THE IMPACT OF THE COVID- 19 PANDEMIC ON COMPUTER VISION SYDROME AMONG TEACHERS IN TRINIDAD

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ABSTRACT

Background

The global pandemic COVID-19 has impacted the world drastically .In Trinidad, there was a drastic change in the education system which was the cessation of face to face lectures. All teaching currently take place via online platforms causing an increase in computer use. The aim of this study is to identify the impact COVID-19 had on teachers with respect to computer related vision problems.

Method

An online survey was distributed to teachers in various educational institutes in Trinidad. Participants were asked the effect COVID-19 had on the amount of time spent on computers and any symptoms experienced because of this computer use along with their effects on overall quality of life.

Results

Five hundred and ninety two teachers from educational institutions in Trinidad participated in the survey. Results showed 89. 5 % of participants had eyestrain, 74% had blurry vision, 48. 6% had redness of eyes, 78% had headaches, 58.1% had dry eyes, 94.3% had eye fatigue, 71.1% had burning of eyes, and 77% had irritated eyes, 54. 6% had watery eyes and 36. 5 % had double vision. Risk factors such as blink rate abnormality, spectacle wear, and daily duration of computer use would have been found to affect severity and prevalence of these symptoms. Forty-five percent of participants rated their quality of life as being five or less out of ten while fifty-five percent had a rating over five.

Conclusion

The COVID-19 pandemic has significantly affected quality of life of teachers. Increased computer use due to the pandemic has resulted in an increased incidence of eye fatigue, eye strain, headache, eye irritation, blurry vision and burning eyes respectively.

CHAPTER ONE

1.1 Introduction

COVID-19 is a newly emerged highly infectious respiratory infection caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and was declared a global pandemic by the World Health Organization (WHO) [1]. The most common mode of transmission is via droplets from an infected person. Less common modes of transmissions are airborne and surface transmission. A person infected with COVID- 19 can present with symptoms or be asymptomatic. Some of these symptoms are fever, headache, dry cough, fatigue, and loss of smell, loss of taste, conjunctivitis, body aches and pain and in severe cases shortness of breath, chest pain, immobility and loss of speech [2]. This pandemic has negatively affected the world, grocery stores, markets, retail stores, religious places and banks have all been placed under restrictions or even shut down while schools have been remodelled to online teaching as face to face teaching is prohibited. Teachers and students are now spending an increased amount of time on computers which puts them at risk for developing computer related vision problems as well as ergonomic issues. Computer related vision problems are all termed under one condition call computer vision syndrome (CVS) which is a group of eye-related problems that occur as a result of extended use of computers, cell phones or tablets [3]. It can affect anyone from children straight to adults and in recent years have become an increasingly common condition.

1.2 Background of the study

Globally, there have been 12.1 million confirmed cases of COVID-19 with 3.3 million deaths [4]. In Trinidad and Tobago, there have been 15,899 confirmed cases and 276 deaths [5]. COVID- 19 caused negative socio-economic impacts globally such as increased health concerns, decrease in business productivity and loss of income. Vulnerable persons were affected the most. In Trinidad particularly, many persons have lost their jobs, businesses were forced to close and hospitals are almost at 100 percent capacity with infected persons.

Worldwide, one of the most common office equipment is personal computers (PC). In a survey done in the early 2000's determined 99 % of academia use computers [6]. In recent years, computers along with projectors have become staple in every lecturers education arsenal as a result of the large numbers in the classroom making the vintage chalk and black board combo futile. Given the abrupt change in teaching methods from face to face to online to counteract the spread of COVID 19, there is an expected increase in the amount of computer users among teachers and the number of hours spent on the device which has many associated complications such as increased time needed to prepare lessons, and ocular problems. More time is needed for lesson preparation and delivery as the primary form is power point presentations resulting in greater exposure to digital devices, increased risk in developing ocular problems particularly CVS- related, decreased productivity, higher failure rate and reduced job satisfaction. Some of the symptoms associated with CVS are blurred vision, diplopia, eye fatigue, headaches, eye strain and light sensitivity [7]. These symptoms can greatly affect the lecturer's ability to execute lessons in an effective manner. Currently, there is a paucity of data regarding the prevalence of CVS amongst academia in Trinidad and globally due to the lack of previous researches. The aim

of this study is to determine the prevalence of computer vision syndrome among teachers in Trinidad during COVID 19 which will ultimately assist in educating them about the condition and the necessary preventative measures to mitigate the problem.

1.3 Rationale of study

The motivation for this research arose from the increased use of digital devices caused by the current pandemic. The target group academia was selected as they are deemed the ones who are most at risk because of the drastic transition from face to face to online schooling. CVS symptoms can develop as a result of prolonged use of digital devices which can become uncomfortable and rather disruptive for academia which negatively impacts the amount of teaching done and the lessons learnt by the students. Lack of knowledge about CVS can cause worsening of symptoms as the necessary precautions may be neglected. Successful demonstration of this study with the distribution of flyers will increase the awareness of this condition among academia thereby reducing the risk of them developing it.

1.4 Aim or Purpose of the study

The aim of this study was to determine the prevalence of CVS among academia during the current pandemic, COVID-19 by assessing the associated risk factors and symptoms as well as educating them about the proper practice of using computers for carrying out tasks. The findings of this study will help recognize the problem amongst this population and raise awareness towards their daily practices resulting in the implementation of preventive measures to avoid CVS-related symptoms.

1. 5 Specific objectives of the study

- To evaluate the prevalence of CVS among teachers during COVID 19.

- To assess the most common symptoms experienced by teachers during COVID 19.
- To investigate the risk factors which contribute to CVS symptoms among teachers.
- To determine how the quality of life amongst teachers is affected by prolonged computer use.

1.6 Research questions

- Is there a high prevalence CVS related symptoms among academia?
- What are the symptoms that are experienced the most by academia suffering from CVS?
- Does spectacle utilization prevent CVS?
- What risk factors affect the prevalence of CVS related symptoms?

1.7 Hypothesis

Due to the constant exposure to computer related near and intermediate work, there is a high prevalence of teachers suffering from CVS related symptoms.

1.8 Significance of the study

Technology is steadily advancing, in order to increase the effectiveness and efficiency of daily tasks, persons especially academia are now required to spend more time using computers. Face to face learning is at a halt due to the current global pandemic and online teaching has become the primary method used by educators. Lesson planning, presentation, examination delivery and marking have become greatly computer based.

In order to solve a problem, comprehension and acknowledgement are firstly required. Computer Vision Syndrome is a common issue plaguing the general population as the percentage of individuals who use computers during the years have steadily increased. There are many precautions that can be taken to prevent the development or the progression of CVS symptoms

such as simply changing your posture or regularly breaking visual contact from computer screens.

With all the evidence provided, the main goal of this research is to identify and analyze the prevalence of CVS- related symptoms in academia and arm them with the means and methods to reduce their risk of developing the condition, as well as treatment and management options for those already experiencing symptoms.

1.9 Delimitation of the study

Our study is focused on the academia population in Trinidad specifically those who frequently use computers in the work place. Subjects were chosen from different schools to achieve a more holistic view of the problem which is the prevalence of computer vision syndrome among academia.

1.10 Limitation of the study

Methodological limitations:

Sample size: the sample size was limited as the academia population was physically inaccessible due to the current pandemic resulting in the questionnaire being delivered electronically.

Lack of previous studies done: there's a limited amount of studies done similar to the one performed which caused a lack of references and good foundation.

Method of data collection: data was collected electronically which can result in errors in the delivery and acceptance of the information affecting results.

Limitations of the researchers

Limited access: this study required us to have access to people in order to obtain more accurate results however this was impossible due to physical restrictions following COVID- 19.

Time constraints: a strict deadline for submission of research was given which limited the time for data collection, affecting the accuracy of results as a greater sample size meant greater accuracy.

Responses: obtaining responses for all the questionnaires dispatched were not achieved because of the online platform used. Academia are generally a busy group of persons so allocating time to complete the questionnaire may have been difficult causing the lack of responses.

1.11 Definition of terms

Academia: the community associated with teaching / academics.

Computer vision syndrome (CVS): a group of vision related problems associated with prolonged used of digital devices.

COVID 19: a highly contagious disease caused by a new strain of coronavirus.

Asthenopia: eye strain associated with the feeling of tired, sore, achy eyes.

Ergonomics: the scientific study of the interactions between humans and objects in their environment in order to optimize human well-being and overall efficiency.

Accommodation: the process by which the eye changes optical power in order to focus on an object as the distance between it changes.

Diplopia: also known as double vision is the viewing of a single object as two.

CHAPTER TWO

2.1 Literature review

Computer- related eye problems has been around for many years but there are not enough studies to show. There is a scarcity of previous studies specific to the effect of COVID-19 on the visual system as this pandemic has a recent onset.

In a recent study, conducted to determine the effects of electromagnetic radiation emitted from electronic devices on intraocular pressure, it was concluded the amount of radiation emitted was minor and had no effect on the pressures in the eyes [8]. This showed there are no risks of developing glaucoma when using electronic devices.

In researches done in the early 1900's by International Commission on Non- Ionizing Radiation Protection (ICNIRP) to determine if radiation emitted by digital devices had an effect on the biological system of human, it was determined that it didn't have any long-lasting effects, only increase in the temperature of the tissue [9]. In another study done in 2011 by the International Agency for Research on Cancer (IARC) contrasted this conclusion by stating that the emission from these device could possibly cause the development of a carcinogen [9].

In an article published in 2015 on the ocular complication experienced by computer users in India, it was observed 80 percent of approximately 40 million computer users experienced ocular discomfort, headache, dryness of eyes, blurring of vision and eye strain due to CVS. Increased blinking rate, alteration of the screen brightness, optimal workstation set up and frequent breaks reduced the chance of developing CVS [10].

In an article published in 2014 on the effects of computer use on vision related problems experienced by students in Ajman, United Arab Emirate, it was observed more than half of the

students who participated in the study experienced burning of eyes, headaches, tired eyes, dry eyes and sore eyes which were more frequent in females. Using filters on the screens, taking breaks and alteration of the computer viewing distance improved symptoms [11].

From a survey done in 2020 in the UK, 50 percent of the 2000 persons who participated reported an increase in the use of computers since the onset of COVID-19 and 38 % reported their vision worsening. Familiarization of the 20-20-20- rule was said to diminish the symptoms [12].

Another article done to determine the impact the COVID- 19 lockdown had on digital related eye problems concluded 95.8 % of 407 subjects who participated in the research experienced at least one symptom of digital eye strain. They assumed greater awareness of CVS and the necessary preventive measures should cause a decrease in these symptoms [13].

on a survey done in the United States amongst 1500 students in an educational institute to determine the impact of COVID- 19 on students. It was concluded, 195 student experienced a delay in their graduation, 600 students lost jobs and 435 students expect to earn less by 35 years of age. The lower-income students were affected more than the higher-income ones and are expected to have a greater delay in their graduation. The effects were not specific to any gender or face but seemed to be directly related to the socioeconomic status of the students [14].

Another study was done and published in June 2020 involving 33 medical schools in the United Kingdom contributing a total of 440 participants with the aim of determining the impact of COVID- 19 on final year medical students. Results showed 169 students had their OSCEs cancelled, 189 students had their assistantship postponed and 340 had their electives cancelled. Students also reported a decline in their confidence and preparedness to transition from a student to a doctor and appreciated the changes in the curriculum that was made in order to assist them.

With the proper supervision and support, students were willing to go to the hospitals and assist during the outbreak [15].

An online survey was previously done amongst teachers in Delhi to determine the impact of COVID-19 on the schooling system of both private and government schools. Teachers reported being comfortable with online teaching but just to get through this era of COVID-19 because they felt as though sufficient training was not supplied. Teachers from private institutes were more trained and equipped for the transition from face to face to online teaching however the issue regarding internet access were common in both private and public schools. Some tech companies are offering solutions but to higher-income persons [16]. Another study published March 2021 among 454 teachers in New Orleans was done to determine the impact COVID-19 had on the mental health of teachers. Overall, teachers experienced a greater amount of stress as a result of COVID-19 which negatively affected their mental health and teaching capability. Teachers who practiced coping mechanisms and had a proper support system were able to strive despite the pandemic [17].

An article on the ocular problems associated with long term use of computers stated prolonged use of computers needs an increased amount of visual attention. Patients with small refractive errors will need spectacles when using computers and presbyopes in particular will need the correct form spectacles such as progressive lenses. Patients with vergence and accommodation problems will observe an increase in these problems when using computers for extended periods of time such as a decrease in accommodative power, absence of near point of convergence and fluctuations in the phoria. Frequent breaks when using the computer will decrease these symptoms [18]. A study done by Sheedy separated the symptoms experienced by computer users into internal ocular symptoms (eye strain and ache), external symptoms (irritation dryness and

burning), visual symptoms (double vision or blurry vision) and musculoskeletal symptoms (neck and shoulder pain). The internal ocular symptoms were as a result of accommodative or binocular vision stress while external ocular symptoms were as a result of dryness in the eyes [19].

A study carried out in northwest Ethiopia revealed, exposure to digital devices utilized by workers constantly for 4-6 hours per day were 2.3 times more likely to develop CVS related symptoms compared to those who spent less than 4.6 hours. The study went on to provide evidence that those who were previously diagnosed with some type of ocular illness were more likely to develop CVS. And lastly those with knowledge of the safe usage of digital devices which included proper ergonomics, correct face to screen distance, taking regular breaks, resting the eyes after intense near work and adjusting the screen brightness of the digital device were 42% less likely to develop CVS [20]. In another article which observed the prevalence of digital eyestrain in a population of bank workers in the city of Gondar, northwest Ethiopia found 75% of the bank workers suffered from symptoms of CVS. Those who had incorrect sitting postures or wore spectacles were 2 times more likely to suffer from CVS [21].

One of the causes of CVS is decreased blinking when using computers for an extended period of time which results in improper lubrication of the ocular surface, also known as dry eyes. In a previous study, 254 lecturers at Mersin University were asked to fill out a questionnaire to ascertain the prevalence of dry eye symptoms among lecturers. Results showed 72% of the participants experienced dry eye symptoms with the most common cause being prolonged computer use. [22]. In another study, 30 individuals who used computers for more than 5 hours daily were compared to 30 individuals who used computers less than 1 hour daily by performing Schirmer test and tear break up time (TBUT) for signs of dry eyes. Results from Schirmer test

did not show any major differences between the two groups which suggested the amount of time the computers were used had no effect on dry eye symptoms while results for TBUT test were lower for prolonged computer use which showed a direct relationship between long term use of computers and the development of dry eye disease [23].

The blink rate is reduced during near to intermediate work such as computer use. In a Study done by Torsten Schloteet, the spontaneous blinking rate of 30 patients with moderately dry eyes using visual display terminals were observed and analyzed. Observations made during conversations with the participants showed the spontaneous blink rates to be considerably high at 16.8 blinks /min and during VDT use it was approximately 6.6 blinks/minute. Multiple results were obtained for blink rate with and without VDT use but all results followed the same trend [24]. In another research carried out by Qurban A Memon to test the validity of detecting CVS using eye blinks, webcams were used to observe the opening and closing of the eye during computer use and was found to have a 95% accuracy rate which showed the blinking rate during computer use to be drastically reduced [25].

During computer use it is very important to employ proper posture and ergonomic practices as failure to do so could result in the development of long term musculoskeletal related pains and aches. A Study was carried out by Abida Ellahi to investigate the association between health disorders such as carpel tunnel syndrome, computer stress syndrome and musculoskeletal disorders and prolonged computer use by questioning 120 students and 120 employees. It was proven that computer related issues such as CVS, musculoskeletal disorders, carpal tunnel syndrome and other computer related issues were more prevalent in employers than students while some occurred simultaneously. It was concluded that employees in educational institutes were more at risk of developing long term posture issues than students [26].

The main elements of visual performance are visual acuity, stereo acuity and binocular vision. Computer vision syndrome caused by prolonged computer use adversely affects visual performance. In a study carried out by Mabrouk M Abdelaziz et al on the incidence and degree of visual defects on computer users vs non- computer users, 50 non computer users and 50 computer users were tested for visual defects. The Snellen test was used to assess visual acuity and Ishihara chart for color vision. Of the 50 individuals who used computers, 84% were found to have visual defects and those who spent more than 2 hours on computers experienced symptoms of CVS. All individuals with visual defects used the computer for 2- 15 years and more than 10 hours per day with the majority complaining of visual defects such as burning eyes, dry eyes and sore eyes, neck and shoulder pain as well as color perception difficulties. Those without visual defects used computers for approximately 6 years. The results gave evidence to the adverse effects on visual performance caused by prolonged computer use [27].

The cumulative conclusion suggested by the previous points showed prolonged computer use can negatively affect visual performance, comfort, productivity and essentially the quality of life. Poor visual performance affects your everyday life as simple tasks such as driving, going to the wash room, performing recreational activities, going to work and performing tasks efficiently and effectively become increasingly difficult. A survey was done to determine the effect of prolonged computer use on the quality of life of 1000 University employees. It was observed that symptoms associated with prolonged computer use negatively affected all the aspects in one's life, mainly their quality of life [28]. In another study carried out by Biljana Miljanović et al, 589 individuals were asked to fill out a questionnaire about the effect of dry eye symptoms on their daily activities and results showed 399 of the participants had dry eyes while the remaining 190 did not. Those with dry eyes complained of difficulties while carrying out tasks such as driving

both at day and night, viewing a television, reading, using a computer and carrying out professional work. These results demonstrated the adverse effects dry eyes had on performing important daily tasks and in fact the quality of life [29].

Taking all the necessary precautions to prevent the onset of computer- related problems is extremely important and should be stressed amongst computer users. A study done in 2008 on methods to prevent CVS stated the most important preventative measures were getting rid of personal, computer-related and environmental factors which caused the condition by modifying the environment with optimal lighting and anti-glare filters as well as proper use of corrective glasses [30].

CHAPTER THREE

3.1 Ethical consideration

The Citi Ethics course was completed which improved knowledge on necessary ethical considerations for conducting a research. The research proposal was submitted to the ethics committee of the University of the West Indies where approval was obtained and data collection commenced. A statement of confidentiality was issued with each questionnaire to ensure participants knew all their information will be kept confidential. Permission was also requested from each participant to use their responses in the research and all responses were 100% anonymous. The primary source of data collection was a questionnaire, there was no physical or physiological risk to participants. Each participant was informed of the purpose of the study and given complete autonomy, they had no obligation to answer the questionnaire and did so on their own free will. All data collected were digitally stored under password protection where only the researchers had access to it. On completion of the research, all data were deleted.

3.2 Research design

A cross sectional study was conducted in educational institutions in Trinidad. All academia who use computers to complete their job task for at least 2 hours per day and worked in the current position for at least 3 months were included in the study except those with ocular diseases such as acute, chronic, infective conjunctivitis, any specific eyelid disorders, uncorrected refractive error and other binocular vision problems. A non-probability purposive sampling method was utilized to determine the sample size. The Trinidad and Tobago Unified Teachers Association (TTUTA) was contacted and the questionnaire was shared among the group page. Informed written consents were obtained from each study participant and ethical approval for the study

was obtained from the Ethics Review Committee of the University of the West Indies, St Augustine campus. Our questionnaire comprised of fixed questions associated to the topic which were used to establish a connection between computer use and CVS- related symptoms. The controlled variables were the questions asked to participants and the type of work done (near work/ computer work). There weren't any manipulated variable and various academic institutions were used to eliminate bias.

3.3 Study population

Based on our exclusion and inclusion criteria our study population was found to be all academia who use computers to complete their job task for at least 2 hours per day and worked in the current position for at least 3 months were included in the study. Those who have existing ocular pathologies and abnormalities that are directly related to CVS symptoms were excluded as these symptoms may be as result of the underlying ocular disorder.

3.3.1 Study site or Area of study

A cross sectional study was conducted from November 2020 to April, 2021 in Trinidad, one of the dual islands of republic of Trinidad and Tobago and the southernmost island in the Caribbean archipelago. Located just off the north-eastern coast of the South America mainland, the larger of the two islands, Trinidad, has a boot-like shape, measures 37 miles (80km) by 50 miles (60 km), and is noted for having an ecological and geographical diversity that is unmatched in the region. The study was conducted among academia in educational institutions located in the East-West Corridor of Trinidad. Our study group required a certain educational level in order to be employed therefore the responses were expected to be comprehensive. Since workplaces have no stipulated ethnic, cultural or geographic requirements, we also expected responses to come from a wide variety of subgroups and they did.

3.3.2 Inclusion criteria

All academia who used computers to complete their job task for at least 2 hours per day and worked in the current position for at least 3 months were included in the study. Due to the current pandemic, all teachers are required to provide online classes so are automatically included in our study, as the average online class is 2 hour, and can even exceed that up to 4 hours.

3.3.3 Exclusion criteria

Academia who had ocular diseases, such as acute, chronic, infective conjunctivitis, any specific eyelid disorders, uncorrected refractive error and other binocular vision problems were all excluded from the study.

3.4 Sample size and sampling technique

Employees satisfying the inclusion criteria were first single out then contacted via the TTUTA group page. Informed written consent was obtained from each study participant. Ethical approval for the study was obtained from the Ethics Review Committee of the University of the West Indies, St Augustine campus.

3.4.1 Sample size determination

We used Raosoft sample size calculator tool to do the sample size calculations. This was used to calculate the sample size based on the total Trinidadian population.

3.5 Tests and instrument/equipment

For our tests and instruments, a questionnaire was distributed electronically among members of the TTUTA group. The questionnaire comprised of both socio-demographic questions and questions related to the objectives in this study.

3.6 Data collection procedure

This descriptive cross-sectional study was conducted from January to April 2021 among academia in educational institutions located in the East-West Corridor of Trinidad. This study utilized a non-probability purposive sampling method to select the number academia recruited. According to Raosoft sample calculation, the sample size for this project was 378. All academia who used the computer to complete their job task for at least 2 hours per day and worked in the current position for at least three months were included in the study except those who had ocular diseases, such as acute, chronic, infective conjunctivitis, any specific eyelid disorder, uncorrected refractive error and other binocular vision problems. The head of the TTUTA was contacted and permission was granted to distribute the questionnaire among members on the group page via a shared link on the telephone. Informed written consent was obtained from each study participant before completing the questionnaire. The research was conducted strictly following Helsinki's Declaration, they have the right to decline partaking in the research at any point in time without penalty.

3.7 Data analysis

The data collected was carefully checked, coded and analysed using the Statistical Package for Social Sciences (SPSS) software version 24.0 for windows. Descriptive statistics were used to generate descriptive statistics for continuous variables and frequencies for nominal variables. Contingency chi-square test was used to assess the association. A $P<0.05$ denotes significance at a 95% confidence interval (CI)

CHAPTER 4

4.0 Results

Table 1. Showing the demographic data of participants in the research

Gender	*Frequency*	*Valid Percent*	*Cumulative Percent*
Male	66	11.1	11.1
Female	526	88.9	100
Total	**592**	**100**	
Age			
18-23	6	1.0	1.0
23-28	025	4.2	5.2
28-33	69	11.7	16.9
33-38	113	19.1	36.0
38-43	124	20.9	56.9
43-48	139	23.5	80.4
48-53	69	11.7	92.1
53-58	31	5.2	97.3
58-63	16	2.7	100.0
Total	592	100.0	
Marital status			
Single	238	40.2	40.2
Married	354	59.8	100.0
Total	592	100.0	
Ethnicity			
African	159	26.9	26.9
East Indian	325	54.9	81.8
Mixed	105	17.7	99.5
Asian	3	.5	100.0
Total	592	100.0	
African	159	26.9	
Educational Level			
CSEC	14	2.4	2.4
CAPE	24	4.1	6.5
Bachelors	431	73.4	79.9
Masters	113	19.3	99.1
PhD	5	.9	100
Total	587	100.0	

Table 2. Showing Prevalence of Ocular complaints.

Seating position	*Frequency*	*Valid Percent*	*Cumulative Percent*
appropriate	325	54.9	54.9
not appropriate	267	45.1	100.0
Total	592	100.0	
Monitor position			
below eye level	250	42.2	42.2
above eye level	64	10.8	53.0
eye level	278	47.0	100.0
Total	592	100.0	
Office lighting			
natural light	208	35.4	35.4
fluorescent light	380	64.6	100.0
Total	588	100.0	
Computer brightness adjustment			
i adjust	252	42.7	42.7
i do not adjust	338	57.3	100.0
Total	590	100.0	

Table 3 Showing pattern of computer use

Years of computer use	*Frequency*	*Valid Percent*	*Cumulative Percent*
>5 years	460	77.8	77.8
<5 years	131	22.2	22.2
Total	591	100.0	100.0
Daily duration of computer use			
>6 hours	369	62.8	62.8
<6 hours	219	37.2	100.0
Total	588	100.0	
Blink Regularity			
yes	291	49.6	49.6
no	296	50.4	100.0
Total	587	100.0	
Break Duration/minutes			
>20	246	42.2	42.2
<20	270	46.3	88.5
not at all	67	11.5	100
Total	583	100.0	
Experience Glare			
yes	289	49.3	49.3
no	297	50.7	100.0
Total	586	100.0	
Anti-glare on Computers			
yes	212	35.8	35.8
no	380	64.2	100.0
Total	592	100.0	
Spectacle wear			
Yes	441	74.5	74.5
No	151	25.5	100.0
Total	592	100.0	
Spectacle coating			
Anti-reflective coating	285	78.1	78.1
Blue light blockers	80	21.9	100.0
Total	365	100.0	

Figure.1 Showing Prevalence of systematic disease in population sample

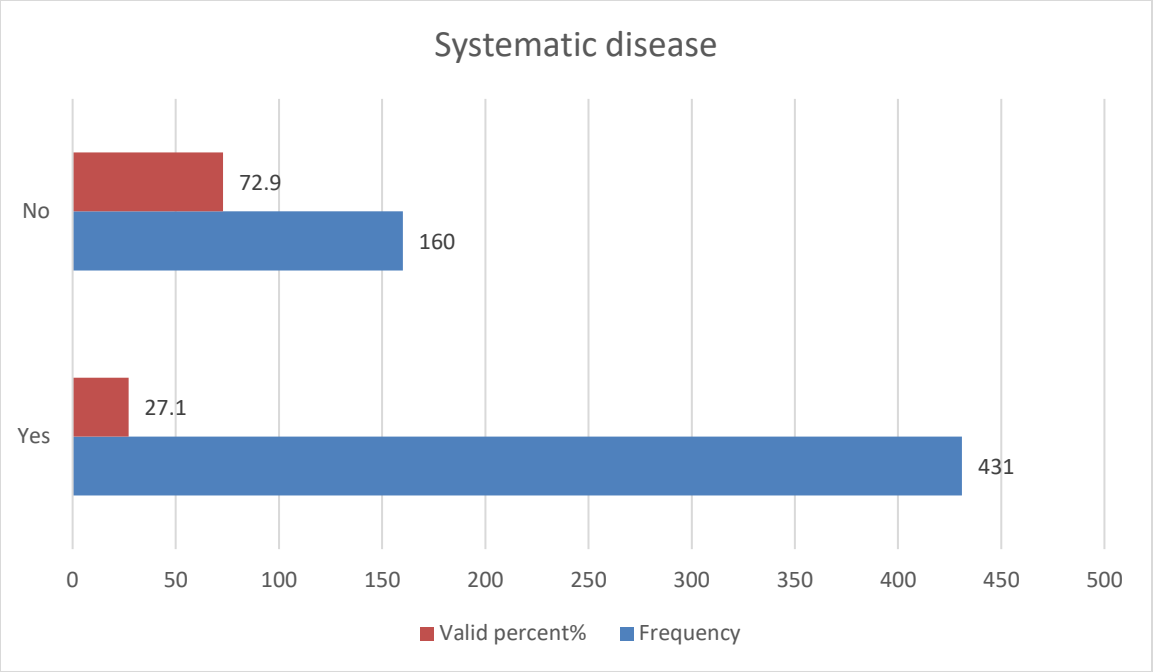

Table 4. Showing Prevalence of Ocular complaints.

Eye strain	*Frequency*	*Valid Percent*	*Cumulative Percent*
Yes	530	89.5	89.5
No	62	10.5	100.0
Total	592	100.0	
Blurred Vision			
Yes	438	74.0	74.0
No	154	26.0	100.0
Total	592	100.0	
Ocular Redness			
Yes	288	48.6	48.6
No	304	51.4	100.0
Total	592	100.0	
Headaches			
Yes	288	48.6	48.6
No	304	51.4	100.0
Total	592	100.0	
Dry Eyes			
Yes	344	58.1	58.1
No	248	41.9	100.0
Total	592	100.0	
Eye Fatigue			
yes	558	94.3	94.3
No	34	5.7	100.0
Total	592	100.0	
Burning Sensation			
yes	421	71.1	71.1
No	171	28.9	100.0
Total	592	100.0	
Ocular Irritation			
Yes	456	77.0	77.0
No	136	23.0	100.0
Total	592	100	
Watery Eyes			
Yes	323	54.6	54.6
No	269	45.4	100.0
Total	592	100.0	
Double Vision			
Yes	216	36.5	36.5
No	376	63.5	100.0
Total	592	100.0	

Figure 2 Bar chart showing ratings for ocular complaints

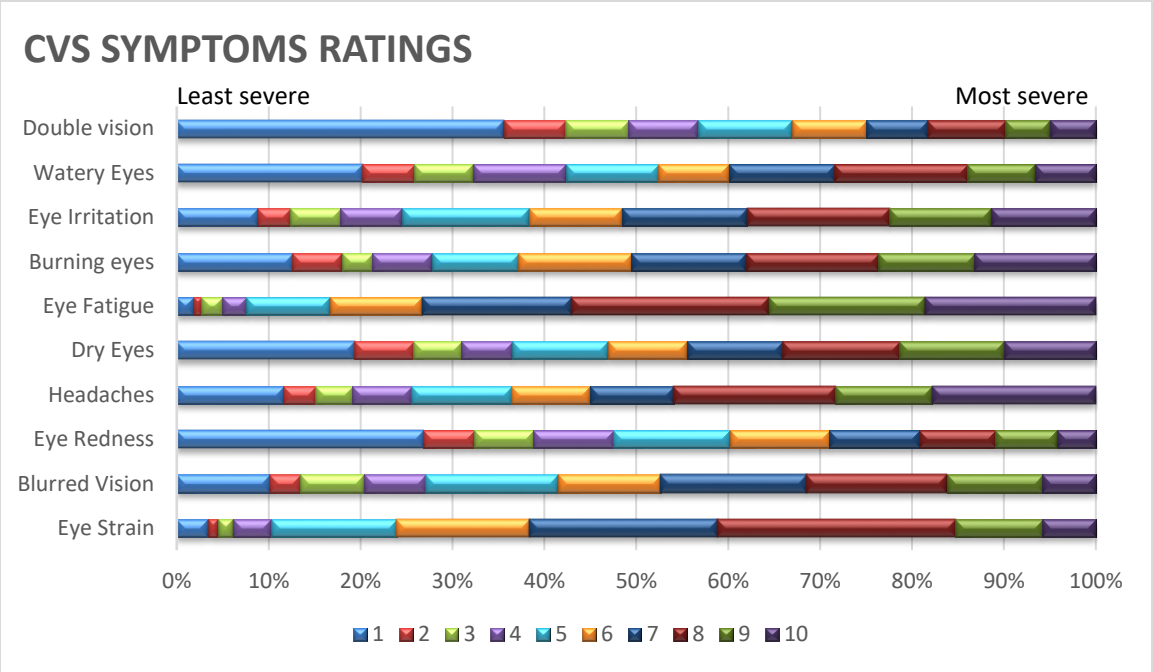

Table 5 showing the ratings for quality of life

Quality Of life	*Frequency*		*Valid Percent*	*Cumulative Percent*
1/not good	17	2.9	2.9	2.9
2.00	12	2.0	2.0	4.9
3.00	33	5.6	5.6	10.5
4.00	47	7.9	8.0	18.5
5.00	150	25.3	25.5	44.0
6.00	89	15.0	15.1	59.2
7.00	104	17.6	17.7	76.9
8.00	80	13.5	13.6	90.5
9.00	36	6.1	6.1	96.6
10/very good	20	3.4	3.4	100.0
Total	588	99.3	100.0	

Fig 3 Bar chart showing the current knowledge of participants

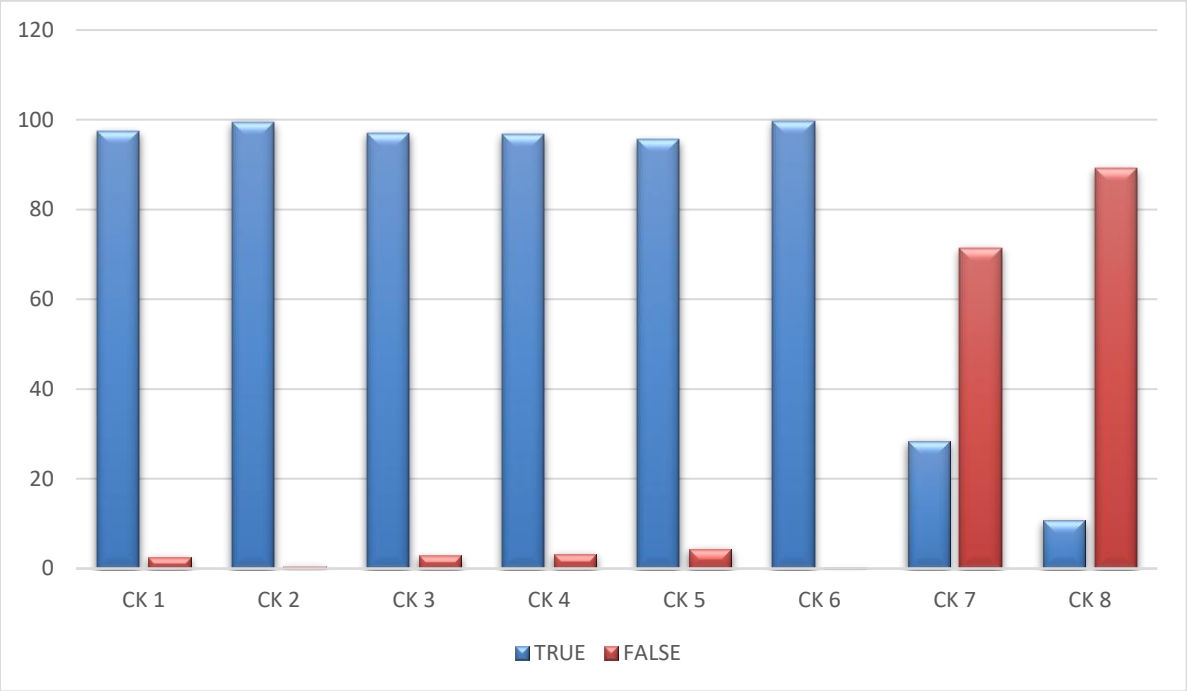

Table 6 showing statistical summary of demographics

		gender	age	marital status	ethnicity	education level
N	Valid	592	592	592	592	587
	Missing	0	0	0	0	5
Mean		1.8885	5.1419	1.5980	2.6503	3.1210
Std. Error of Mean		.01295	.06863	.02017	.04411	.02438
Median		2.0000	5.0000	2.0000	3.0000	3.0000
Mode		2.00	6.00	2.00	3.00	3.00
Std. Deviation		.31500	1.66992	.49072	1.07315	.59062

In this study, a total of 592 teachers participated. Table 1 shows the sociodemographic data collected. 88.9% of the participants were female (n=526). The modal age of the participants was 43-48 representing 23.5%. 59.8% (n= 354) of participants were married while 40.2% (n= 238) were single. The modal ethnic background was those of East Indian decent which accounted for 54.9% (n=325) of the participants. Individuals of African descent accounted for 26.9% (n= 159) of responses, mixed accounted for 17.7% (n=105) and Asians accounted for 0.5% (n=3). 72.8% of respondents (n=431) indicated a bachelor's degree was their highest educational achievement, 19.5% had masters degrees (n=113), 4.1% had CAPE qualifications (n=24), 2.4% had CSEC qualifications (n=14), while only 5 participants had PHDs at 0.8%.

Table 2 described the pattern of computer use for participants. 54.9% (n=325) of participants reported their seating position as being appropriate while 45.1% (n= 267) reported inappropriate seating positions. 47% (n= 278) indicated their computer's position was at eye level, 42.2% (n=

250) indicated below eye level and 10.8% (n= 64) said above eye level. 64.2% (n= 380) reported fluorescent light as their primary source of light while 35.1% (n=208) reported natural light as their primary source. 57.1% (n=338) reported they did not adjust the brightness of the computer screen during use while 42.8% (n=252) indicated that they did.

Table 3 represents the risk factors of CVS. 77.7% (n=460) indicated using the computer for more than 5 years while 22.1% (n=131) indicated less than 5 years. 62.3 % (n=369) stated the time spent on the computer was greater than 6 hours while 37% (n=219) indicated less than or equal to 6 hours were spent on the computer. 49.2% (n=291) indicated they blinked frequently while 50% (n=296) did not. 41.7% (n=247) reported taking breaks less than 20 minutes long while 45.6% (n= 270) spent more than 20 minutes on their break. 48.8% (n=289) reported they did indeed experience glare while 50.2% (n=297) did not. The majority which was 64.2% (n=380) indicated there weren't any antiglare coatings on their screens while 35.8% (n=212) indicated they did have antiglare coatings on their display screens. 74.5% (n=441) wore spectacles while 25.5% (n=151) did not. The majority which was 48.1% (n=285) had anti-reflective coatings on their spectacles, while 13.5% (n=80) had blue light blockers. The remaining 61% had no coatings on their spectacles.

Figure 1 represents the amount of persons who had systemic diseases as opposed to those who did not. 72.8% (n=431) reported having a systemic disease while 27% (n=160) did not have any.

Table 4 represents the ocular complaints of the participants and figure 2 represents the ratings for these ocular complaints. These responses were of great importance in fulfilling the aim of this research. 89.5% (n= 530) indicated they experienced eye strain with the modal severity being 8 at 24.8% (n=147). 74% (n= 438) indicated they experienced blurred vision, with the modal severity being 7 followed closely by 8, at 14.4% (n=85) and 13.9% (n=82) respectively. 48.6% (n=288)

reported having ocular redness with the modal severity being 1 representing 21.8% (n=129) of participants. A great percentage of 78% (n=462) of participants experienced headaches with a modal severity of 10 which indicated a great severity among 16.6% (n=98). When asked if they experienced dry eyes, 58.1% (n=344) of the respondents had dry eyes while 41.9% (n=248) did not. The modal severity of those who did experience dry eyes was 1. 94.3% (n= 558) experienced eye fatigue with a modal severity of 8 among 20.8%. 71.1% (n=421) experienced a burning sensation in their eyes with the modal severity being 8 among 12.7% (n=53). 77% (n=456) experienced ocular irritation with the modal severity being 9 among 14% (n=83). 54.6% (n=323) of the respondents indicated they experienced watery eyes with a modal severity of 1 or not severe among 16.6% (n=98). The minority of the respondents, 36.5% (n=217) experienced double vision at only with the modal severity being 1 among 27% (n=160).

Table 4 represents the quality of life of the participants affected by the increased computer use caused by the COVID-19. The modal severity was 5 among 25.5% (n=150).

Figure 3 shows responses for the questions meant to assess the participants' common knowledge. CK 1 refers to the question regarding the participants' awareness to the eye problems caused by prolonged use of computers. 97. 5% were aware of the associated symptoms. CK 2 refers to the question regarding the participants' awareness to the effects on the visual system caused by light from the computer. 99. 5% were aware of the effects. CK 3 refers to responses from the question about the benefits of adjusting the brightness of the computer screen. 97.1% of participants were aware of the benefits. CK 4 refers to their knowledge on materials to decrease glare on computers. 96.8% were aware of some materials. CK 5 refers to the question asked about their knowledge on spectacles to protect eyes from light emitted from computers. 95.6% were aware about such spectacles. CK 6 refers to the question on the necessity of taking breaks during computer use. 99.

8% were aware of this necessity. CK 7 refers to the question on their knowledge on the correction for computer related vision problems. 71.5% were aware that these problems cannot be resolved medically. CK 8 refers to the question on whether or not participant's' were aware that computers were made in such a way to cause minimal harm to its users. 10.7% were aware of this fact leaving the majority with the assumption that computers were made to be harmful to the eye.

Spectacle wear x ocular complaint

	P value (Asymptomatic significance)	Pearson correlation
Spectacle wear x eyestrain	0.327	0.040
Spectacle wear x Blurred vision	0.001	0.139
Spectacle wear x Redness	0.919	-0.004
Spectacle wear x Headaches	0.624	-0.020
Spectacle wear x Dry eyes	0.005	0.116
Spectacle wear x Eye fatigue	0.031	0.089
Spectacle wear x Burning Sensation	0.587	-0.022
Spectacle wear x Irritation	0.945	0.003
Spectacle wear x Watery eyes	0.211	-0.051
Spectacle wear x Double Vision	0.031	0.89

Spectacle wear x severity of ocular complaints

	P value (Asymptomatic significance)	Pearson correlation
Spectacle wear x eyestrain severity	0.44	-0.085
Spectacle wear x Blurred vision severity	0.003	-0.129
Spectacle wear x Redness severity	0.977	0.001

Spectacle wear x Headaches severity	0.030	0.093
Spectacle wear x Dry eyes severity	0.141	-0.066
Spectacle wear x Eye fatigue severity	0.320	-0.042
Spectacle wear x Burning Sensation severity	0.399	0.037
Spectacle wear x Irritation severity	0.816	-0.010
Spectacle wear x Watery eyes severity	0.147	0.066
Spectacle wear x Double Vision severity	0.30	-0.103

Seating position vs ocular complaint

	P value (Asymptomatic significance)	Pearson correlation
Seating position x eyestrain	0.425	-0.034
Seating position x Blurred vision	0.402	-0.069
Seating position x Redness	0.095	-0.079
Seating position x Headaches	0.055	-0.079
Seating position x Dry eyes	0.634	-0.20
Seating position x Eye fatigue	0.636	-0.19
Seating position x Burning Sensation	0.10	-0.106
Seating position x Irritation	0.001	-0.140
Seating position x Watery eyes	0.122	-0.64
Seating position x Double Vision	0.339	-0.39

Display Position x ocular complaints

	P value (Asymptomatic significance)	Pearson correlation
Display position x eyestrain	0.769	0.012
Display position x Blurred vision	0.063	0.076
Display position x Redness	0.105	0.067
Display position x Headaches	0.177	0.056
Display position x Dry eyes	0.580	0.023
Display position x Eye fatigue	0.079	0.072
Display position x Burning Sensation	0.085	0.071
Display position x Irritation	0.160	0.058
Display position x Watery eyes	0.182	0.055
Display position x Double Vision	0.703	0.016

Office lighting x Ocular complaints

	P value (Asymptomatic significance)	Pearson correlation
Office Lighting x eyestrain	0.905	-0.05
Office Lighting x Blurred vision	0.338	-0.040
Office Lighting x Redness	0.116	0.065
Office Lighting x Headaches	0.107	-0.067
Office Lighting x Dry eyes	0.954	-0.002
Office Lighting x Eye fatigue	0.143	-0.061
Office Lighting x Burning Sensation	0.979	0.001
Office Lighting x Irritation	0.167	0.057
Office Lighting x Watery eyes	0.406	0.034

Office Lighting x Double Vision	0.957	0.002

Brightness adjustment x ocular complaint

	P value (Asymptomatic significance)	Pearson correlation
Brightness adjustment x eyestrain	0.888	-0.006
Brightness adjustment x Blurred vision	0.475	0.029
Brightness adjustment x Redness	0.668	-0.018
Brightness adjustment x Headaches	0.08	0.109
Brightness adjustment x Dry eyes	0.876	-0.006
Brightness adjustment x Eye fatigue	0.852	0.008
Brightness adjustment x Burning Sensation	0.460	0.030
Brightness adjustment x Irritation	0.391	-0.035
Brightness adjustment x Watery eyes	0.131	0.062
Brightness adjustment x Double Vision	0.127	-0.063

Duration of Pc use vs ocular complaints

	P value (Asymptomatic significance)	Pearson correlation
Duration of daily pc use x eyestrain	0.721	0.0721
Duration of daily pc use x Blurred vision	0.330	0.040
Duration of daily pc use x Redness	0.024	0.093
Duration of daily pc use x Headaches	0.416	0.034
Duration of daily pc use x Dry eyes	0.000	0.160
Duration of daily pc use x Eye fatigue	0.316	0.041
Duration of daily pc use x Burning Sensation	0.088	0.070

Duration of daily pc use x Irritation	0.100	0.068
Duration of daily pc use x Watery eyes	0.662	0.018
Duration of daily pc use x Double Vision	0.870	-0.007

Duration of daily pc use vs ocular complaint severity

	P value (Asymptomatic significance)	Pearson correlation
Duration of daily pc use x eyestrain severity	0.065	-0.078
Duration of daily pc use x Blurred vision severity	0.183	-0.058
Duration of daily pc use x Redness severity	0.027	-0.101
Duration of daily pc use x Headaches severity	0.159	-0.060
Duration of daily pc use x Dry eyes severity	0.001	-0.151
Duration of daily pc use x Eye fatigue severity	0.208	-0.053
Duration of daily pc use x Burning Sensation severity	0.066	-0.081
Duration of daily pc use x Irritation severity	0.044	-0.088
Duration of daily pc use x Watery eyes severity	0.470	-0.033
Duration of daily pc use x Double Vision severity	0.768	0.014

Years of computer use vs ocular complaints

	P value (Asymptomatic significance)	Pearson correlation
Years of computer use x eyestrain	0.574	-0.023
Years of computer use x Blurred vision	0.384	0.036
Years of computer use x Redness	0.903	0.005
Years of computer use x Headaches	0.165	-0.057
Years of computer use x Dry eyes	0.685	0.017
Years of computer use x Eye fatigue	0.844	0.008
Years of computer use x Burning Sensation	0.132	-0.062
Years of computer use x Irritation	0.227	-0.050
Years of computer use x Watery eyes	0.130	-0.062
Years of computer use x Double Vision	0.033	-0.088

Blink regularity x ocular complaint

	P value (Asymptomatic significance)	Pearson correlation
Blink regularity x eyestrain	0.00	0.208
Blink regularity x Blurred vision	0.00	0.162
Blink regularity x Redness	0.00	0.179
Blink regularity x Headaches	0.004	0.119
Blink regularity x Dry eyes	0.00	0.155
Blink regularity x Eye fatigue	0.005	0.115
Blink regularity x Burning Sensation	0.00	0.186
Blink regularity x Irritation	0.01	0.141
Blink regularity x Watery eyes	0.00	0.201
Blink regularity x Double Vision	0.272	0.045

Blink regularity x ocular complaint severity

	P value (Asymptomatic significance)	Pearson correlation
Blink regularity x eyestrain severity	0.00	-0.188
Blink regularity x Blurred vision severity	0.00	-0.206
Blink regularity x Redness severity	0.00	-0.228
Blink regularity x Headaches severity	0.00	-0.196
Blink regularity x Dry eyes severity	0.00	-0.203
Blink regularity x Eye fatigue severity	.015	-0.102
Blink regularity x Burning Sensation severity	0.00	-0.222
Blink regularity x Irritation severity	0.00	-0.205
Blink regularity x Watery eyes severity	0.00	-0.239
Blink regularity x Double Vision severity	0.001	-0.151

CHAPTER 5

5.1 Discussion

Results for the demographic variables showed 11.1% of the participants were males and the other 88.9% were females, 56.9 % were below the age of 43 years and 43.1% were between the ages of 43 and 63, 59.8 % were married while the other 40.2% were single, 73.4 % reported their highest level of education was a bachelor's degree, 19.3% had a master's degree and 0.9% had their PhD. The majority of participants were of East Indian descent which amounted to 54.9 %, followed by 26.9 % being of African descent, 17.7% were mixed and 0. 5% were Asian. A person's demographic data can affect their risk of developing CVS. All ocular complaints gave a significant p value with age except eye fatigue watery eyes and double vision , this gave indication that there was a statistically significant relationship between ocular complaint and severity .In a study carried out in Sri Lanka between May and December 2009 it was found that there was a greater prevalence of females than males experiencing CVS symptoms , this also proved to be true as with statistical analysis, compared the percent ratio of women to men experiencing CVS related ocular complaints were as followed ; double vision 36.3%: 37.9% , watery eyes 53.2%: 65.2% , ocular irritation 79.5%:57.6%, eye fatigue 94.5%:92.45 , burning sensation 73.2%:54.5% ,dry eyes 60.8%: 36.4% ,headaches 79.8%:63.6% ,ocular redness 48.9%:47% ,blurred vision 75.1%:65.2% and eye strain 90.7%:80.3%. This gave evidence that a great percentage of female than males experience CVS related symptoms (31) In a study done to determine the associated factors for developing computer vision syndrome, it was concluded that persons who had a higher educational level resulting in a higher occupational position were less at risk for developing CVS as they may have more awareness of the condition and a greater opportunity to use good computers with proper coatings. Present research gave no statistical

evidence between the educational level and ocular complaints, all p values were found to be below the significance level of 0.05. With regard to age only 2 ocular complaints showed significant p values, these were headaches and dry eyes, with p values of 0.00 and 0.009 respectively. Pearson's correlation value for these 2 significant complaints were, 0.217 for headaches and 0.107 for dry eyes. Given the positive correlation value, it can be interpreted that with increasing age prevalence of dry eyes and headaches also increase. This follows theoretical expectations as an individual gets older the eyes ability to self-lubricate decreases increasing the chance of experiencing dry eyes.

The pattern of computer use such as improper ergonomics affects the risk of developing CVS. Results from this study for the subjects' ergonomic design showed 45.1% had inappropriate seating postures, 10.8% had the computer screen above eye level, 35.4% relied on natural light as their source and 57.3% don't adjust their computer screens. Statistical analysis of the data collected showed significance between seating position and ocular irritation as well as seating position and burning eyes only with p values of p=0.001 and 0.01 respectively which was found to be below the 0.05 level of significance. Both of these variables had negative correlation values of -0.140 and -0.0106 which gave evidence to a decrease in ocular irritation and burning sensation with appropriate seating position. Position of computer display showed no statistical significance with all variables of ocular complain over the significance level of 0.05. Based on results from this study, the position of the monitor (above, below or at eye level) does not have a significant effect on CVS related ocular complaints. Both displays and seating position would appeal more to ergonomic related CVS symptoms such as shoulder, back and neck pain. There was no statistical significance in the data collected which gave an indication to the relationship between the prevalence of CVS ocular complaints, office lighting and adjusting computer

brightness. The severity of ocular complaints also gave no significance, p values were found to be higher than the 0.05 significance level. The majority of participants had an otherwise proper ergonomic set up except for the poor seating arrangements. A study done among computer users concluded neck and back pain as the most common symptom of CVS which also adds to the conclusion of poor ergonomics having minimal effect on the visual system [78]. A study done among university staff in Ghana concluded poor ergonomics such as improper seating position as major risk factor for developing CVS. These results coincided with the results of this research as improper seating position was common among the participants [79]. However, another study done among university staff concluded high monitor levels as showing great significance in ocular complaints caused by CVS which had no significance in our study [80].

Other factors such as period of computer use, number of breaks taken during computer use, glare, lack of filters of device screen and reduced blinking rate all lead to symptoms of CVS. Prolonged use of computers is the main risk factor which stimulates the onset of CVS symptoms. In a study previously done, it was observed that persons who used computers for 2-15 years and more than 10 hours per day experienced burning eyes, dry eyes, sore eyes and neck and shoulder pain which coincided with results from this study which showed 77.8% of persons used computers for more than 5 years and 62.8% used it for more than 6 hours daily. On analysis it was found that there was statistically significant evidence to prove that duration of daily compute use affected ocular redness and dry eyes , p values were found to be p= 0.024 and p= 0.00 respectively . Pearson's correlation also showed that there was a significant positive correlation value of 0.93 for ocular redness this showed that as computer use increased so did ocular redness , dry eyes also proved to have a significant positive correlation of 0.160 which meant as daily pc use increased so did dry eyes. The results obtained from severity took an un expected

turn as there was statistically significant negative correlations found with severity of ocular complaints and duration of daily computer use. Ocular redness, dry eyes, and ocular irritation was found to have decreased severity with increased duration of computer use with significant values of -0.101 , -0.158 and -0.88 respectively .This strayed from theoretically expected results and may have been a results of misinterpretation of the questionnaire . When statistically analysed the only ocular complaint that was found to be statically significant, with regard to years of computer use was double vision with a p value of 0.033 which was well below the significance level of 0.05. Mersin University confirmed the direct relationship between prolonged use of computers and dry eyes stating 72% experienced the symptom due to long term use of computers. Though a smaller percentage of 58.1% was attained, it still showed similarities to the previous researches as more than half of the participants in both researches experienced dry eyes due to extended use of computers

Abdelaziz's findings and our findings were analogous as they both proved that long term use of computers contributes to CVS symptoms.

With regard to blink rate a there was significance seen in all ocular complaints, it was seen that there was an increase in ocular complaints with blink rate abnormality. This was also noted with regard to severity there was clear evidence that's as blink ate normality decreased severity of ocular complaints increased across the board. All ocular complaint gave significant negative Pearson correlation values, which indicated an inverse relationship between blink regularity and ocular complaints.

With regard to blink rate a there was significance seen in all ocular complaints excepts double vision , which had a p value of -0.272 , it was seen that there was an increase in ocular complaints with blink rate abnormality. This was also noted with regard to severity there was

clear evidence that's as blink rate normality decreased severity of ocular complaints increased across the board. All ocular complaint gave significant negative Pearson correlation values, which indicated an inverse relationship between blink regularity and ocular complaints.

A low blinking rate during computer use contributes to dry eyes which is a symptom of CVS. Results showed 50.4% of teachers reported blinking infrequently and 58.1% had dry eyes. A study done by Torsten Schlote et AL proved the blinking rate of computer users to be drastically reduced from 16.8 blinks to 6.6 blinks while another study done by Qurban A Memon et AL proved the blinking rate to also be reduced during computer use. Similar results of a reduced blinking rate were achieved among teachers in Trinidad

Another study done among lecturers in

The results of the survey showed that there was a high prevalence of CVS symptoms among teachers in Trinidad. In particular, 89. 5 % had eyestrain, 74% had blurry vision, 48. 6% had redness of eyes, 78% had headaches, 58.1% had dry eyes, 94.3% had eye fatigue, 71.1% had burning of eyes, 77% had irritated eyes, 54. 6% had watery eyes and 36. 5 % had double vision. Based on these results, the most common CVS symptoms among this population were eye fatigue, eyestrain, headaches, irritated eyes, blurry vision and burning of eyes. Results from previous studies as stated in the literature coincided with the results obtained from the research performed which signified accuracy in research. Drawing particular reference to an article published in December 2020, results showed 95.8% of computer users experienced eye strain after the onset of COVID-19. When these previous results were compared to the current results which showed 89 5% of the participants had eyestrain, they both show great similarity as these

percentages were relatively close. In another survey done in 2020, it was reported 38% of persons experienced worsening in their vision due to COVID-19 while in this research 74% had blurry vision, 36. 5 % had double vision and 74. 5 % wore spectacles. This signified a greater amount of teachers in Trinidad with worsening in their vision. This difference can be justified by comparison of the time period in which the two surveys were done as the previous study was done mid-2020 and the present one was done early 2021. This gap allowed progression in visual disturbances as the time spent on computers may have increased.

When the amount of persons who wore spectacles i.e. 74. 5 % was compared to the amount of persons who experienced CVS symptoms, it was evident that those who wore spectacles experienced symptoms despite the assumption of spectacles preventing them ,ocular complaints such as eye strain , eye redness, headaches , burning sensation, irritation , watery eyes showed no statistical significance with p values of , p= 0.327 , p= 0.919 , p= 0.623 , p= 0.586 , p=0.944 and p=0.210 respectively, while blurred vision , double vision and eye fatigue showed statistical significance to spectacle wear with p=0.001 ,p=0.30 and p= 0.31 respectively. This showed evidence that spectacles may not directly affect computer vision related ocular complaints associated with prolonged use, but more those that are associated with refractive correction. What was also found to be significant was the correlation between severity of CVS symptoms and spectacle wear. Pearson's correlation showed a statistically negative correlation between eye strain, blurred vision, and double vision, with values of -0.085, -0.129 and -1.03, and spectacle wear, this showed evidence that with spectacle wear there was a decrease in these specific ocular complaints. In an article published in 2015 on the prevalence of eyestrain in a banking population in Gondar, it was concluded, those with irregular seating postures and wore spectacles were 2 times more likely to suffer from CVS

The quality of life of teachers can be negatively affected if they experience any one of the symptoms of CVS. Participants were asked to rate their quality of life affected by computer use with 1 being the least comfortable and 10 being the most comfortable. Twenty- six percent of teachers reported their quality of life as being a "5" which represents a quality of life that is passable but could be better, 19% rated their quality of life less than 5 while 55% had a quality of life rating above 5. This signified approximately half had an adequate quality of life (ratings above 5) which seemed to be unaffected by the increase in computer use due to COVID-19 while the other half reported their quality of life as mediocre. When analysed statistically there was a negative Pearson correlation for all ocular complaint but all but eye strain was found to statistically insignificant as they surpassed the significant p value level of 0.5. The ocular complaint of eye strain was found to be significant with a p value of 0.4 and a correlation value of -0.89. This proved that quality of life deceased as severity of eye strain increased.

These results were expected as previous studies proved the quality of life to be affected by prolonged computer use.

Knowledge about CVS which leads to the implementation of the necessary preventative measures will reduce the risk of developing symptoms. The knowledge of the participants regarding CVS was assessed and the majority was aware of simple preventative measures as seen in figure it, the lowest percentage of respondents that answered correctly was 71.5% this indicated that most individuals were knowledgeable about the issue at hand, but did not necessarily know the preventative measures that should be employed to avoid or reduce CVS. This being said, it can be concluded that in order to prevent this issue more focus should be placed on proper ergonomic practices.

Despite the research limitations that the current pandemic imposed, it also provided an ideal situation to simulate the effect of long term CVS on productivity and quality of life, the teaching population would have been more exposed to computer use than they would have been previously, due to the strict online status of most institutes. As seen in the results obtained there is a high prevalence of CVS related symptoms in the sample population with 94.3% experiencing eye fatigue , 89.5% experiencing eye strain, 78% experiencing headaches , 77% with ocular irritation , 74% with blurred vision and 71.1% experiencing burning sensation of the eyes . The previously stated CVS symptoms are also seen to be the most common, all being experienced by over 70% of the population. According to the data collected it was shown that there was no significance between spectacle wear and CVS prevalence, suggesting that spectacles may not necessarily prevent CVS related symptom. What was seen though as an inverse effect between severity of ocular symptoms and spectacle wear. It was found that factors such as duration of daily computer use and blinking rate blinking rate has the highest effect on CVS symptoms

5.2 Conclusion

The impact of COVID-19 on teachers resulting in symptoms of computer vison syndrome was significant in Trinidad. The majority reported symptoms such as eye fatigue, eye strain, headache, eye irritation, blurry vision and burning eyes. Despite these symptoms, approximately half of the participants reported their quality of life as being barely affected while the other half experienced significant changes in their quality of life. Many of the participants were aware of simple preventative measures to reduce the risk of developing CVS symptoms however they didn't quite understand the importance of employing them. Successful distribution of flyers containing information about CVS will benefit all teachers as they will now be conscious about the condition and the variety of precautions that can be taken to make their experience while using computers more comfortable during the COVID-19 pandemic.

5.3 Recommendation

The following points can be followed by computer users to reduce the risk of developing computer vision syndrome:

- Have regular eye exams
- Follow the 20-20-20 rule when using computers for extended periods of time.
- Use proper lighting in the work environment and adjust the brightness of the computer screen.
- Ensure proper work ergonomics is followed in work space.
- Blink regularly when using computer.
- Take frequent breaks to exercise the muscles.

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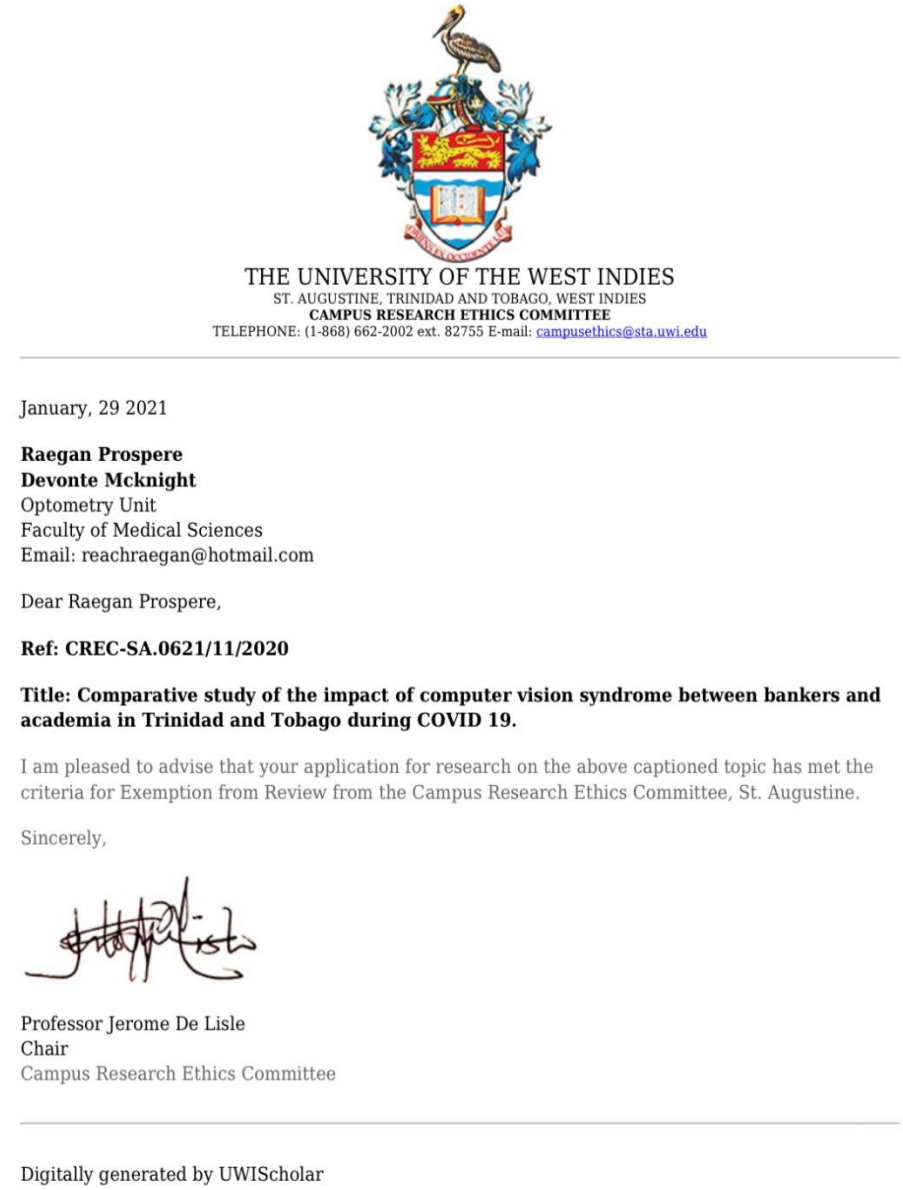
APPENDICES

Appendix A: Approval letter

Figure 1: An image of the approval letter from the campus research ethics committee



THE UNIVERSITY OF THE WEST INDIES
ST. AUGUSTINE, TRINIDAD AND TOBAGO, WEST INDIES
CAMPUS RESEARCH ETHICS COMMITTEE
TELEPHONE: (1-868) 662-2002 ext. 82755 E-mail: campusethics@sta.uwi.edu

January, 29 2021

Raegan Prospere
Devonte Mcknight
Optometry Unit
Faculty of Medical Sciences
Email: reachraegan@hotmail.com

Dear Raegan Prospere,

Ref: CREC-SA.0621/11/2020

Title: Comparative study of the impact of computer vision syndrome between bankers and academia in Trinidad and Tobago during COVID 19.

I am pleased to advise that your application for research on the above captioned topic has met the criteria for Exemption from Review from the Campus Research Ethics Committee, St. Augustine.

Sincerely,

Professor Jerome De Lisle
Chair
Campus Research Ethics Committee

Digitally generated by UWIScholar

Appendix B: Consent form

Figure 2: An image of the consent form given to all participants

Consent Form

You are invited to participate in a web-based online survey on the comparative study of the impact of computer vision syndrome between bankers and academia in Trinidad and Tobago during COVID 19. This is a research project being conducted by Raegan Prospere and Devonte Mc Knight, students at The University of the West Indies. It should take approximately 20 minutes to complete.

PARTICIPATION
Your participation in this survey is voluntary. You may refuse to take part in the research or exit the survey at any time without penalty. You are free to decline to answer any particular question you do not wish to answer for any reason.

BENEFITS
You will receive no direct benefits from participating in this research study. However, your responses may help us learn more about the effect of uninterrupted, long-term use of digital devices particularly a computer and how COVID 19 has a part to play in this.

RISKS
There are no foreseeable risks involved in participating in this study other than those encountered in day-to-day life.

CONFIDENTIALITY
Your survey answers will be sent to a link at SurveyHeart.com where data will be stored in a password protected electronic format. Survey Heart does not collect identifying information such as your name, email address, or IP address. Therefore, your responses will remain anonymous. No one will be able to identify you or your answers, and no one will know whether or not you participated in the study.

CONTACT
If you have questions at any time about the study or the procedures, you may contact me or my research supervisor, Dr. Kingsley via email at doctorkingsley1981@gmail.com.

If you feel you have not been treated according to the descriptions in this form, or that your rights as a participant in research have not been honored during the course of this project, or you have any questions, concerns, or complaints that you wish to address to someone other than the investigator, you may contact the Campus Research Ethics Committee, St. Augustine UWI via email at campusethics@sta.uwi.edu

ELECTRONIC CONSENT: Please select your choice below. You may print a copy of this consent form for your records. Clicking on the "Agree" button indicates that

- You have read the above information
- You voluntarily agree to participate

- You are 18 years of age or older

☐ Agree

☐ Disagree

Adapted from Source: www.agnesscott.edu

Appendix c: Questionnaire

Figure 3: shows the *questionnaire distributed to all* participants

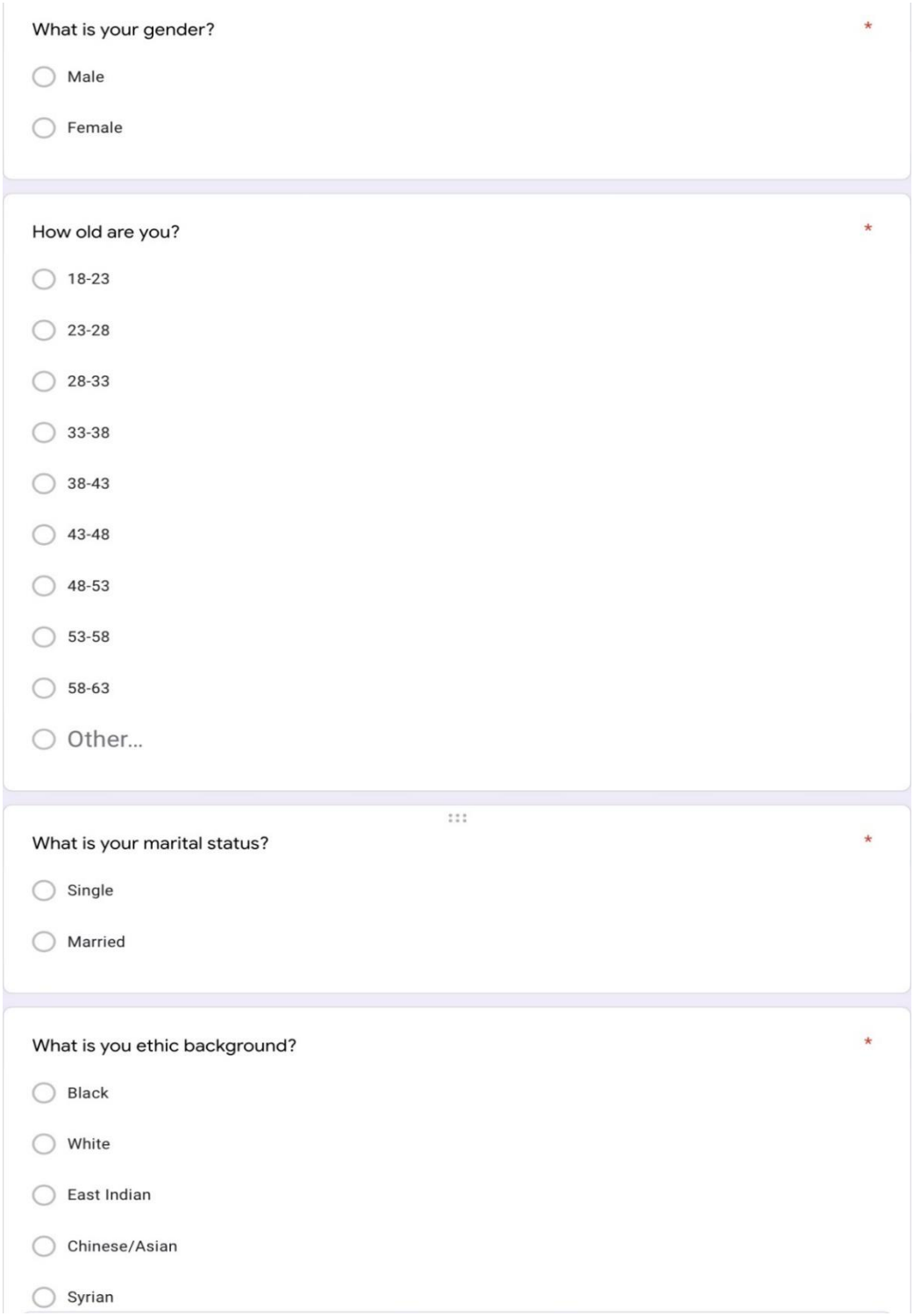


Figure 4: shows the questionnaire distributed to all participants

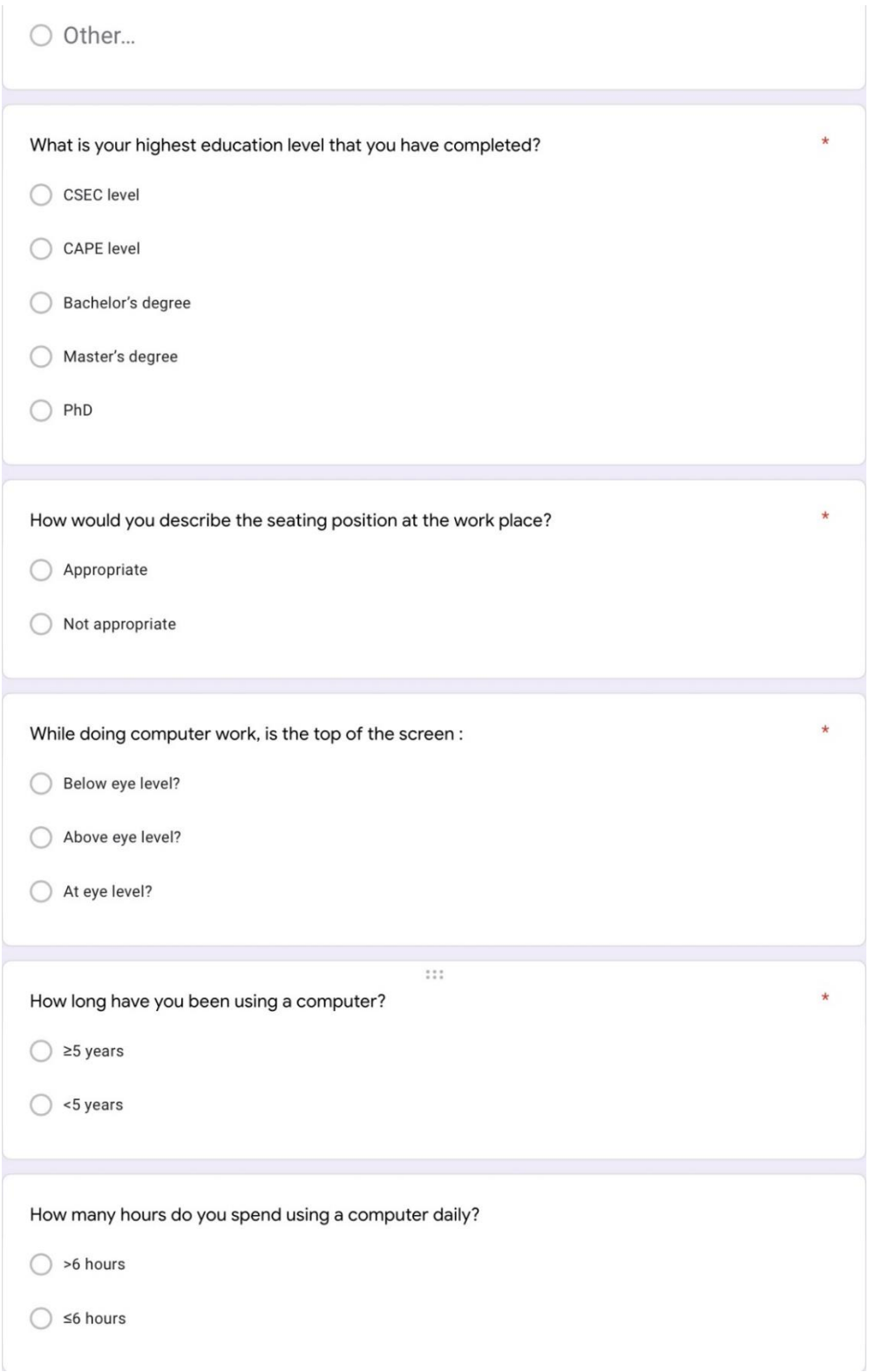


Figure 5: shows the questionnaire distributed to all participants

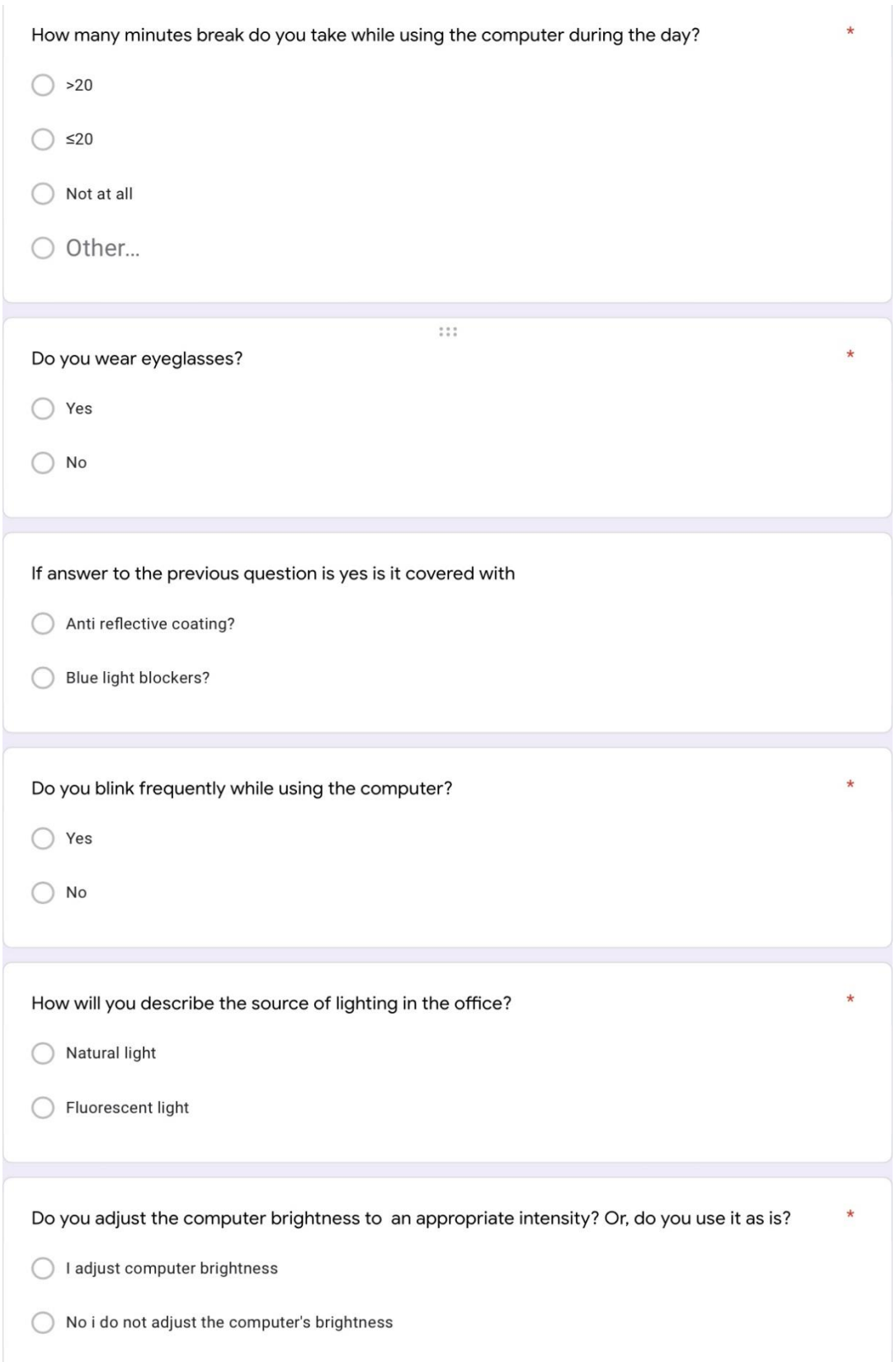
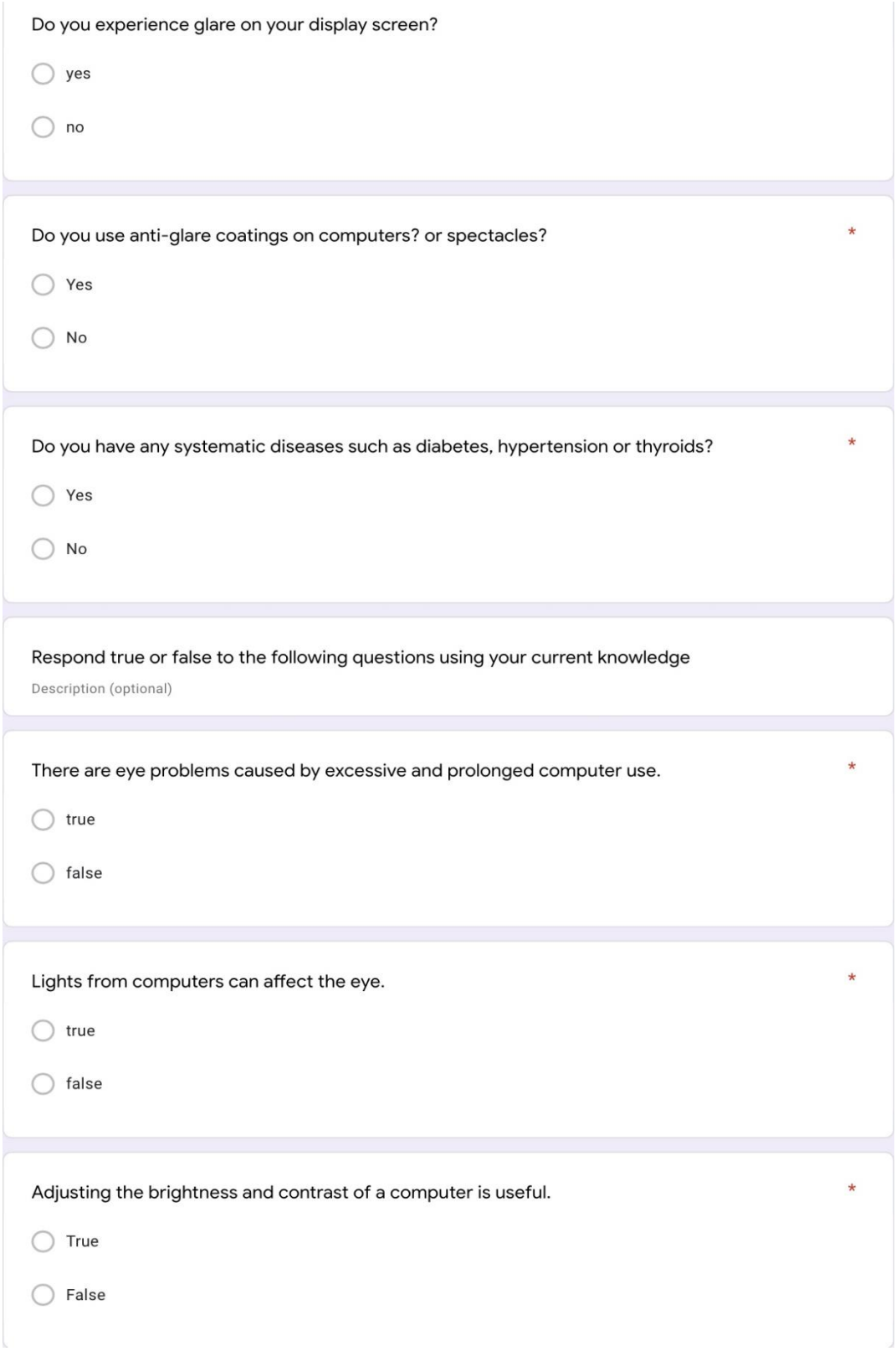


Figure 6: shows the questionnaire distributed to all participants



Do you experience glare on your display screen?

- yes
- no

Do you use anti-glare coatings on computers? or spectacles? *

- Yes
- No

Do you have any systematic diseases such as diabetes, hypertension or thyroids? *

- Yes
- No

Respond true or false to the following questions using your current knowledge

Description (optional)

There are eye problems caused by excessive and prolonged computer use. *

- true
- false

Lights from computers can affect the eye. *

- true
- false

Adjusting the brightness and contrast of a computer is useful. *

- True
- False

Figure 7: shows the questionnaire distributed to all participants

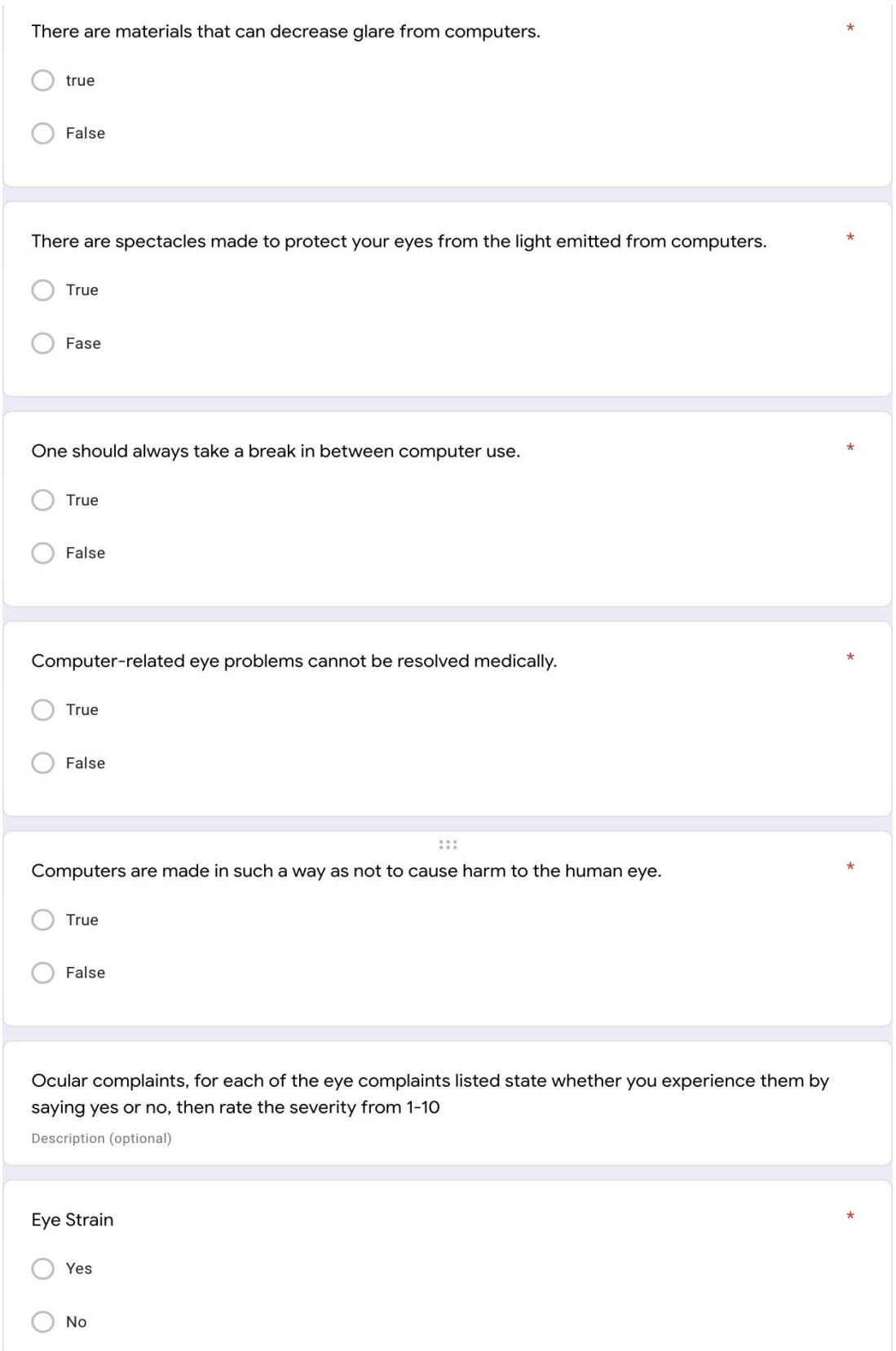


Figure 8: shows the questionnaire distributed to all participants

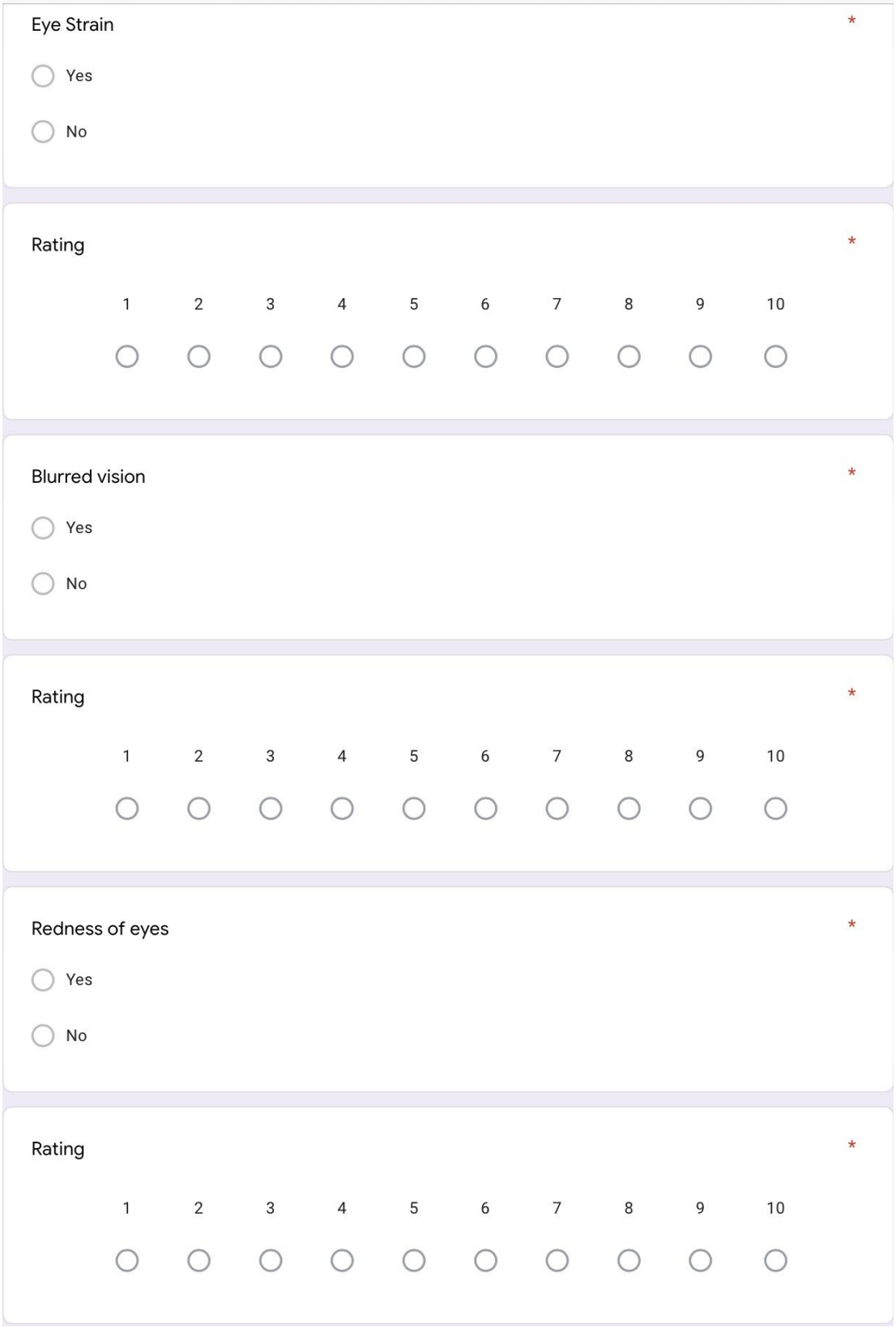


Figure 9: shows the questionnaire distributed to all participants

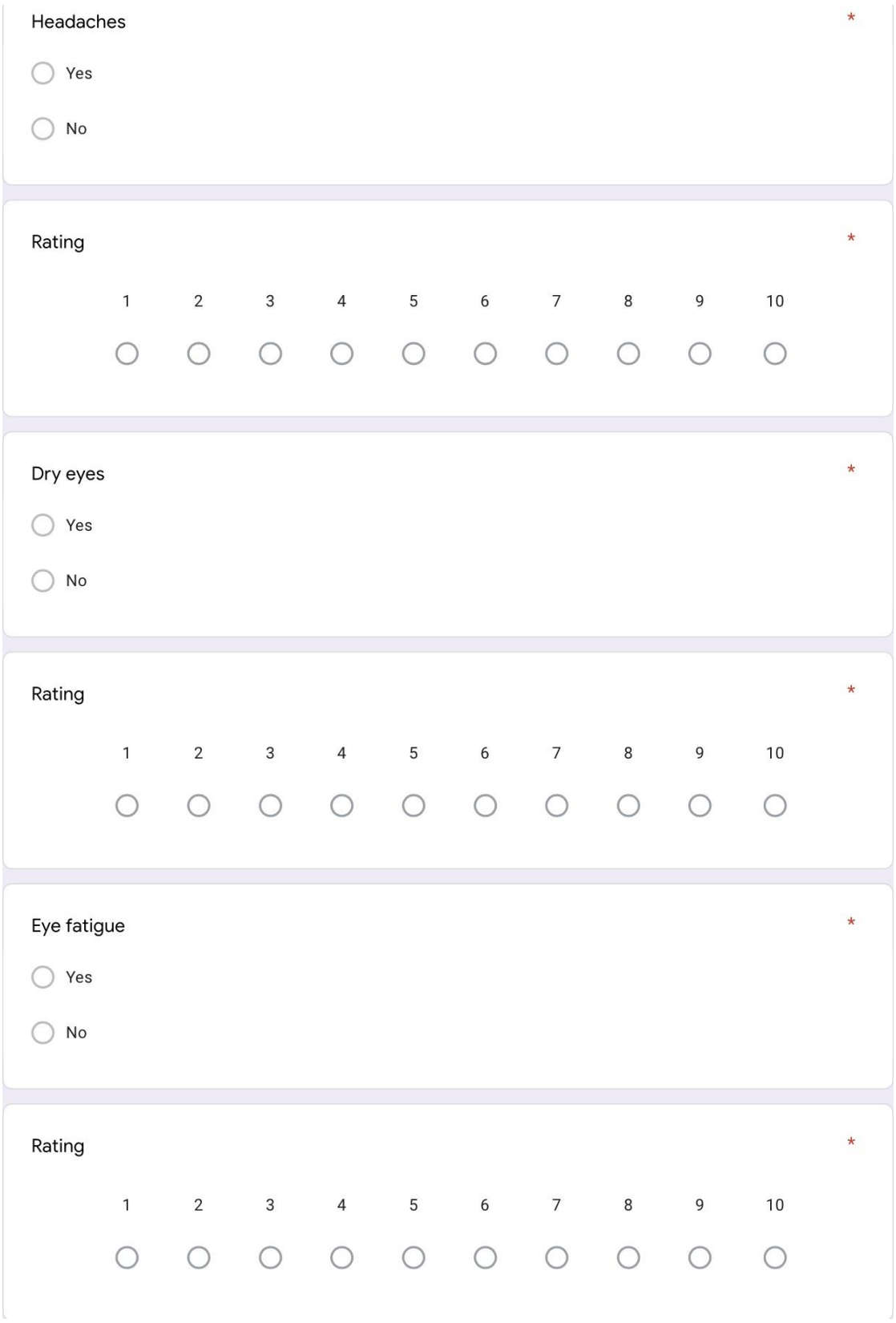


Figure 10: shows the questionnaire distributed to all participants

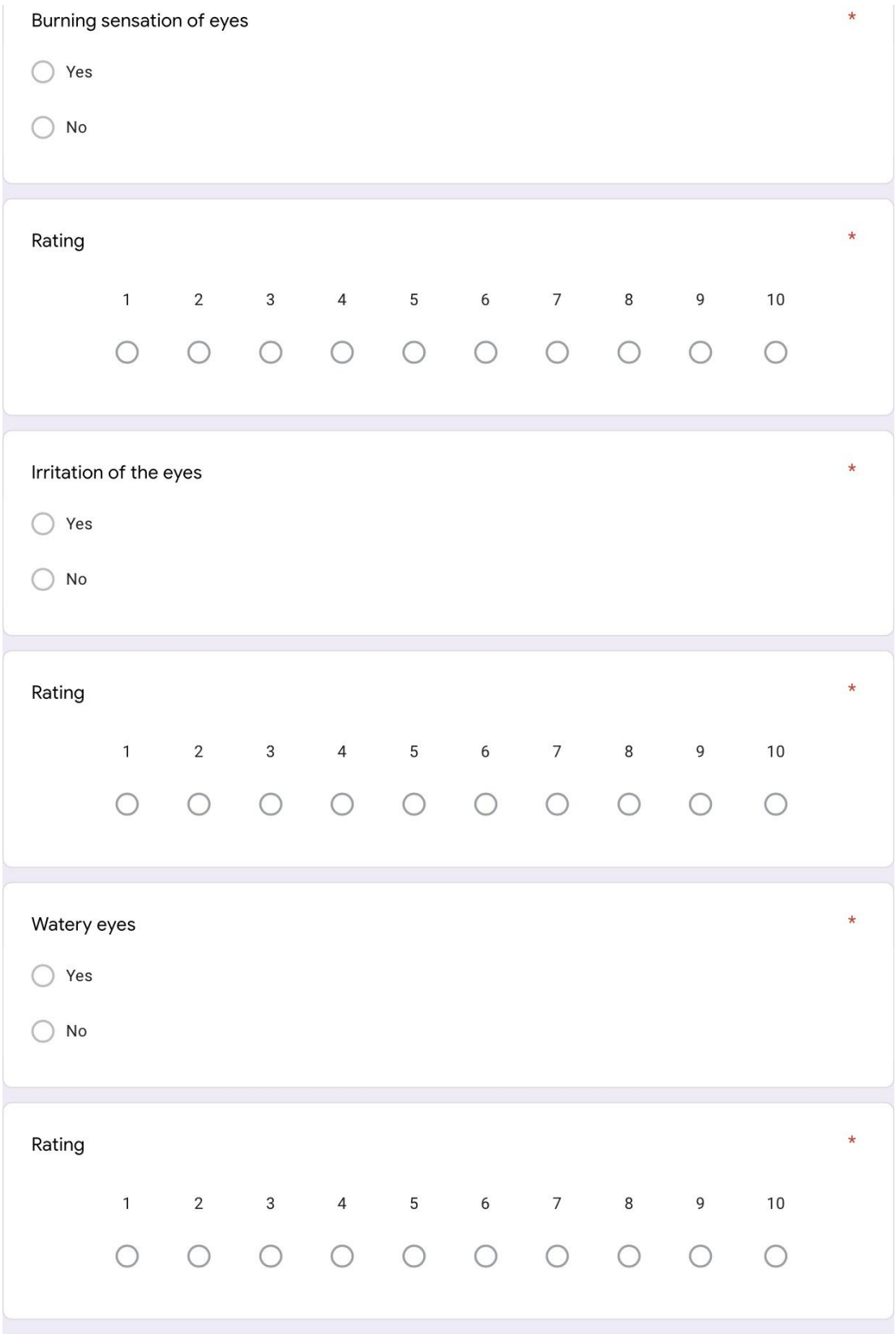


Figure 11: shows the questionnaire distributed to all participants

Rating *

1 2 3 4 5 6 7 8 9 10

Watery eyes *

- Yes
- No

Rating *

1 2 3 4 5 6 7 8 9 10

Double vision *

- Yes
- No

Rating *

1 2 3 4 5 6 7 8 9 10

How would you rate your quality of life using your computer to work? *

1 2 3 4 5 6 7 8 9 10

Appendix 4: Flyer

Figure 12: Showing the flyer distributed to all participants

COMPUTER VISION SYNDROME (CVS)

UWI

WHAT IS CVS?

Computer vision syndrome (CVS) or digital eye strain is a group of eye-related problems that occur as a result of prolonged use of computers, cell phones and tablets . It can affect anyone from children straight to adults and in recent years have become an increasingly common condition

SYMPTOMS OF CVS:

-Headaches
-Double vision
-Blurred vision
-Eye strain
-Light sensitivity
-Dry eyes
-Excessive watering and irritation

RISK FACTORS OF CVS

-Duration of computer usage
-Inadequate lighting
-Glare
-Uncorrected eye problems
-Improper setup of work station
-Improper Screen brightness

PREVENTING COMPUTER VISION SYNDROME:

-Position computer screen at or slightly below eye level.

-Maintain a computer to viewer distance of no less than 20 inches

-Practice frequent blinking to avoid dry eyes

- Rest your eyes! Practice the 20|20|20 rule ; every 20 minutes of computer use look at an object 20 feet away for 20 seconds

- Stretch!! After 2 hours of continuous work, get up, stretch your legs and change sitting position for 15 mins.

-Make sure the room is well lit

- Position the computer screen to avoid glare, or use anti glare filters on monitors