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SK Sakhil Akhtar
 Department of Optometry,
 Swami Vivekananda
 University, Telinipara, Barasat
 - Barrackpore Rd Bara
 Kanthalia, West Bengal, India

Srimanti Sarkar
 Department of Optometry,
 Swami Vivekananda
 University, Telinipara, Barasat
 - Barrackpore Rd Bara
 Kanthalia, West Bengal, India

Digital screen exposure and its influence on dry eye syndrome among young adults

SK Sakhil Akhtar and Srimanti Sarkar

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Abstract

Aim: To explore the impact of various digital screen usage patterns, including duration and content, on the occurrence and severity of dry eye syndrome among adults.

Methodology: It was an observational cross-sectional study that was held at ASG Eye Hospital, Agarpara. It was a convenience sampling. There were 36 patients in this study. Following these, the study period was 4 months, and patients' belonging the age group was 25-35 years. Patients were asked to fill out the consent form. The visual acuity of the selected patient was measured with Snellen's chart. Patients were asked to fill out the SPEED questionnaire along with their digital screen use timing. Afterwards, the Schirmers test I was performed for the participants. All the data was collected and added to Microsoft Excel with coding. Data analysis was done with the appropriate statistical analysis method.

Result: A connection between screen usage and dry eye syndrome has been demonstrated in earlier research. 36 patients in all, of whom 21 were female and 15 were male, participated in the study. Individuals who use digital gadgets for longer than eight hours must be between the ages of 25-35 years were included in this study. As opposed to this, 52.8% of women and 80% of men had Dry Eye Syndrome (DES). The association between SVT and SPEED was then examined using linear regression. This instance has a positive relationship because the p value is 0.1098, which is higher than 0.05 and it is called weak positive relationship Using the regression line to measure the association between SVT and DED, it was shown that the p value is 0.0243, which is less than 0.05.

Conclusion: My research aims to determine whether there is a correlation between screen time and dry eye. My research revealed that the likelihood of developing dry eye syndrome increases with screen time. Therefore, the null hypothesis is being rejected. As well as acknowledging the alternative theory's significance relationship. Everyone needs to be more mindful because screen time is linked to dry eyes. I believe that these behavioural factors blink rate, break, and screen brightness can be included in future research to obtain more information.

Keywords: Dry eye, digital device use, screen time, visual disorder, Schirmer's test, and speed questionnaire

Introduction

In today's digital age, screens are ubiquitous, playing a pivotal role in communication, education, work, and entertainment. Young adults, in particular, are immersed in digital environments, often spending hours each day in front of various screens. While the advantages of digital technology are vast, there is a growing concern about its potential negative impact on ocular health, specifically regarding Dry Eye Syndrome (DES). DES is a condition where the eyes fail to produce sufficient tears or produce poor-quality tears, leading to discomfort, visual disturbances, and potential damage to the ocular surface. The link between digital eye strain and dry eye: One common sign of digital eye strain is dry eye. According to "The link between digital eye strain and dry eye", dry eye was one of the symptoms mentioned by 27.2% of those with digital eye strain. Our blink rate reduces when using digital devices, which might cause dry eye [1]. A common illness known as dry eye disease arises when our tears are insufficient to lubricate our eyes adequately. For a variety of reasons tears may not be sufficient or steady. For instance, inadequate tear production or low-quality tear production might lead to dry eye. The instability of tears causes inflammation and surface damage to the eye. Symptoms include - dryness, irritation, redness, blurred vision, foreign body sensation, watering. Dry eye impairs functional vision,

Corresponding Author:
SK Sakhil Akhtar
 Department of Optometry,
 Swami Vivekananda
 University, Telinipara, Barasat
 - Barrackpore Rd Bara
 Kanthalia, West Bengal, India

especially while doing the near activities ^[2]. According to article "Dry eye in the digital age" by Ernie Bowling, OD, MS, FAAO, FNAP, it has been stated that the percentage of global population with internet access 16% in 2005, 30% in 2010, 51% in 2017, 58.8% in 2019 ^[3]. From these various studies it is seen that the prevalence is increasing as the new generation are more into the digital device. According to a 2016 study "Smartphone use is a risk factor for pediatric dry eye disease according to region and age"- children who use their smartphones more frequently suffer from dry eye syndrome ^[4]. So, to investigate the prevalence of the dry eye among adults in a tertiary eye care centre population. To differentiate between dry eye, infections, and allergies which can present clinically similarly but need different treatments diagnostic testing is essential. Dry eye may get worse if an inaccurate clinical diagnosis is established and antiallergic medications or epitheliotoxic antibiotics are provided. Patients can be categorised into the "aqueous-deficient" or "hyperevaporative" treatment-based categories depending on the results of the diagnostic tests. The Dry Eye Workshop released diagnostic guidelines in 2007 ^[5, 6]. Aim of this study is to explore the impact of various digital screen usage patterns, including duration and content, on the occurrence and severity of dry eye syndrome among adults.

Methodology

- **Study design:** Observational - Cross-sectional study
- **Study location:** ASG EYE HOSPITAL, Ground and First Floor, 149, Barrackpore Trunk Rd, Kamarhati, Agarpura, Panihati, Kolkata, West Bengal 700058
- **Study period:** 4 months
- **Sampling technique:** Convenience sampling
- **Sample size:** 36

Inclusion criteria

- a) Participants must be aged between 25-35 years.
- b) Participants must use digital devices more than 8 hours.

Exclusion criteria

- a) Participants having a history of neurological or psychiatric disorder.
- b) Participants having any history of squint surgery or refractive surgery or undergone any non-strabismic binocular vision disorder.
- c) Participants having any history of pre-existing ocular inflammatory condition or ocular syndrome.
- d) Participants having any history of amblyopia or anisometropia of (+/-2.00Ds) or any non-strabismic binocular vision disorder.
- e) Participants having any history systemic disease that can affect accommodation, vergence and ocular motility such as multiple sclerosis, thyroid, myasthenia gravis, Parkinson's disease
- f) Participants having any history of presence of Developmental disability or ADHD, or Learning disability or Mental retardation that have existed.

Data collection

- a) All the patients who satisfied the inclusion criteria were selected.
- b) Participants are asked to fill up the consent form
- c) The VA of the selected patients was measured using Snellens chart

- d) Participants are asked fill up the SPEED questionnaire along with that their digital screen use timing.
- e) Afterwards, Schirmers test I was performed for the participants.
- f) All the data are collected and added in Ms. Excel with coding
- g) Data analysis was done with appropriate statistical analysis method.

Assessment tools

- a) Consent form
- b) Information sheet
- c) SPEED questionnaire
- d) Data sheet
- e) VA chart
- f) Schirmer strips

Materials

The Schirmer test I: It is commonly used to detect dry eye syndrome since it measures the quantity of tears in the eyes. When conducting the non-anesthetized Schirmer test, or when the test is performed without anaesthesia, basal and reflex tear secretions are measured simultaneously. By taking away the stimulus that causes reflex tearing, the anaesthetic Schirmer test analyses basal tear production exclusively. The strips of filter paper are 5 mm by 30 mm. The patient may close their eyes or continue to blink frequently. After 5 minutes, the examiner removes the strips and measures the length of the wet strip ^[7].

Korb and Blackie created the SPEED questionnaire with the goal of rapidly monitoring the evolution of dry eye symptoms over time. This questionnaire evaluates the frequency and severity of symptoms using eight items that result in a score ranging from 0 to 28. The following symptoms are evaluated: burning, watering, pain, dryness, grittiness, itching, irritation, and eye fatigue ^[8].

Assessment process

The dry eye has been checked by using Schirmer's test I as that was available at that time. Dry eye severity has been assessed in two categories:

1. Qualitatively
2. Quantitatively

In qualitative method, speed questionnaire has been used for data collection.

- **0-4:** Mild dry eye syndrome
- **5-7:** Moderate dry eye syndrome
- **8+:** Severe dry eye syndrome ^[9].

In quantitative method, we have used Schirmer's strip for Schirmers test I.

- **0-5 mm:** Extremely dry eyes.
- **5-10 mm:** Moderately dry eyes
- **10-15 mm:** Possible dry eyes
- **Longer than 15 mm:** Normal tear function ^[10].

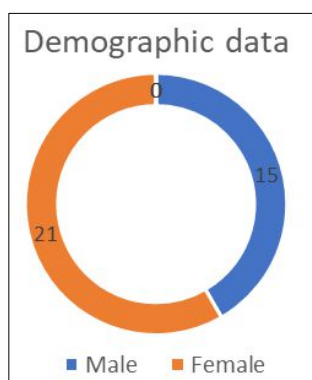
Data analysis

- The data collected were coded and entered in Microsoft Excel Sheet.
- The data was analysed using MS Excel software and Primer application.

- The result is represented in tabular and graphical format.
- The mean was used to describe the measured parameters.
- Linear correlation regression and descriptive analysis are used to analyse the relation between screen time and dry eye syndrome.
- p-value < 0.05 was considered as significant, negative value states the relation between two variables is inversely proportional.
- In this study, dry eye syndrome is taken as dependent variable and screen time is taken as independent variable.

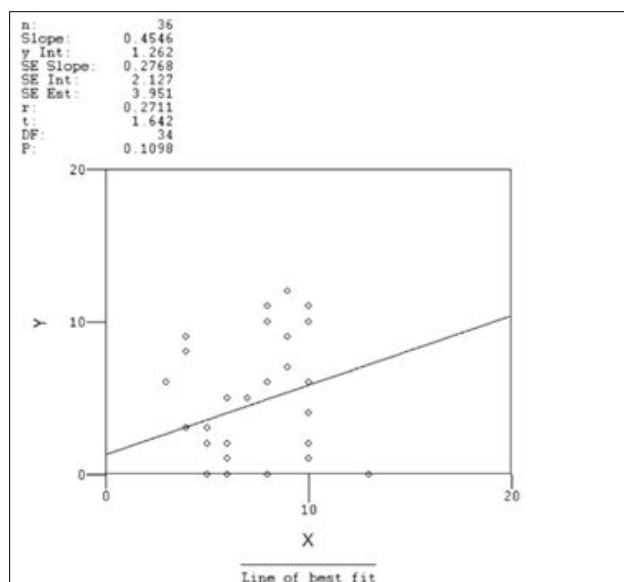
Results

Out of 36 participants with mean age of 27.92 ± 3.392 , 21 were female and 15 were male. In this study it is shown that the prevalence of DED among male is 80% and the Prevalence of DED among female is 52.38%. It also shows in Fig:1.



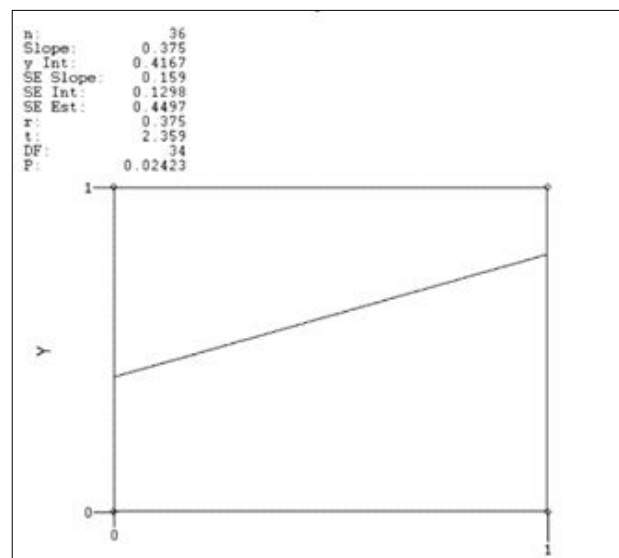
Relation between SVT and SPEED with linear regression

The regression analysis suggests that there is no statistically significant linear relationship between the independent variable X and the dependent variable Y, given the p-value of 0.1098 is greater than 0.05. The slope of 0.4546 indicates a weak positive relationship, but this is not strong enough to be considered statistically significant. The correlation coefficient of 0.2711 further indicates a weak positive correlation between the variables. It shows in Fig:2



Relationship between SVT and DED

The regression analysis suggests a statistically significant positive linear relationship between the independent and dependent variables, given the p-value of 0.02423 is less than 0.05. The slope indicates that for every one-unit increase in the independent variable, the dependent variable increases by 0.375 units. The correlation coefficient of 0.375 indicates a moderate positive relationship. It is shown in Fig.3



Discussion

A connection between screen usage and dry eye syndrome has been demonstrated in earlier research. 36 patients in all, of whom 21 were female and 15 were male, participated in the study. Individuals who use digital gadgets for longer than eight hours must be between the ages of 25-35 years were included in this study. I noticed that the Schirmer test and the SPEED Questionnaire varied in how severe the dry eye was. As opposed to this, 52.8% of women and 80% of men had dry eye illness. The association between SVT and SPEED was then examined using linear regression. This instance has a positive relationship because the p value is 0.1098, which is higher than 0.05 and it is called weak positive relationship. Using the regression line to measure the association between SVT and DED, it was shown that the p value is 0.0243, which is less than 0.05. For that, it is known as moderate positive relationship. I can therefore conclude that prolonged screen time may cause dry eyes.

Conclusion

Rejecting the null hypothesis my research aims to determine whether there is a correlation between screen time and dry eye. My research revealed that the likelihood of developing dry eye syndrome increases with screen time. Therefore, the null hypothesis is being rejected. As well as acknowledging the alternative theory's significance relationship. Everyone needs to be more mindful because screen time is linked to dry eyes. I believe that these behavioural factors blink rate, break, and screen brightness can be included in future research to obtain more information. In young people, environmental factors including excessive air conditioning and low humidity might worsen Dry Eye Syndrome (DES). Digital devices can further increase DES. Blurred vision, redness, burning feelings, and discomfort are among the symptoms. The 20-20-20 rule, deliberate blinking, screen

placement optimisation, and routine eye exams are examples of preventive strategies. A multimodal strategy is needed to address DES, including proactive eye care and behavioural changes.

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