be said to be appropriate and meet the standards, because according to the Occupational Safety and Health Association (OSHA) (1997). The ideal distance is about 50-80 cm.

When someone works by looking at luminous objects on a colored base at close range continuously for a certain period of time, it can cause the eyes to have to continue to accommodate. Eyes that continuously accommodate will cause eye fatigue (Septiansyah, 2014).

This is in accordance with the reason or cause of eye fatigue, namely the distance between the eyes that are too close to the monitor, so that the eyes work to see at a fairly close distance for a long period of time. The distance of the eye on the monitor screen should not be too far or too close because it can cause the eyes to get tired quickly. Setting eye visibility with the right monitor screen will make workers comfortable while working and maintain eye health (Fadhillah, 2013).

### **3.2.5 Lighting**

Lighting includes the human ability to be able to recognize a visual object, the efforts made to be able to see things better and the effect of lighting on the environment. The main criteria for



lighting is that it must be able to facilitate the sense of sight to see quickly and precisely so that comfort, security, and safety are achieved and a comfortable atmosphere for the eyes, and the spread of light evenly throughout the work area in the room (Firmansyah F, 2010)

According to Suma'mur (2013) Good lighting is lighting that allows or makes workers able to see objects around them clearly. Lighting that is arranged properly and sufficiently can help or make the atmosphere of the work environment feel comfortable so that it adds to the morale of the employees and increases productivity. In the K3 and Environmental rooms, the employees are satisfied with the lighting conditions in the workspace. Lighting measurements have been carried out using a lux meter, which results in 140.2 Lux which is measured once a year in the room.

The results of observations made by researchers are in accordance with the statements given by each of the informants above.

#### 4. CONCLUSION

Based on the research that has been done on K3 and Environmental employees, the researcher can conclude that there are two variables that have not been achieved, namely the distance from the monitor and computer users who are too long at work. With the result that the average distance of the employees' monitors is 45cm, this result is not in accordance with the predetermined standards. As for the variable of employee computer use, the average obtained is more than 4/day. Due to the absence of this suitability, it is possible that these two variables can cause eye fatigue in computer users in the K3 and Environmental rooms.

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