



PREVENTING AND MANAGING COMPUTER VISION SYNDROME



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INTRODUCTION

Computer Vision Syndrome (CVS) is a term used to describe a wide range of visual symptoms experienced by operators of visual display terminals (VDT)[1].

Ocular Symptoms

- Eye strain
- Dry eyes
- Fatigue of the eyes
- Blurred vision
- Double Vision



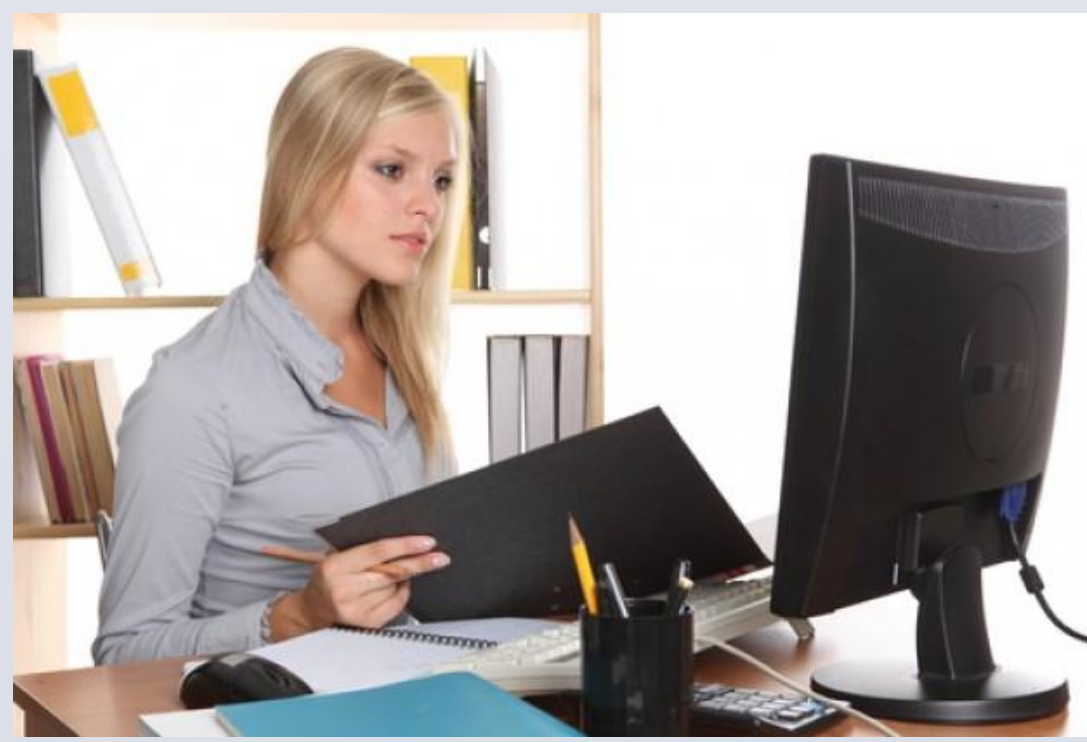
Non-ocular Symptoms

- Headache
- Decreased cognitive abilities
- Neck and shoulder pain

As many as 90% of VDT users report at least one symptom (ocular or non-ocular) [3], with ocular symptoms being reported by as many as 47.5% of VDT employees in an American study [4], 31.9% in an Italian study [5] and 63.5% in an Australian study [6].

Computer use continues to increase within the workplace, and the amount of VDT exposure (>4 hours per day) has a strong relationship with the severity of reported CVS symptoms [1, 7, 8].

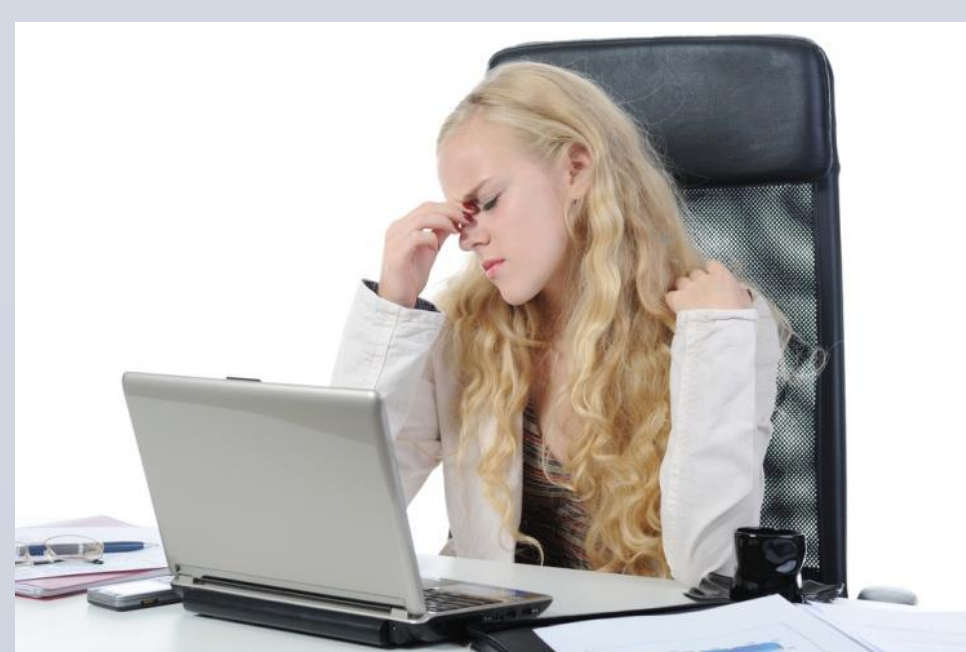
Despite a high prevalence of VDT employees reporting CVS, there are relatively few studies on this issue, and when studies are available, there have been limited efforts to disseminate that knowledge to the workplace [1,2].



OBJECTIVES

Objectives:

- Review underlying mechanisms for CVS,
- Discussion of contributing factors to CVS, and
- Provide intervention strategies that occupational therapy practitioners can use to address CVS in the workplace.

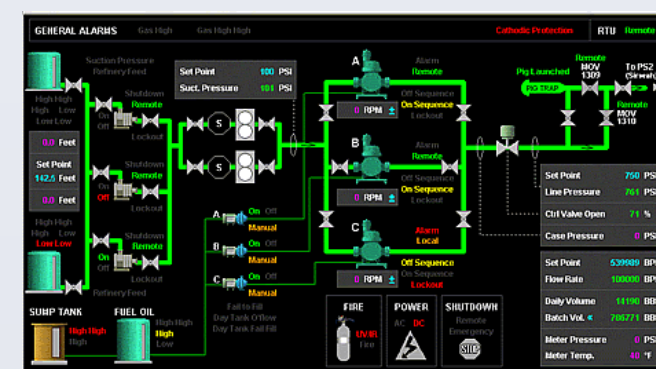


MECHANISMS OF CVS

Ocular CVS Symptoms:

Contributing factors – workplace:

- Image quality
 - Too small and low resolution will make fonts difficult to decipher.
 - High contrast or brightness tends to make the image blurry.
 - A low refresh rate on the screen appear to the computer user as flicker on the screen.
- Work station design
 - If the monitor is too high, it can lead to an upward position of the eye, which increases surface exposure [1,8].
 - Glare (overall light levels, reflected light on the screen and bright spots) increases difficulty in interpreting images and readability [1,12].
- Environmental factors
 - Dry air, high heating and excessive air movement can lead to evaporation of eye moisture [1].



Negative Visual Adjustments

- Squinting (improves visual accommodation and vergence), but it can lead to ocular muscle fatigue [9].
- Reduced frequency and quality of blinking to view an image can lead to dry eyes [1,9,10]

Non-ocular CVS Symptoms:

Contributing factors – workplace:

- Workstation setup
 - Sustained viewing at the computer monitor can lead to increased activity of the trapezius muscle [9].
- Poor image quality and cognitive overloading
 - Link between poor image quality or inability to read the screen can cause a reduction in cognitive performance [12].



Negative Muscular Adjustment

- The link between the difficulty associated with the viewing task, difficulty of the cognitive task, perceptions of discomfort/fatigue in eyes' muscles and shoulder/neck region can manifest as a psychophysical response in the form of a headache.
- The visual-postural motor interaction between ocular muscles and neck/shoulder muscles can lead to increased muscle activity and fatigue [8,9].

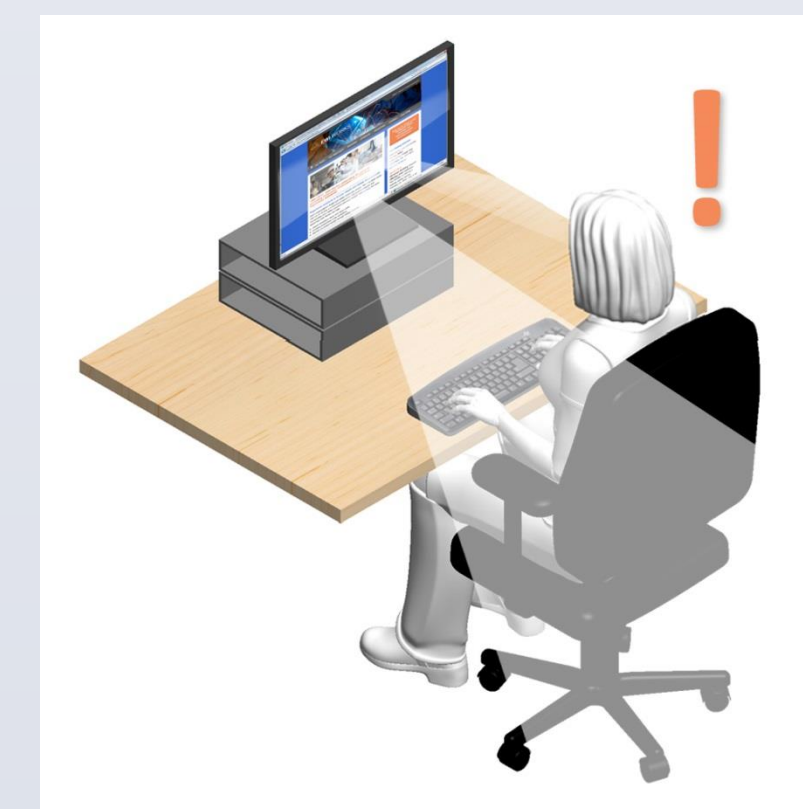
PREVENTION STRATEGIES AND EDUCATION

Specifications on image properties

Recommendation	Description	Targeted Issue
Image Size/font	Easily distinguishable from an eye distance of up to 40 inches [1].	Image Clarity
Spacing between characters	At least half of font size; space between lines should be equal to font size [1].	Removes blending and blurring of characters.
Refresh Rate	Minimum of 75 Hz [1]	Reduces blinking to improve image quality
Color of font	Dark characters on light colored background [1]	Improves contrast and brightness of text

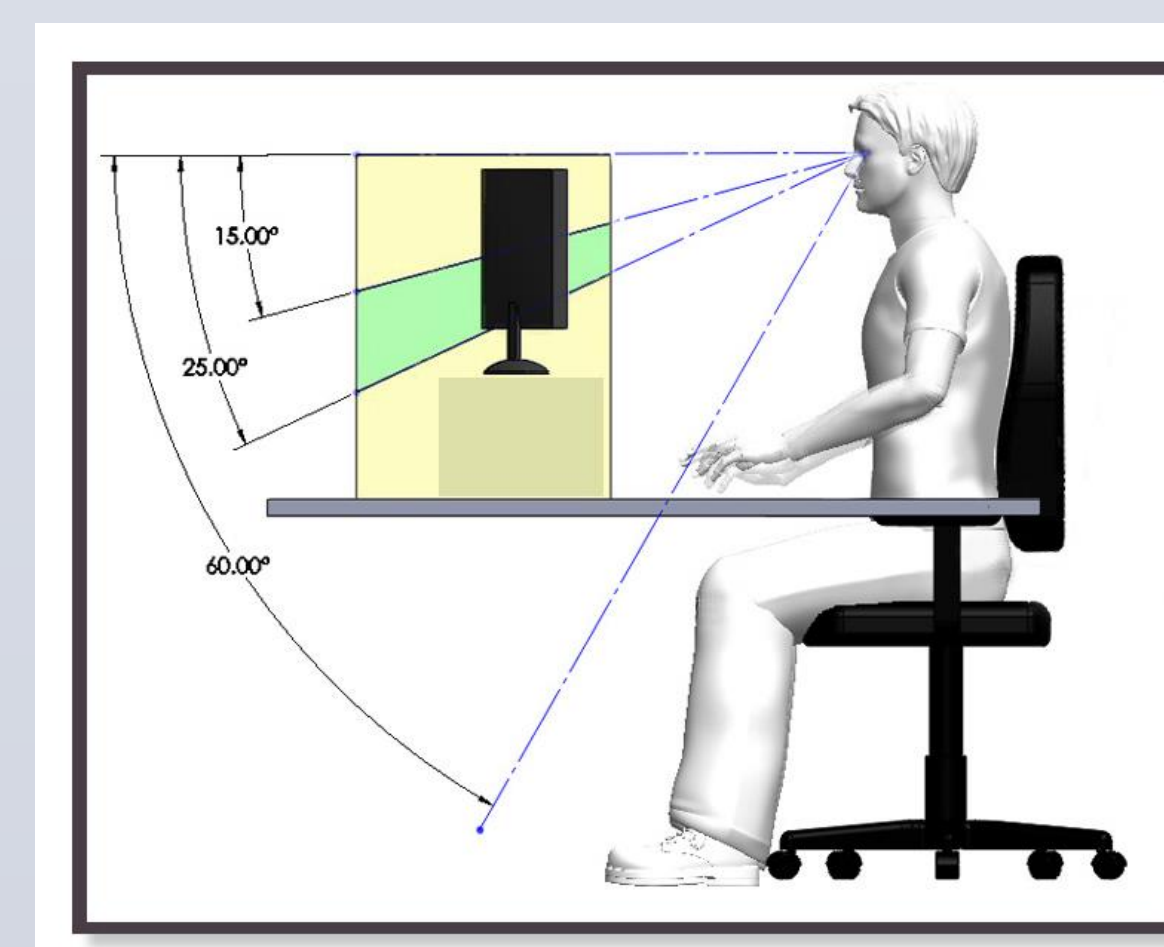
Specification on preventing screen glare

- Use of blinds to limit natural light
- “Warm” light within office environment [1]
- Lighting in operator’s field of view should not exceed 3x the average screen luminance [14,15]
- Reposition VDT if glare source cannot be removed



Specifications on VDT position relative to user

- Monitor should be positioned at least 20 inches from eyes [1, 14]
- Monitor adjusted in height so main viewing area is 15-20 degrees below eye level [1, 14]
- Proper placement of paper documents, input devices, adjustment of chair [6,13,17]



Work organization and micro breaks

- Incorporation of regular visual breaks [1, 11, 19, 20]
- Every 20 minutes, focus on an object 20 feet in distance for 20 seconds [21]
- Conscious effort to increase blinking rates [11]

ADDITIONAL CONSIDERATIONS

Drying effects on eyes:

- Use of contact lens
- Cosmetics
- Medications
- Age

Optometrist and Ophthalmologist:

- Regular eye exams
- Proper corrective lenses
- Strategies to help manage chronic dry eye



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