



## Mini review on computer vision syndrome

Rajitha SR<sup>1</sup>, Latha C<sup>2</sup>

<sup>1</sup> Assistant Professor, Christian College of Nursing, Neyyoor, Kanyakumari District, Tamil Nadu, India

<sup>2</sup> M. Sc (N) Student, Christian College of Nursing, Neyyoor, Kanyakumari District, Tamil Nadu, India

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### Abstract

Computer vision syndrome is characterized by visual symptoms which result from interaction with a computer display or its environment. It affects 75% of the people who work on computers. It can be diagnosed through a comprehensive eye examination. Testing with special emphasis on visual requirements at the computer or digital device working distance is necessary. Workers who have recurrent symptoms of computer vision syndrome are encouraged to get proper optometrist review and assessment. The best position for the monitor is slightly below the eye level about 20 to 28 inches away from the face and follow the 20-20-20 rule. Regular eye examinations and proper viewing habits can help to prevent or reduce the development of the symptoms associated with computer vision syndrome. The outcome of CVS is good.

**Keywords:** double vision, myopia, presbyopia, keratitis, dry eye syndrome

### Introduction

The computer was invented by Charles Babbage in 1791. In India, the first computer was used by the Indian Statistical Institute at Calcutta in 1956. The Indian National Survey (INS) was conducted in December 2013, which says that the total number of computer users in India was 150,000,000. Prolonged usage of computer has led to numerous disorders in human beings. Among that, the ocular manifestations play a prominent role. These groups of symptoms are known as Computer Vision Syndrome (CVS) [1]. The prolonged use of digital devices like computer, tablet, e-reader and mobile phone has contributed to an increase of 'computer-related' ocular symptoms called computer vision syndrome and also known as digital eye fatigue and digital eye strain [2]. It is the leading occupational health problem of the twenty first century [3].

### Definitions

Computer vision syndrome is a complex of eye and vision problems related to near work which are experienced during or related to computer use. It is characterized by visual symptoms which result from interaction with a computer display or its environment [4]. The American Optometric Association defines CVS as "the complex of eye and visual problems experienced during or related to computer use" [1]. Computer vision syndrome is a condition resulting from focusing the eyes on a computer or other display device for protracted, uninterrupted periods of time and the eye muscles being unable to recover from the strain due to a lack of adequate sleep [5].

### Incidence

A worldwide data show nearly 60 million people suffering from CVS and 1 million new cases occurred each year.<sup>3</sup> In United States, more than 143 million people work on computer everyday [6]. The computer-using population in India is more than 40 million and 80% of them have discomfort due to CVS. The National Institute of Occupational Safety and Health survey has reported that,

visual symptoms occur in 75-90% as opposed to 22% musculoskeletal disorders of video display terminals workers [1]. Computer vision syndrome affects 75% of the people who work on computers, most markedly those who work more than 3 to 4 hours with computers [4]. It affects most markedly those over the age of 40 [7].

### Causes and Risk Factors

There are several contributory factors for computer vision syndrome to develop. They are uncorrected spectacle power, inappropriate glasses for computer use, difficulty in eye coordination at near work, strain on the muscles of the eye due to work style, decreased blink rate or tear function, glare and reflections from the monitor and surroundings, poor workstation setup or improper use of workstation, job nature and stress [4]. Reading, writing or performing close activities like sewing can also cause eye strain [8].

### Symptoms

The symptoms experienced in computer vision syndrome are caused by three potential mechanisms. They are extra ocular mechanism, accommodative mechanism and ocular surface mechanism. Extraocular mechanism causes musculoskeletal symptoms such as neck stiffness, pain, headache, backache and shoulder pain. These symptoms are well associated with improper placement of computer screen which lead to muscles sprain. Accommodative mechanism causes blurring of vision, double vision, presbyopia, myopia and slowness of focus change. In one study it was reported that a transient myopia was observed in 20% of computer users at the end of their work shift. Many people may have slight accommodative problem or binocular problems which do not usually cause symptoms when they are doing ordinary less strenuous visual task, but these problems are worsen in prolonged period of computer usage.

Ocular surface mechanism causes symptoms such as dryness of the eyes, redness, gritty sensation and burning after extended period of computer usage. These symptoms may be multifactorial, among the common factors found to

be related to dryness and redness of the eyes are cornea dryness, reduction in blink rate, increased surface of cornea exposure caused by horizontal gaze at the computer screen, reduction of tear production due to ageing process contact lens usage, medication such as antihistamines and systemic medical illnesses such as autoimmune connective tissue disease [9].

### Diagnosis

Computer vision syndrome can be diagnosed through a comprehensive eye examination. Testing with special emphasis on visual requirements at the computer or digital device working distance is necessary. It may include: patient history to determine any symptoms the patient is experiencing and the presence of any general health problems, medications taken or environmental factors that may be contributing to the symptoms related to computer use; visual acuity measurements to assess the extent to which vision may be affected; a refraction to determine the appropriate lens power needed to compensate for any refractive errors (nearsightedness, farsightedness or astigmatism) and testing how the eyes focus, move and work together. In order to obtain a clear, single image of what is being viewed, the eyes must effectively change focus, move and work in unison. This testing will look for problems that keep the eyes from focusing effectively or make it difficult to use both eyes together. This testing may be done without the use of eye drops to determine how the eyes respond under normal seeing conditions. In some cases, such as when some of the eyes' focusing power may be hidden, eye drops may be used. They temporarily keep the eyes from changing focus while testing is done [10].

### Treatment

#### Environmental factor modification

Among the most important modifiable external environmental factors is lighting. Bright lights, windows and overhead fluorescent lights often contribute to discomfort glare. These bright light sources need to be controlled with proper blinds, filters or adjustment of the room arrangement so that an acceptable level of lighting is obtained to minimize visual fatigue [11]. The best position for the monitor is slightly below the eye level about 20 to 28 inches away from the face and follow the 20-20-20 rule. It is looking away from the screen every 20 minutes or so and looking at something around 20 feet away for about 20 seconds [12].

#### Proper eye care

Taking a short break, stretching the muscles, change of scenery and a quick walk around the office have been shown to improve productivity and reduce ocular symptoms of stress. Working nonstop for more than 4 hours has been associated with eye strain. Frequent short break can restore and relax the accommodative system of the eyes and preventing ocular strain and visual fatigue. Workers who have recurrent symptoms of computer vision syndrome are encouraged to get proper optometrist review and assessment. Dry eyes secondary to decreased blink rate can be easily managed by applying lubricating eye drops or artificial tears. Use of proper corrective glasses for refractive errors such as myopia, astigmatism and presbyopia is important to prevent further deteriorating of the ocular symptoms which can lead to poor work

performance and the poor quality of life. Workers who have history of medical illnesses such as diabetes mellitus and connective tissue disease affecting the eyes must get referral to see ophthalmologist without delay [11].

### Recommendations

Nine steps to reduce computer eyestrain have been suggested by the National Institute of Health and Occupational Safety. They are, regular, yearly complete eye examination, using proper lighting, minimizing glare, adjusting the brightness of the computer screen, taking frequent breaks, refocusing the eyes, blinking more often, modifying the workstation and exercising even while sitting [1].

### Prevention

Creating a better work environment is necessary to prevent digital eye strain. If the person uses glasses or corrective lenses, see their eye care provider at least once a year or as advised for a checkup. Also see their healthcare provider regularly. This can help prevent and treat health problems [13].

### Complications and Differential Diagnosis

The complications of computer vision syndrome are keratitis, superficial punctate keratitis, optical decentration in the eye glasses, bifocal height malpositioning in the eye glasses, especially the progressive bifocal type. The differential diagnoses of CVS are allergic conjunctivitis, lagophthalmos, refractive errors, blepharitis, dry eye syndrome and presbyopia [14].

### Prognosis

Regular eye examinations and proper viewing habits can help to prevent or reduce the development of the symptoms associated with computer vision syndrome [15]. The outcome of CVS is good. Prevention is the most important strategy in managing computer vision syndrome. Modification in the ergonomics of the working environment, patient education and proper eye care are crucial in managing computer vision syndrome [11].

### Conclusion

Computer vision syndrome is a new problem that has emerged in this century following increase usage of computer both at home and at work. There is a correlation between ocular symptoms such as pain, redness, dryness, blurring of vision, double vision and other head and neck sprains and computer usage. Prevention remains the main strategy in managing of computer vision syndrome. Modification in the ergonomics of the working environment, patient education and proper eye care are important strategies in preventing computer vision syndrome.

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