Understanding Harmful Blue Light in a group of Thai People

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ABSTRACT

Blue light is the light that harmful to health in the long term. Understanding the dangers of blue light could prevent blue light hazards. This study aims to understand the basic knowledge and dangers of blue light. How it could harm people during using computers, tablets, and smartphones as well as to assess the level of knowledge about the usage and dangers of blue light. A questionnaire was used to study the behavior of electronic device users. 150 participants answered the questionnaire about personal information, the dangers of blue light, and the blue light prevention. The results showed that majority of participants have the basic understanding about blue light. People in age range 18-30 years old are most damaged by blue light more than people age 15-17 years old and 31-60 years old respectively. If the people do not protect their eyes, they might have blurred vision or in the worst case they might lose their vision.

Keywords: Blue light, Blurry Vision, Eyestrain, and Dizziness

INTRODUCTION

The world is increasing the number of screen device users, monitor screen also increasing the number of users as well (Statista Research Department.2018). Many users are not concerned about the dangers of blue light effects from the electronic devices. Very few people are clearly understanding the danger of blue light and few seriously protect their eyes from the blue light harm. The dangers of blue light are ignored because it isn't a problem that immediately happens, it takes a long time to reveal the obvious symptoms (Preventing Bliness.2021, Bahl, Rajiv.2018).

The common symptoms are affected by blue light are eyestrain, headaches or migraines, blurry vision, and disrupts sleep patterns (Pixeleyewear. 2020). All of the common symptoms have badly affected our body either physically or mentally (Frequency Distribution Table: Examples, How to Make One. 2021). When sleep pattern is disrupted, it will affect the work of hormones in our brain that causing our brain has low efficiency or our emotion is not stable. Physically, if we have a problem with the eyes whether it is a problem with seeing colors or myopia problems, it is a very serious injure because the eye is an important organ of our bodies, so we have to protect and prevent our eye from the dangerous of blue light. The objective of this study is to educate the dangers of blue light, to protect and prevent the dangers of blue light perfectly, to offer the correct way to use electronic devices, and to survey the percentage of people who know and concern about the dangers of blue light. The questionnaire was provided to survey the sample group of 150 people, including 50 people 15-17 years old, 50 people from 18-30 years old, and 50 people 31-60 years old. Therefore, this study aims to increase awareness of blue light and how to the take care their eye health as much as possible to decrease the risk of harmful blue light.

THEORY

Blue light

Blue light is everywhere in our world. It is a color in the visible light spectrum that can be seen by human eyes. It is considered as a short wavelength, which means it produces higher amounts of energy. We have brought blue light inside by way of digital screens (found on TVs, Smartphones, computers, laptops, tablets, and gaming systems), electronic devices, LED, and fluorescent lighting (Blutech Lenses.2020).

Effects from blue light

Eyestrain is a symptom, not an eye disease, it occurs when your eyes get tired from intense use, such as reading, or working at the computer for long time (Thera specs.2020).

Headache, people who are prone to headaches or mi-graine attacks. It is exposed to this blue light that leads to high discomfort, a greater perception of pain and

throbbing and even enhanced spreading headache pain across the brain (Harvard Health Publishing.2018).

Blindness is the inability to see anything, including light. If you're partially blind, you have limited vision. You may have blurry vision or the inability to distinguish the shapes of objects (Statistic How to.2021).

METHODOLOGY

In this study, the data were collected by questionnaire to survey the basic knowledge of the sample group about the dangers of blue light and survey the solution that the sample group chooses to protect themselves from the dangers of blue light. 50 participants from 3 groups, aged 15-17 years old, 18-30 years old, and 31-60 years old. The questionnaires were distributed through the link on the Google form. It consists of 4 sections,

Section 1: The question about general information of answerer.

Section 2: The question about the dangers of blue light. Scoring of each section of the questionnaire will consider from the average score that we separate in 3 levels by use class interval which can calculate through maximum data subtract minimum data then divided by the length of the class interval.

Table 1: The range of average score calculates from the data in section2 both subsection1 and subsection2.

Score length	**Level**
0-0.33	Low
0.34-0.66	Medium
0.67-1	High

Section 3: After giving the knowledge to our sample group by using the infographic, we let them test their understanding by giving the questionnaire again. The questions are 2 choice, it is about the basic knowledge of blue light, then we can build the table that shows the range of the average score, its name is Table 2.

Table 2: The range of average score that calculates from the data in section3

Score length	**Level**
0.00-1.66	Low
1.67-3.33	Medium
3.34-5.00	High

Section 4: We give 5 questions to our sample group to check themselves that are damaged by blue light or not?

Table 3: The range of average score that calculates from the data in section4

Score	**Level**
2.5-0.00	Your eye is damaged by blue light.
5.0-2.6	Your eye has a high risk of damage by blue light.
7.5-5.1	Your eye has a low risk of damage by blue light.
10.0-7.6	Your eye is not damaged by blue light.

Table 4: The range of people who answer correctly and level of people that calculate from the data in section3 and section4.

% Of people	**Level**
1-33	Low
34-66	Medium
67-100	High

After we receive the answer from the answerer, we analyze the data that we are collected to evaluate the basically knowledge of our sample group and also know the percentage of people who know and protect themselves from the dangers of blue light or not and lastly, we know what kind of method that people mostly use to protect themselves then conclude the awareness level of each group and the difference of age is the impact to method that people choose or not?

RESULTS

The results in this session showed how well the participants have the basic understanding about blue light. The section 1 showed the number of sample group who know the danger of blue light, in section 2, the questions are related with the dangers of blue light. The results are shown in Table 5 and table 6, respectively.

Table 5: The number of people who know the danger of blue light.

Dangerous of blue light.	**Number of participants**	
	Yes	No
Do you know the dangerous of blue light?	128	22

Table 6: The number of people who know the danger of blue light in each age group.

Dangerous blue light.	**Number of participants**		
	15-17 years old	18-30 years old	31 -60 years old
Yes	46	46	36
No	4	4	14

Table 7 : The number of people who prevent their eyes from the danger of blue light.

Blue light prevention methods	**Number of participants**	
How to protect yourself from dangerous of blue light?	Yes	No
1. Avoiding use phone in the darkness	25	125
2. Using devices less than 2 hours per day	50	100
3. Turn on night mode	13	137
4. Wearing blue light glasses	22	128
5. Do nothing	37	113
6. Do it all	3	147

As shown in table 7, There were only three people who applying all 4 methods including avoiding using to prevent themselves including avoiding using phone in the dark, using devices less than 2 hours, turn on night mode, and wearing blue light glasses.

Table 8: The number of people prevents their eyes from blue light danger in each age group.

Dangerous blue light.	**Number of participants**		
	15-17 years old	18-30 years old	31-60 years old
1. Avoiding use the phone in the darkness	6	9	10

2. Using devices less than 2 hrs. per day	24	8	18
3. Open night shift mode	4	6	3
4. Use blue light cut glasses	8	12	2
5. Do nothing	7	13	17
6. Do it all	1	2	0

Table 9: The number of participants that being aware of dangerous blue light in each age group after providing about the basic knowledge of blue light.

Dangerous blue light.	**Number of participants**					
	15-17 years old		18-30 years old		31-60 years old	
	Yes	No	Yes	No	Yes	No
1. Do you agree that it's necessary to take precautions to protect yourself against blue light exposure?	47	3	47	3	39	11
2. Would you say that you are surrounded by LED lighting?	46	4	49	1	35	15
3. Would you say you are using electronic devices for more than six hours a day?	44	6	49	1	33	17
4. Do you use your phone or other devices for leisure time (playing games)?	46	4	48	2	31	19
5. Do you tend to use your phone and/or laptop before going to bed?	45	5	49	1	39	11
6. Do you own one (or more) of these electronic devices: television or tablet?	48	2	49	1	45	5
7. Do you take breaks while using devices for two hours or more?	30	20	29	21	32	18
8. Do you adjust the controls on your devices to reduce brightness?	41	9	44	6	31	19

9. Do you use an app to help reduce blue light emitted from your device?	23	27	28	22	27	23
10. Have you ever worn lenses that help reduce blue light exposure?	3 0	20	23	27	33	17

Table10: The result shows that how many people in each age interval who damaged by blue light

Are you damaged by blue light?	**Number of participants**					
	15-17 years old		18-30 years old		31-60 years old	
	Yes	No	Yes	No	Yes	No
1. Dry Eyes	26	24	30	20	28	22
2. Eye Strain	31	19	35	15	31	19
3. Blurred Vision	26	24	29	21	22	28
4. Headaches	21	29	25	25	25	25
5. Insomnia	17	33	28	32	16	34

DISCUSSION

In section 1 of our questionnaire, the questions about the dangers of blue light, we found that the people who know about the dangers of blue light is 85.3%, so the level of our sampling is high and about another 14.7% are people who do not know about the dangers of blue light mostly in the people who 31-60 years old, accounted for 9.3% out of 14.7%, leveling is high who do not know about the dangers of blue light. For the answer about how to protect their eyes from blue light danger, we found that the people have many ways to protect themselves, accounted for 75%, so the level is high. In the whole picture, the way that people use to do to protect themselves the most is using the mobile phone less than 2 hours per day, accounted for 33.33%, so the level is low. The lowest way that persons use to do to protect themselves is an open night shift this method is easy to do but only 8.67% of our sample group use the night mode to protect themselves, it is very low level compare with other methods. However, surprising that there also have a few groups of people in our sample who

know the dangers of blue light, but they do not have any way to protect themselves, it is about 24.67%, so the level of our sampling is low.
For section3 of our question, after giving the basic knowledge infographics to our participants, then we were scoring the data by using the criteria in Table 4. The results of this section show in Table 9, consisting of 10 items. According to the results, it shows that people 15-17 years old choose the correct answer 80%, it is a high level, the people 18-30 years old choose the correct answer 83%, it is high level, and people in 31-60 years old choose correct answer 69%. It is still in high and most likely to medium, so the first priority group that needs to be concern is 31-60 years old.
For the last part of our questionnaire, the basic symptoms about blue light were asked and scored in Table3. People in 15-17 years old answered yes, which means they have some basic symptoms of damage by blue light 121 times out of 250 times. People in 18-30 years old answered yes, which means they have some basic symptoms of damage by blue light 147 times out of 250 times, and people in 31-60 years old answered yes, which means they have some basic symptoms of damaged by blue light 122 times out of 250 times. In terms of different ages, the method that the people who are 15-17 years old choose to do the most is using mobile phones for less than 2 hours per day. Unfortunately, the method that the people who 18-30 years old choose the most is doing nothing. Lastly, the method that the people who 31-60 years old choose to do the most is using the mobile phone for less than 2 hours per day. In section3 people have more knowledge about the dangers of blue light both what is the effect that caused by blue light danger and how to protect themselves from the danger, people in 15-17 years old and 18-30 years old answer the correct high level. However, people who 31-60 years old also answer correctly at a high level, but it is at a low interval of high level. In section4 the last part of our questionnaire, all of our sample group is on the same level, but the most age range that has the highest percentage of people who has symptoms that show they might be damaged by blue light is 18-30 years old group.

CONCLUSIONS

As refer to our results that is analyzed, mostly people have the basic knowledge about the dangers of blue light, and they are concerned about the problem that causes from blue light danger and they try to protect themselves from the risk that causes harm or danger that can get them unhealthy. Although in the whole picture is like the people can control their behavior to use the electronic devices correctly, but when we consider the small details, we can find that the people do not have enough protection. However, it is a pleasant story that people in 18-30 years old and 15-17 years old have people who very concern about the problem causing by blue light, they use many ways (all of our choices) to protect themselves and reduce the risk that can cause harm. 31-60 years old should care about and control in priority because they do not have the basic knowledge about the dangers of blue light in high level. It might be affected their health too much and the consequence of this problem is exactly not satisfied, it might be the minor injuries (headache or eye strain) that can take more rest time to care about it but do not forget that the serious injury is also happening, they might be blinded or lost visible, this is the injured that you cannot control and

cannot be treated. After we give the infographics, the result is satisfactory, our answerer can choose the correct choice in our questionnaire that means they understand the infographics that we present, and they have more understanding about the dangers of blue light. When they apply all suggestions in their real-life, they also reduce the risk that can cause any injury as well. In summary, most people have a good way to protect themselves from the dangers of blue light at a high level, but the quality of protection is not good enough because everyone can choose more than only one way to protect themselves but only 2% who use more than one way to protect themselves, so that is the decision point to give the knowledge about the effect of blue light to everyone. The producer team hopes that our project will make the reader more awareness about blue light danger. This project might not a good result enough because of the limitation. We have the limit of our sample group, it is only a few groups of people, we will not divide the age range thoroughly so in the future if we have the opportunity to improve this project again, we might show the better result of people who damaged by blue light, and we may not be able to provide as much useful information as we should because, with online questionnaires.

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