

EFFECTS OF COMPUTER USE ON EYE COMPLAINTS

***Kiril Slaveykov, **Kalina Trifonova, **Valentin Stoyanov, ***Stefan Valkanov,**

**Department of General Medicine and Internal Medicine, Trakia University, Armeiska 11, Stara Zagora, 6000, Bulgaria, kirilslaveykov@gmail.com*

***Department of Ophthalmology and Otorhinolarhyngology, Trakia University, Armeiska 11, Stara Zagora, 6000, Bulgaria, e-mail: kali_tr@yahoo.com*

***Department of Ophthalmology and Otorhinolarhyngology, Trakia University, Armeiska 11, Stara Zagora, 6000, Bulgaria, drvstoyanov@abv.bg*

****Department of Neurosurgery, Trakia University Armeiska 11, Stara Zagora, 6000, Bulgaria, satorirazor@yahoo.com*

Abstract

Background: Personal computers are part of our everyday life. Work time could be anywhere between several minutes to eight and more hours. With their increased usage ocular complaints are also increased, with the different complaints grouped together as Computer Vision Syndrom.

Aims and tasks: To make a connection between increased computer usage and ocular complaints

Methods and materials: literature review; free search, Pubmed, Embase

Results: Reviewed sources show increased ocular complaints with computer usage, with leading symptoms being eye strain, itching and burning. Visual acuity and color vision are also shown to be affected after prolonged computer usage. Most studies report additional complaints from the wrists, back and neck. Symptoms could be alleviated with proper posture, increased distance from the computer, increased frequency of breaks, working in a bright room and with LCD monitors.

Conclusion: Ocular complaints from frequent computer usage are common occurrence and proper procedures are critical for the control of their gravity and frequency.

Key words: *ocular symptoms, personal computer, computer vision syndrome*

Background:

Before the advent of computers, the office work involved a range of activities, including typing, filing, reading and writing etc. All these activities are different from each other and needed different types of posture and vision, causing a natural break from each activity. With the computer all these activities were combined and needed no change of posture or vision of the user from his desktop. (18)

Nowadays personal computers are part of our everyday life. Computer exposition is no longer limited to desktop computers, most people have access to laptops, tablets, book readers and smartphones. Work time could be anywhere between several minutes to eight and more hours, with additional hours spend on entertainment media, watching TV or playing video games. With their increased usage ocular complaints are also increased, with the different complaints grouped together as Computer Vision Syndrom (CVS). Bankers, account section workers, professional computer workers, excessive near work by mobile, laptop or tab users are commonly affected (4). The subject of "Computer vision syndrome", it is defined by the American Optometric Association as a complex of eye and vision problems related to the activities which stress the near vision and which are experienced in relation, or during, the use of the computer. There is little research on the topic in Bulgarian literature.

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A recent estimate of internet usage by continent ranged from 10.9% to 77.4% with an estimated 1 966 514 816 users worldwide (or 28.7% of the world's population) (20)

According to the United States Bureau of Labor Statistics, computers are used in the United States, by 100 million people at their jobs daily. Further, the National Center for Education Statistics, reported that 95% of schools and 62% of all classrooms in the United States have had computers since 1999. (10)

Eye and vision problems are the most frequently reported health-related problem in computer workers and can lead to lowered productivity, increased error rate, and reduced job satisfaction (11)

The main symptoms of CVS include eyestrain, tired eyes, irritation, redness, blurred vision, and double vision. Computer vision syndrome symptoms may be the cause of ocular (ocular-surface abnormalities or accommodative spasms) and/or extraocular (ergonomic) etiologies. However, the major contributor to computer vision syndrome symptoms by far appears to be dry eye. The visual effects of various display characteristics such as lighting, glare, display quality, refresh rates, and radiation also influence the exhibition of different complaints. Treatment requires a multidirectional approach combining ocular therapy with adjustment of the workstation. Proper lighting, anti-glare filters, ergonomic positioning of computer monitor and regular work breaks may help improve visual comfort. Lubricating eye drops and special computer glasses help relieve ocular surface-related symptoms. (7, 19)

Rosenfield et al conclude that visual demands for computer usage are significantly different from those of printed materials in terms of working distances, gaze angles and text sizes. As such it is no longer reasonable to assume that a patient will read text at a viewing distance of approximately 40 cm with their eyes depressed. (15)

Bansal et al compare accommodation and vergence responses to electronic screens to those found when viewing printed material and found them to be similar, whereas prevalence of dry eye symptoms is greater during computer use. The team conclude that is probably due to dynamics of the computer screen and decrease in blink rate due to constant viewing of the monitor positioned in primary gaze leading to increased corneal exposure and hence the multitude of ocular problems. (5)

The local medical associations in most of the developed countries, issue recommendations with regard to the definition, the diagnosis, and the methods for the prevention, treatment and periodical control of the symptoms found in computer users, in conjunction with an extremely detailed ergonomic legislation (6)

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Results: Reviewed sources show increased ocular complaints with computer usage, with leading symptoms being eye strain, itching and burning. Visual acuity and color vision are also shown to be affected after prolonged computer usage. Most studies report additional complaints from the wrists, back and neck. Symptoms could be alleviated with proper posture, increased distance from the computer, increased frequency of breaks, working in a bright room and with LCD monitors.

Using a computer for more than 2 hours per day can cause symptoms of computer vision syndrome. These symptoms occur in approximately 75% to 90% of computer users. In comparison, only 22% of computer workers report musculoskeletal disorders. (8)

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Wimalasundera et al list the following as risk factor for CVS: Environmental factors (dry air ventilation fans, dusty environment); Reduced blink rate; Increased exposure; Female gender; Age ; Systemic diseases and medications; Contact lens use; Other ocular pathology (dysfunctions of the lid glands). (18) Their findings are confirmed by Wang et al (17)

Hazarika et al add to the to the risk factors long hours of computer use, poor lighting in work place, glare on the computer screen, improper viewing distances, poor seating posture, inadvertent less blinking, uncorrected vision problems and/or combination of these factors. (9) Kokab et al also confirm these risk factor and expand on the thresholds which increase the risk (12) while also giving recommendations for protecton.

Graney also reports similar risk factor to increase the severity of CVS. (8)

During consultations Barar et al found out that CVS problems are common, yet ophthalmologist show low interest in their treatment. The most frequent complaints of eye-strain documented by the team are asthenopia, headaches, blurred distance and/or near vision, dry and irritated eyes, slow refocusing, neck and backache, photophobia, sensation of diplopia, light sensitivity, and double vision. Most of them are neglected as unimportant and are not thoroughly examined for the real cause for the complaints. (6)

Many people report ocular fatigue after prolonged work at video display terminals, in part prompting legislation regulating the use of these terminals. Since one of the main causes of ocular fatigue is dry eyes, Tsubota et al hypothesized that this type of work exacerbates drying of the ocular surface. (16) The group studied several factors affecting tear dynamics in 104 healthy office workers, measuring the rate of tear evaporation. Their results indicate that the use of video display terminals is associated with a decreased frequency of blinking and an increased rate of tear evaporation, each of which can contribute to dry eyes.

The team suggests artificial tears, and, in more severe cases, special spectacles to provide relief from dry-eye symptoms. In addition, the width of the palpebral fissure, and hence the exposed ocular surface area, can be decreased by placing the terminal at a lower height, with the screen tilted upward.

Miljanović et al use a supplementary questionnaire asking how much their everyday activities were limited by symptoms of dry eye and to what degree problems with their eyes limited them in reading, driving, working at the computer, their professional activity, and watching television. The results showed that (dry eye syndrom) DES is associated with a measurable adverse impact on several common and important tasks of daily living, further implicating this condition as an important public health problem deserving increased attention and resources. (14)

Additional negative side effects of frequent computer usage are shown by Mangen et al in their studies on the effect of computer usage on comprehension. Main findings show that students who read the texts digitally scored significantly lower on the reading comprehension test than students who read texts in print. (13)

Conclusion: Ocular complaints from frequent computer usage are common occurrence and proper procedures are critical for the control of their gravity and frequency. More work needs to be done to specifically define the processes that cause computer vision syndrome and to develop and improve effective treatments that successfully address these causes. (1, 2)

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