

Dry Eye Symptoms and Screen Exposure Time in the Workplace

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Abstract

Introduction: Dry eye syndrome is one of the most common ophthalmology disorders, influenced by many factors and symptoms such as eye irritation, turbulent eyesight, foreign body feeling, burns, etc. Electronic devices have become an indispensable part of our private and professional life, and long-lasting focus on them causes decreased eye blinking, increased tear volume, eye irritation and pain.

Aim: Evaluation of the tear production level in the patients that work at different period with electronic devices.

Methodology: Subjects were patients of the Ophthalmologic ambulance "Guri-Clinic" in Prizren. Their symptomatology included scratches, burns, pain or foreign body feeling in the eye. With Schirmer test (type I, without topical anaesthesia) was measured the level of tear production for 5 minutes.

Results: Participants were 64 patients, respectively 128 eyes, 39% were women (age 41.56 ± 7.76) and 61% males (age 34.62 ± 11.05). According to the results analysis, there is a moderate negative correlation (-0.42 to -0.54) between the level of the tear production and the working years of experience, or the working hours during per day (-0.37 to -0.45) with electronic devices.

Discussion: The findings of our study are in coherence with the literature used, including the significant difference in the level of tear production in females and males, and the moderate negative correlation of the tear production level and years of experience in work or duration of working hours per day with electronic devices which in this study was -0.42 while according to Yang, *et al.* (2015) this correlation rate was -0.65.

Keywords: Ophthalmology; Eye; Computer; Tear; Patients

Introduction

Dry eye syndrome is one of the most frequent disorders in ophthalmology. It is a condition influenced by many factors and with a large number of symptoms such as eye irritation, turbulent eyesight, foreign body feeling, burns, pain, increased osmolarity of tears and changes in the surface epithelium of the eye [1]. Smart electronic devices have become an inseparable part of our private and professional life. Focusing on a smart electronic device screen requires continuous eye contact without blinking for a long period of time. With a reduction of eye blinks, the rate of tear evaporation increases thus the time to accommodate proper eye condition increases, therefore, irritation of the eye and the pain is unavoidable. Recently, there have been concerns over the negative effect of blue light, generally from light diodes or LED screens, on cornea and retina as it stimulates phototoxicity and oxidative stress [2]. This study is primarily concerned with patients who have declared that in their workplace they are required to use a smart device of some sort.

Aim of the Study

Evaluating the rate of tear production at patients who work for a long time with various screens of electronic devices.

Methodology

The subjects of this study are patients who have been treated at the Ophthalmological Center “Guri-Clinic” in Prizren, Kosovo. Their symptomology included: scratching, burning, pain or feeling of the foreign body in the eye. Using the Schirmer test, we measured the rate of tear production for a duration of five (5) minutes. Other data included the duration of the symptoms, the time that patients stay in front of screens within twenty-four (24) hours and throughout the annual working days. Statistical analysis is conducted with the OneWay ANOVA test, the t-test, correlation coefficient and regression analysis with SD 0.05.

Schirmer test produces four outcomes and those are:

1. Normal ≥ 15 mm, coloring of the ribbon after 5 minutes.
2. Light 14 - 9 mm, coloring of the ribbon after 5 minutes.
3. Moderate 8 - 4 mm, coloring of the ribbon after 5 minutes.
4. Severe < 4 mm, coloring of the ribbon after 5 minutes.

Results

Participants in this study were sixty-four (64) patients, respectively one hundred twenty-eight (128) eyes. Of these, 39% were women (age 41.56 ± 7.76) and 61% males (age 34.62 ± 11.05). From statistical analysis it appears that there are no significant differences in the results of the level of tear production between females and males. On the other hand, the correlation analysis confirms that there is a moderate negative correlation (-0.42 to -0.54) between the level of tear production and working hours, or the daily periodic length of exposure to screen (-0.37 to -0.45) of electronic devices.

Female	Age (years)	Schirmer test OD (mm)	Schirmer test OS (mm)	Work hours (within a day)	Years at work	Early symptoms (after x working years)
Average	41.56 ± 7.76	6.96 ± 4.04	7.40 ± 3.67	6.14 ± 1.63	9.08 ± 4.11	3.15 ± 1.87
Min	23.00	3.00	2.00	3.00	2.00	0.15
Max	56.00	17.00	18.00	10.00	16.00	7.00

Table 1: Statistical summary of female participants' age, Schirmer test results, hours and years exposure to screen and time when early symptoms appeared in reference to the work starting date.

Male	Age (years)	Schirmer test OD (mm)	Schirmer test OS (mm)	Work hours (within a day)	Years at work	Early signs of symptoms (after x working years)
Average	34.62 ± 11.0	8.10 ± 3.73	8.13 ± 4.10	6.97 ± 1.86	7.92 ± 3.99	3.10 ± 1.74
Min	15.00	3.00	3.00	2.00	2.00	0.50
Max	55.00	17.00	18.00	10.00	16.00	7.00

Table 2: Statistical summary of male participants' age, Schirmer test results, hours and years exposure to screen and time when early symptoms appeared in reference to the work starting date.

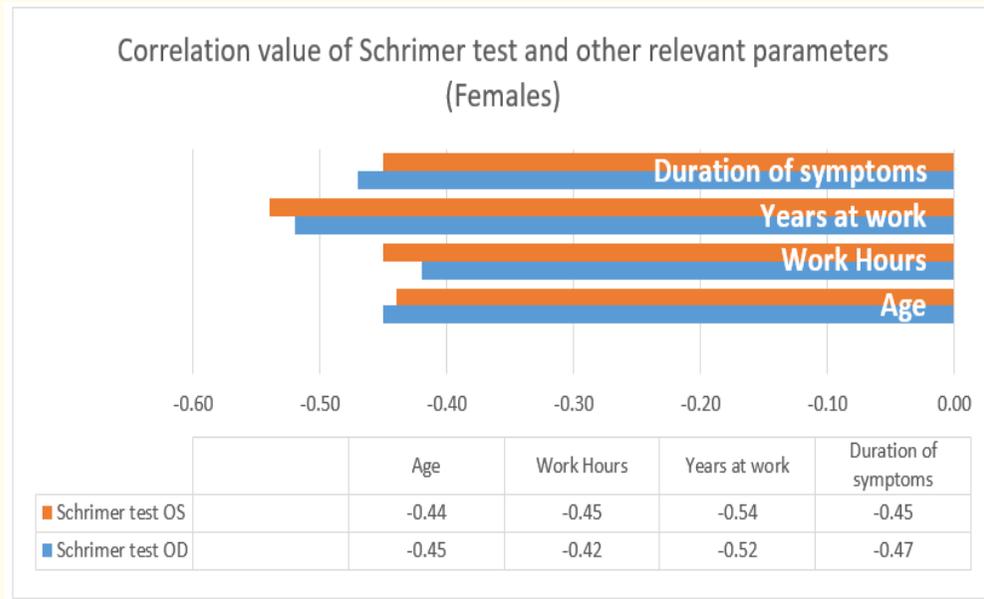


Figure 1: Graphical representations of the correlation between Schirmer test results with age, exposure time, years at work, and duration of symptoms for female patients.

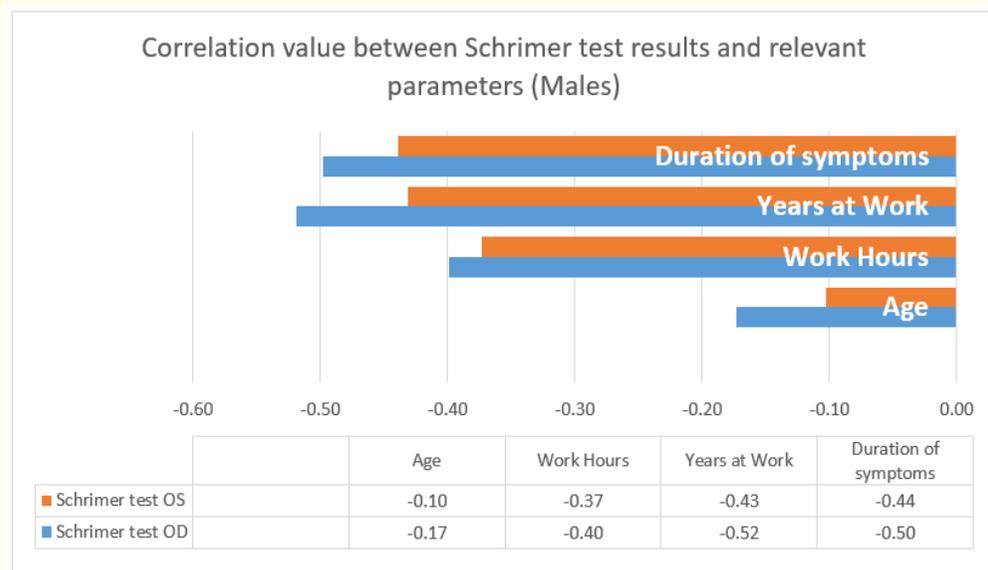


Figure 2: Graphical representations of the correlation between Schirmer test results with age, exposure time, years at work and duration of symptoms for male patients.

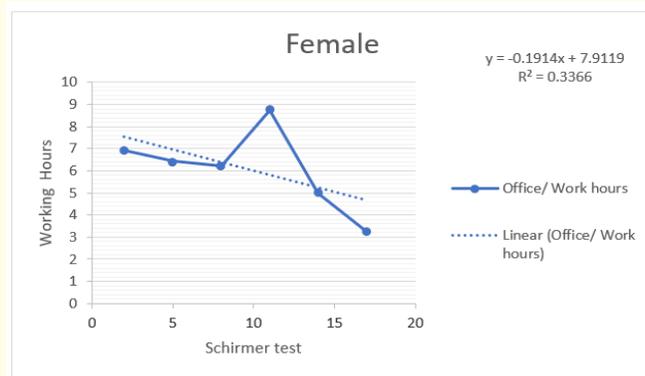


Figure 3: Graphical representation of the regression analysis between Schirmer test results and hours at work (Females).

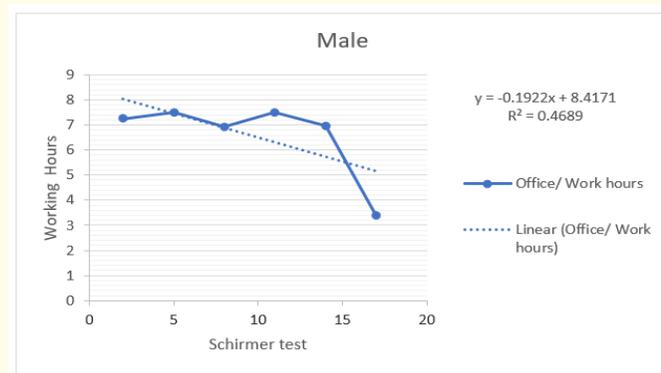


Figure 4: Graphical representation of the regression analysis between Schirmer test results and hours at work (Males).

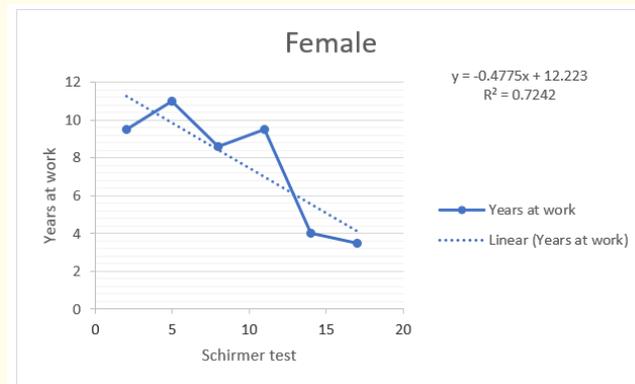


Figure 5: Graphical representation of the regression analysis between Schirmer test results and years at work (Females).

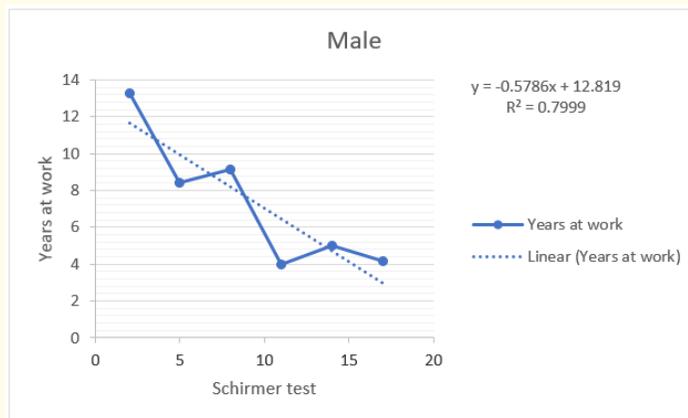


Figure 6: Graphical representation of the regression analysis between Schirmer test results and years at work (Males).

Discussion

The data analyzed from this study are consistent with data from the used literature, including the significant difference in the level of tear production in females and males and the moderate negative correlation between tear production rate and daily periodic length exposure to screens of electronic devices. For the latter, Yang, *et al.* (2015) [5] had correlation coefficient of -0.65, whereas our study concluded a correlation coefficient of -0.42. Yang, *et al.* [5] looked at a Japanese company and found significant difference in the amount of tear production (measured by the Schirmer test) between individuals who work more than six (6) hours a day with computer screens and those under one hour [4-9].

Kim, *et al.* (2016) [10] also found a significant difference between eye tear production rate at subjects who used smart tablets for a constant two hours long exposure and the control group.

Conclusion and Recommendations

This study reaffirms that dry eye symptoms have a connection to the exposure time of patients' eye to various screens such as smart devices in their workplace. Moreover, a slightly higher correlation coefficient for both males and females was the Schirmer test results and the years at the workplace. The surveyed patients stated that they are required to use smart devices in their workplace, and as a result, the amounts of years at work reflects in the exposure time to screens of those smart devices. Therefore, some of our recommendations are:

1. Application of artificial tear without preservatives.
2. After twenty (20) up to thirty (30) minutes of exposure to the screen, it is recommended to look at a further object and blinking the eyes.
3. Blinking twelve to fifteen (12 - 15) times per minute is also recommended.
4. Washing the face with water during breaks.
5. A few minutes of walking during the work breaks will refresh the body and the mind. In addition, it will benefit your eyes due to increased blood flow from walking.
6. Use a screen filter to reduce blue light. Moreover, adjust the position of the screen in a way that light reflection from the screen is minimal.
7. Follow-up with regular examination at your nearest ophthalmological clinic.

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