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Review Article

Digital Eye Strain

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Addressing Digital Eye Strain: A Narrative Review of Complementary and Alternative Medicine Approaches

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Background: Digital eye strain (DES) also called as Computer vision syndrome (CVS) is a prevalent issue among individuals who spend extended hours on digital screens, such as office workers, students, and gamers., characterized by symptoms including eye fatigue, headaches, blurred vision, dry eyes, eye strain and neck or shoulder pain. With the increasing reliance on digital devices in daily life, it has emerged as a widespread occupational health concern.

Objective: To undertake a narrative review of studies on CAM approaches for mitigating the symptoms of digital eye strain.

Methods: Keyword searches of PubMed, Google Scholar and PubMed Central databases. Manual searches of other relevant reference of articles.

Conclusion: The present review provides evidence supporting the potential use of CAM approaches in managing the digital eye strain.

Keywords: Digital eye strain, Computer vision syndrome, CAM, Asthenopia, Visual Fatigue

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Introduction

Digital eye strain is defined by the American Optometric Association as a group of visual and ocular issues caused on by extended use of desktops, laptops, mobile phones, tablets, e-readers, and storage devices.[1] The phrase Computer Vision Syndrome (CVS) was first used in the 1990s to refer to symptoms experienced by computer users. As a result of the expansion of digital media, additional, more general terminology like Digital Eye Strain (DES) and Visual Fatigue (VF) emerged.[2]

Nowadays, watching electronic screens has become a common place aspect of everyday life, whether at home, at work, in leisure time, or when travelling. Electronic reading devices, cell phones, and desktop, laptop, and tablet computers are now widely used.[3]

The incidence of digital eye strain was estimated to be 70.7% worldwide; however it varied greatly, ranging from 97.3% among Saudi Arabian university students to 31.9% among Italian bank employees. These statistics demonstrate how common digital eye strain is worldwide and how serious its effects are.[4]

Due to the COVID-19 epidemic, students from elementary and secondary schools as well as present university students were urged to engage in online learning in order to finish the needed coursework on time. Youngsters are now spending nearly eight hours a day in front of computer or smartphone screens. Students also used internet platforms throughout this epidemic for communication, entertainment, and knowledge. Adults who were encouraged to continue working from home due to the increase in COVID-19 instances spent a lot of time in front of screens. They used internet platforms for information, communication, and entertainment because they were confined to their residences.[5]

CVS frequently manifests as headache, ocular redness, dry eyes, blurred vision, and eye strain. Non-ocular symptoms including shoulder and neck discomfort may also be present. At the end of the working day, these symptoms could not go away, even though they are often transient. Because computer usage tends to be chronic, many of the symptoms of CVS are recurring, prone to progression, or both.[6]

Several putative remedies for DES include the "20-20-20 rule" (focussing on an object 20 feet away for 20 seconds every 20 minutes), blue light filters, and "night mode" interfaces.[7]

Numerous researches indicate that managing digital eye strain may benefit from ergonomic techniques. The utilisation of suitable lighting, cautious digital device placement, modifying image characteristics (resolution, text size, contrast, and brightness), and taking breaks are all well recognised ergonomic techniques.

An ergonomic technique that is less often used is the use of antiglare screen filters. Screen filter use was linked to less digital eye strain, according to Shantakumari *et al*. and Ranasinghe et al. On the other hand, with their large sample size, Scullica *et al.* discovered that screen filters did not lessen digital eye strain. Furthermore, Reddy et al. discovered that a radiation screen filter was ineffective in lowering digital eye strain.[8]

Complementary and Alternative Medicine (CAM) includes medical knowledge and treatments that are not part of the current or allopathic medical system. When used in conjunction with allopathic medicine or standard medical care, they are referred to as complimentary; when used in place of allopathic medicine or conventional medical treatment, they are referred to as alternatives. Some nations, notably rural India, continue to use complementary and alternative medicine.[9] Over the past 20 years, the usage of complementary and alternative treatments (CAM) has significantly increased worldwide.[10]

Aims and Objectives

The aims and objectives of the current narrative review is to explore the various CAM approaches for alleviating digital eye strain, one of the major global issues.

Methodology

The narrative review literature search was done using PubMed, Google Scholar, and PubMed Central. The search was done using the terms "digital eye strain" or "computer vision syndrome" or "CAM" or "eye strain", or "visual fatigue" or "Naturopathy" on 24 Nov, 2024. All the articles with available abstracts along with the referenced articles until the date of search were evaluated.

Original research work in the English language on DES and those mentioning CAM interventions for eye strain were considered for inclusion into the present review article.

Discussion

Overview of Digital eye strain

Digital eye strain (DES), a synonym for computer vision syndrome (CVS), is a modern-day condition that manifests as a variety of ocular, musculoskeletal, and behavioural signs and symptoms brought on by extended usage of electronic devices with digital screens. Blurred vision, conjunctival congestion, eye tiredness, visual accommodation abnormalities, headaches, back and neck muscular soreness, and focus issues are some of the initial symptoms that develop.**[11]** The widespread use of digital technology has become a necessity in modern life, and millions of people of all ages are susceptible to CVS. The use of digital gadgets by people of all ages has significantly expanded in industrialised countries in recent years. Furthermore, a large burden of CVS has been caused by the rise in the usage of digital devices in developing nations.**[12]**

Pathophysiology of DES:

Three possible pathways might be responsible for computer vision syndrome symptoms: 1. Ocular surface mechanism, 2. Accommodative mechanism, and 3. Extra-ocular mechanism.

Musculoskeletal complaints, including headaches, backaches, shoulder discomfort, and stiff necks, can be caused on by extra-ocular processes that are not directly related to ocular activity. These symptoms are linked to postural issues caused by wrong computer screen positioning, inappropriate table or chair height, or an inaccurate eye-screen distance, which leads to needless stretching or forward bending and frequently results in a sprain of the muscles.

Blurred vision, double vision, presbyopia, myopia, and slowness of focus shift are all caused by accommodating processes. Changes in adaptation lag have been seen as a result of long-term use of digital devices. However, the demanding close work-rather than the screen itself-is the primary cause of the impacts on pupil size, accommodation, and convergence.

After prolonged computer use, symptoms including dry eyes, redness, a gritty feeling, and burning are brought on by an ocular surface mechanism. Eye blinking contributes to the maintenance of a normal ocular surface by means of the entire cycle of tear production, wetting, evaporation, and drainage. It is now commonly recognised that when using a computer, the blink rate decreases dramatically. In one research, it went from 18.4 to 3.6 blinks per minute, and in another, it went from 22 to 7 blinks per minute. According to Sheedy et al., the pathophysiology of decreased blink and squinting is bimodal; first, it improves visual acuity when refractive error is present, and second, it reduces retinal illumination when utilising a source that produces glare in the superior visual field. An incomplete blink, in which the upper eyelid does not completely cover the corneal surface, may be more significant to dry eye than a decreased blink rate because, as long as the majority of blinks are complete, a lower blink rate can preserve the stability of the tear film.**[13]**

Numerous researches have suggested that the 20-20-20 rule is an efficient method of managing DES. According to the 20-20-20 rule, eye care specialists recommend taking a 20-second break from near work every 20 minutes by focussing on an object 20 feet away. DES symptoms can be prevented and alleviated by taking regular intervals. Rewetting drops are advised to help lubricate the eye. Particularly when using digital gadgets that lower the blink rate frequency, rewetting eye drops have been associated with a decrease in ocular pain and dry eye symptoms. Rewetting eye drops may be more necessary in challenging conditions where temperatures are very high and relative humidity is low.**[14]**

As technology advances, digital screen devices have emerged as a ubiquitous tool utilised for a variety of everyday tasks. According to numerous studies, CVS is a serious public health issue that causes a wide range of complaints and symptoms that may substantially decrease individual's standard of life. **[11]**

CAM Approaches:

Complementary and alternative medicine (CAM) encompasses a wide range of traditional and modern methods that aim to prevent or cure illness. Since there is not enough evidence to support the safety and efficacy of CAM procedures,

They are by definition excluded from traditional medicine. While alternative therapies are used in place of mainstream medicine, complementary therapies are utilised in conjunction with it.**[15]**

Mud pack for eyes

Application of mud induces the membrane's electrical conductance to increase, absorption phenomena to increase, enzyme and hormone activation, hyperaemia, and hydropoitic glands to occur. Mud therapy also affects the cardiovascular system and raises skin its temperature, immunity, neurotransmission, and water electrolyte balance. All of the patients reported that mud treatment was quite relaxing. According to studies, mud treatment has anti-inflammatory and antioxidant effects, rendering it a highly useful tool for easing asthenopia symptoms.

Mud has the unusual ability to draw heat and toxins from the body. The toxins are not only dissolved by mud, but they are also changed into a form that allows the body to expel them. It softens the hard tissues and dissolves the hard fatty glands within or outside the body, which results in less stiff muscles. When it is applied, the patient notices a reduction in symptoms immediately. Mud becomes hotter more quickly after application if the body has too many toxins.**[16]**

Vaccinium uliginosumextract (DA-9301)

Vaccinium uliginosum is a flowering plant that is indigenous to the Northern Hemisphere's colder climate. In addition to Mongolia, China, Japan, and Korea, it may be found in the European Alps, Pyrenees, and Caucasus. The fruit extract of Vaccinium uliginosum is rich in flavonoids and anthocyanins, two types of antioxidants. Supplementing with antioxidants is recognised to be an excellent way to relieve the symptoms of dry eyes. (Vaccinium uliginosum extract) DA9301 contains flavonoids and anthocyanins, which are antioxidant components. Inhibiting the photo-oxidation of N-retinyl-N-retinylidene ethanolamine, Vaccinium uliginosum extract has been shown to prevent the mortality of human retinal pigment epithelium cells caused by blue light. Following light damage, V. uliginosum extract partially restored the retina's outer nuclear layer. Because DA9301 has a considerable antioxidant capacity, consumption orally proved beneficial in reducing CVS caused by a tablet computer.**[17]**

Oral omega-3 fatty acids (O3FAs)

Artificial tear supplements are frequently used to treat computer users' dry eyes; while they alleviate symptoms, they also change the pathophysiology of the condition. O3FAs are anti-inflammatory and have shown potential in treating illnesses such as coronary artery disease and rheumatoid arthritis. Additionally, studies have shown that dry eye patients produce more tears after taking fish and flaxseed oils as dietary supplements for three months.

According to the study, dietary supplements of O3FA enhance the integrity of the tear film naturally rather than causing an increase in tear production and volume. Reduced tear evaporation rates and an improved Nelson grade in the O3FA group further supported this finding. In order to sum up, consuming foods high in O3FAs improves the symptoms of dry eyes, lowers the pace at which tears evaporate, and improves Nelson grade, as shown by improved epithelial cellular shape and goblet cell density.**[18]**

Trataka **(A Yogic Cleansing Technique) and Cold Eye Pack**

The practice of eye movements and certain visual processes has seen to be associated with degrees of alertness and calm. The technique of *Trataka*, which calms the eyes, is described in traditional yoga books. A potential mechanism of action for reducing visual strain would involve using a cold pack and *Trataka* to provide the extra-ocular muscles with deep rest. One way to reduce eye strain from gazing at digital screens is to use a cold eye pack.

Hatha Yoga Pradipika, an ancient Indian yogic literature, mentions six cleaning methods, including *Trataka*. Previous research has demonstrated the benefits of *Trataka* in the management of digital eye strain. Cold packs can help those who use their phones or other electronic devices and neglect to take blinking breaks.

Subcutaneous loose connective tissue, blood vessels, and nerves are abundant in the vicinity of the eyes. Applying cold can help vasoconstriction, which may lessen localised inflammation and the formation of oedema. *Trataka* and cold packs for the eyes are therefore affordable, practical, and secure methods of reducing visual strain and exhaustion. **[19]**

Eye exercises

Eye exercises are effective therapies for vision-related issues as they have been demonstrated to improve visual function and lower the prevalence of eye fatigue. According to Rizanti's research on the benefits of eye workouts, practicing palming, blinking, and focussing techniques on a daily basis greatly improved extra-ocular muscle performance and decreased eye tiredness. The present study showed significant improvement through effectiveness of specific eye exercises, including palming, figure-8, and focusing exercises, performed consistently over four weeks in reducing vision-related symptoms among young adults.**[20]**

Conclusion

In conclusion, this present narrative review contributes to the growing body of evidence supporting the use of CAM approaches like Mud pack for eyes, *Vaccinium uliginosum*extract (DA-9301), Oral omega-3 fatty acids (O3FAs), *Trataka* (A Yogic Cleansing Technique) and Cold Eye Pack and Eye Exercises in managing the digital eye strain.

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