Research Article

The Interrelationship Between Screen-Viewing Posture, Neck–Shoulder Discomfort, and Ocular Symptoms: A Narrative Review

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Abstract

With increasing usage of digital devices in our daily lives, there are increasing concerns around digital eye strain (DES), neck and shoulder pain. When using digital devices, we generally experience increased near visual tasks, decreased blink rates and stiff postures. The relationship between digital device usage and eye and musculoskeletal issues is not completely understood. This review discusses the relationship between digital device postures, neck/shoulder pain and eye symptoms. How risk factors are shared, visual and posture interactions are discussed, along with practical prevention and management techniques. A search was performed using databases, websites and reference lists to identify studies looking at DES, digital device postures, neck/shoulder pain, smartphone and computer use and ergonomic solutions. Key findings were summarised to show how the issues are connected, how they work and the limitations of the research. Research has shown that eye related issues (dryness, irritation, blurring, eye fatigue and headaches) often occur simultaneously with neck and shoulder pain. Risk factors are shared between the two, including constant near visual tasks, incorrect viewing distances, poor workstation setups, being stuck in one position and previous visual/muscle issues. Poor vision can cause leaning forward or pushing the head forward to get closer to the screen, causing additional pressure and strain on the neck. Pre-existing neck/shoulder pain can cause changes in sitting positions, changing how you view the screen. Most studies are cross-sectional, have different measurements and do not account for other lifestyle factors, meaning causality is difficult to prove. Although the two issues often co-occur, individualised approaches are the best way to prevent and treat. Updating glasses, correcting viewing distances and postures and taking regular breaks can help.

This review discusses the links between digital device postures, neck/shoulder pain and eye symptoms. Including how they work, recent studies, prevention tips and clinical implications. Along with identifying areas for future research.

Keywords: Digital eye strain, screen-viewing posture, neck-shoulder discomfort, ocular symptoms, smartphone use, computer vision syndrome, musculoskeletal symptoms and ergonomics.

1. Introduction

Digital technology is a huge part of everyday life for learning, working, communicating and relaxing. With devices such as smartphones, tablets, laptops and desktop computers, we can constantly access information but also have prolonged near work, repetitive hand movements, and lack of movement. [1] This has led to a greater focus on understanding the effects digital screens have on our eyes and musculature, particularly in students and workers in an office environment. [2]

Digital eye strain (DES) is also referred to in many studies as computer vision syndrome (CVS). The condition is caused by using digital screens for prolonged periods of time. Usually, patients report dry, burning and irritated eyes, blurred vision, difficulty focusing, eye fatigue and headaches. [3] There are many factors that can cause DES, including a lack of moisture on the eye surface, extra effort required by the eyes to focus and work together, visual defects that are not corrected, lighting in the room and the amount of time spent on the task. [3]

Musculoskeletal pain is another major issue for those using lots of devices. Smartphone users often bend their necks to look down at their phone for hours. Laptop users are known to slouch forward to look at their low and/or distant screen. [4] Those using desktops can suffer from discomfort due to the height of their screen, positioning of their keyboard, chair and armrests, causing them to be in uncomfortable and rigid positions. [2] Major reviews have looked into the link between screen use and neck and arm pain; however, some studies show a stronger link than others. [2] University

students are a great population to look at as they tend to use lots of digital technology throughout their day, such as online lectures, reading on-screen, homework on computers, texting, gaming and streaming. [5] Studies have shown high rates of eye symptoms along with clear links between smartphone use and neck pain and other musculoskeletal issues. [6]

Although symptoms may occur at the same time, they do not necessarily cause each other. Prolonged screen use can cause both eye and musculoskeletal issues in completely different ways. [2] However, if you struggle to see the screen, you may lean forward or move closer, causing changes in your neck load. [5] If you have neck pain, this can alter your head position and distance from your screen. [6]

It is very important to understand the interaction between these issues for eye care professionals. Often patients will visit with tired eyes, headaches, neck pain and tired shoulders. [5] If we only look at the eyes, we may miss poor desk set-ups, however if we blame everything on poor posture, we may be missing an old glasses prescription, focusing issues in the eyes or dry eyes. [4]

Digital Eye Strain and Ocular Symptoms

Definition and Clinical Presentation

Digital eye strain refers to the range of symptoms patients experience after long periods of exposure to electronic screens. [1] Digital eye strain can cause ocular symptoms such as dryness, irritation, burning and watering eyes. Patients may also report visual symptoms like blurriness, tiredness, difficulty refocussing and headaches. [3] The frequency and severity can all depend on the activity, amount of time spent, room set up and sensitivity of the eye. [2]

It is important to distinguish between common symptoms caused by digital eye strain and true ocular diseases. For example, patients may experience dryness and burning after a long day at work. However, this does not necessarily mean they suffer from clinical dry eye disease. Similarly, tired eyes and headaches can be caused by needing glasses, problems with focussing, teaming and poor lighting in the room. A proper assessment should be made to ensure everything isn't just due to screen time. [2]

Prevalence and Burden

The prevalence will vary depending on the study. Different groups will be assessed, different questionnaires used and screening times will vary. [7]

A large review conducted by Ccami-Bernal et al found that across 103 studies, 66,577 participants had an overall prevalence of 69.0%. However, this varied greatly between different studies. [8]

Studies in college students have shown there are a lot of ocular problems. A review conducted in 2023 looked at young screen users and found that increased screen time per day and poor ergonomics correlated with worse ocular symptoms. They also noted that research into specific prevention methods is still very inconsistent. [9,10]

Overall this demonstrates that DES is a real problem for those studying or working on screens throughout the day. [10]

Mechanisms of Ocular Discomfort

Digital eye strain is caused by various factors:

- Decreased blinking: If staring intensely at a screen, individuals blink less frequently and do not fully shut their eyelids. This causes disruption to the tear film, leading to dry, irritating and burning eyes.[3] However, not everyone will be affected equally. Blink rates vary depending on the task being undertaken, so not all users will experience this issue.[2]
- Accommodation and convergence: Tasks requiring you to focus on something close will cause your eyes to constantly accommodate and converge.[3] This can lead to tired eyes and difficulty refocusing after prolonged use. This could also cause sore eyes, especially if there is an untreated vision problem or focusing/teaming issues.[2]
- Font size, viewing distance, contrast and screen set-up: If you are working with small font sizes, close distances, poor contrast and poorly set up screens, this will make your eyes work harder.[1] You will tend to lean forward or move the screen closer when squinting to read small text, causing eye and neck strain.[3]

- Glare, reflection, contrast and light: Having glare on your screen, reflections, poor contrast and bright lights will cause discomfort. Dry air and having the vents blowing directly onto your face can cause dry eyes if you are prone to them.[3]
- Length of time using and continuous use: The longer you are using a screen the less opportunities you will have to look away, blink, stretch and redistribute your weight. Research has shown that longer screen times and poor ergonomics cause more severe DES symptoms. Evidence was stronger for some habits than others.[9]

Screen-Viewing Sitting Posture and Musculoskeletal Discomfort

Biomechanical Demands

Neck and shoulder pain while using the screen can occur due to a combination of postural issues, muscle fatigue, time spent on the screen and individual sensitivity. [6] Sitting in one position for a long period of time can cause muscle fatigue. This is made worse by sitting with a forward head posture, hunched shoulders and unsupported arms. [4] Smartphones are typically held below eye level causing you to look down and bend your neck. Laptop screens are often too low, causing you to lean forward with no support for your forearms. [4] Although desktop computers are more adjustable, bad monitor height, uncomfortable chair and incorrectly positioned keyboards and mouses can cause discomfort. [6]

Sitting positions should not be assumed as the cause of chronic pain. Your posture will simply demonstrate how you are performing the activity at that point in time. Individual activity levels, previous injuries, quality of sleep, stress, high workloads and other individual factors can influence whether you experience pain. [5]

Smartphone Use and Neck Pain

Due to the high portability and usage of mobile phones, research has been done on how they influence our musculoskeletal system. [4] Common symptoms reported are discomfort in the neck, shoulders and upper back, and pain in the wrist and thumb. [6]

A study by *Maayah et al*. (2023) explored the relationship between neck pain and smartphone use in college students. They assessed individual characteristics, duration of phone use, and posture whilst using the phone. This shows how important it is to consider how individuals actually use their phones and if they have previous pain. [6]

Chen et al (2025) conducted a review and meta-analysis looking at the relationship between excessive smartphone usage and neck pain. After analysing 7 previous studies involving 10,715 individuals, they found excessive smartphone use increased the odds of experiencing neck pain by more than double (OR: 2.34; CI: 1.44-3.82). However, since these were retrospective studies, it cannot be proved that the pain was caused by phone use. [11]

Although it is clear smartphone use should be monitored, simply looking at the amount of time spent on screens will not give the full picture. [2] Smartphone grip, frequency of breaks, activity performed on the device, previous neck problems, exercise habits and individual factors will all contribute. [6]

Computer and Laptop Use

Using a computer for studying or work will often mean that people will be sat for long periods of time with minimal movement. In addition, people will make small repetitive movements using their hands. [2] Depending on how high the screen is positioned, people may also have their heads flexed forwards, extended backwards, rotated or laterally flexed. [5] This, alongside unsupported forearms and overreaching to reach the mouse and keyboard will cause the shoulder and arm extra strain.

A large review was carried out looking into neck pain in college students. This found the pain could be related to poor sitting postures, long hours spent on electronic devices, head flexion, lack of exercise and other lifestyle factors. [10] Although it can be difficult to determine exactly how much posture affects this, it is highly relevant to campus life.

It is also important to consider total screen time against continuous screen time. [11] Two people may spend 6 hours on their computers, however one person may be moving around, have a good chair and take regular breaks, whilst the other remains in one position with a poor desk. It is important to consider how people are using their screen. [10]

Posture Variation and Ergonomics

There is no 'ideal' posture.[2] Any comfortable posture will cause fatigue if you remain static. A good ergonomic practice will ensure your workstation is comfortable and you are moving regularly throughout.[5]

Sometimes correcting one issue can cause an issue elsewhere. If you raise your phone, the neck will be relieved ,however raising your arms above your head will cause fatigue within your shoulder. [4] If you raise your computer screen to help reduce looking down, having it too high will cause issues. It is important to find a balance between comfortable viewing, relaxation, supporting your arms and moving regularly.[10]

Interrelationship Between Ocular Symptoms and Neck-Shoulder Discomfort

Shared Exposures

Visual symptoms and neck or shoulder pain often occur together as they stem from similar risk factors. Staring at something close for long periods of time will cause eye fatigue, and remaining static will cause musculature to tense. Heavy workloads, poor workstation set-up, fatigue and lack of breaks will exacerbate both issues.[12]

Many studies look into visual fatigue and neck pain in college students.[9] This does not mean there is a cause and effect relationship, but that there are common risk factors between screen use and other underlying factors.[13]

Visual-Postural Interaction

The way you view your screen can definitely affect your posture. If text is small or blurry, then you will naturally lean forward or bring the device closer. If your eyes feel sore, you may also change your posture by tilting your head and changing the distance. This will cause a change in physical load in the neck and shoulders.[12]

Alternatively, if you have neck pain, you may find yourself changing your posture, moving your screen or slouching in your chair to avoid the uncomfortable angle. This will cause a change in your viewing angle and distance, causing your eyes to work harder. How much this affects you will depend on what you are doing, what device you are using and what individual you are.[11]

It is useful to think about this as a bidirectional relationship. There aren't enough long-term studies to prove visual fatigue causes musculature pain or vice versa.[10]

Accommodation, Binocular Vision, and Posture

Accurate focusing and convergence of both eyes is essential when using screens. [1] Poor focusing/convergence skills can cause eye strain, headaches, blurring and difficulty refocusing after prolonged periods of work. [3] This will cause an individual to move their head to relieve this discomfort, which can cause increased strain on the neck and shoulders. [12]

Neck pain cannot always be blamed on focusing or convergence issues. [11] It is easy for physical, lifestyle and medical factors to cause neck pain. In a clinical setting, it is important that we distinguish any findings seen in the eye examination from patient-reported symptoms and assumptions made. [10]

Confounding and Causal Interpretation

Most research into screen usage and physical symptoms uses cross-sectional surveys. [8] While these are excellent for seeing trends, they do not allow us to understand the causality of the physical symptoms. Did increased screen time cause the pain? Did the pain affect their seating position? Or was it something completely unrelated? [8]

There are many confounders when measuring variables. Screen time is usually self-reported. Posture is often subjective. And symptom surveys can cause confusion between physical symptoms such as eye strain, headaches and neck pain. [11,14] Age, prescription, contact lens use, physical activity, sleep, previous injuries and stress can also impact comparisons between individuals. [10]

While it makes sense to consider someone's eyes and posture, there is no evidence to suggest that poor posture causes DES directly. [10]

Recent Evidence and Research Developments

In recent years we have learnt a lot more about digital eye strain, neck pain from smartphones and prevention advice. Large reviews show that CVS is very common. However, the prevalence and causes can vary greatly between studies. [8]

Mataftsi and colleagues showed in their 2023 review that increasing screen time and poor ergonomic practices can lead to worse DES symptoms in young screen users. They also highlighted that blue light-blocking glasses are not a reliable prevention method based on the research. [9]

Musculoskeletal pain has also been studied. Increased smartphone usage was shown to cause neck pain through a meta-analysis conducted by Chen et al. [11]. Another review looking at college students identified that a combination of individual practices, lifestyle choices and desk set-up were factors. [15]

This supports the idea that there are many factors that contribute to physical symptoms and eye issues related to screen usage. Device usage, lighting in the room, posture, mobility, eyesight and individual factors are all mixed together. However, this research is limited due to the different survey methods used, single point in time studies and lack of information on other lifestyle factors. [7]

We do not need any further studies looking into whether screen users experience symptoms, as we know they do. We need research to understand what specific practices are causing issues, how eye and musculoskeletal issues interact over time, and what solutions will be sustainable. [10]

Prevention and Management

Optimizing the Visual Environment

The text should be legible and easy to read from a reasonable distance, with high contrast and appropriate brightness.[1] Minimising glare and reflections and avoiding crowding the screen.[3]

Correctly prescribing glasses, managing dry eyes and eye-team issues should be prioritised. Blue light glasses shouldn't be promoted as an all-in-one solution to DES as the evidence does not show them to be a reliable intervention to manage computer eye strain.[15]

Regular Breaks and Posture Variation

Short breaks can help reduce close viewing and sitting in a static position.[1] Looking at a distance, fully blinking, moving and shoulders and shifting your weight should be done during breaks.[8] Simple changes in behaviour can help reduce long periods of screen viewing.[3]

Using the 20-20-20 rule (every 20 minutes looking at something around 20ft away for 20 seconds) can help remind people to take short breaks.[3] However, they shouldn't be considered to be a miracle cure or the sole intervention for patients. The frequency and duration should depend on the task being performed along with how their body feels.[9]

Improving Device and Workstation Arrangement

Ensure the screen is positioned at an appropriate height and distance directly in front of you for desktops/laptops. This will not cause any neck twisting or shoulder rounding. Using a good quality chair and armrests can help reduce strain on muscles.[2]

For smartphone users, the screen should be held slightly higher. However, this will cause shoulder fatigue very quickly if your arms aren't rested.[4] Rest your arms, change hands and take breaks.[6]

Addressing Individual and Behavioral Factors

Individuals who are busy, stressed, don't have good sleeping patterns, little physical activity and suffer from old pains can make symptoms worse. Good advice should consider the whole lifestyle of individuals.[15]

It is useful to spread awareness on campus as many college students don't have control over their timetable, dorm layout or long online lectures. Any interventions suggested should be affordable, easy to implement and realistic for

students.[7,10]

Evidence for Interventions

Although recommendations can be made to improve ergonomics and behaviours not all popular interventions have evidence to support them. A large review was carried out looking at 45 clinical trials with 4497 participants to see what interventions could help with computer vision syndrome. Blue light glasses weren't very effective at reducing eye fatigue and there was no strong evidence for any of the interventions.[15]

This means we need to be cautious about recommendations made by highly marketed products. In a clinical setting it makes perfect sense to provide correct glasses, manage dry eyes, optimise desk setup, move regularly and take regular breaks. However, more high quality studies are needed to determine what combination will be most effective long term.[9,15]

Limitations of the Available Evidence

There are several limitations to the evidence:

- **Cross sectional studies**- Most studies are cross-sectional meaning we don't know if screen time caused pain.[7]
- **Self-report**- Individuals usually report how much they use their screens and how much their symptoms are based on their memory. This may not be accurate and depends on how individuals feel pain.[7]
- **Different definitions**- There is no standard way of measuring DES, neck pain, shoulder pain or poor posture. Some use validated questionnaires whilst others use simple questions. This makes it difficult to compare data between studies.[9]
- **Not all screen time is equal-** Texting on a phone, studying on a laptop, working at a desktop, gaming, and reading an e-book all ask different things of your eyes and body.[9] What's true for one activity or group might not apply to another.[12]
- **Missing information**- Many studies don't record information such as glasses prescriptions, dry eye disease, exercise, previous injuries, sleeping, stress or workload.[7] Whilst the evidence clearly shows there are many factors to consider, it cannot prove there is a single chain reaction between poor posture causing eye and muscle pain.[10]

Conclusion

Visual display unit related eye discomfort can be linked to visual, motor, lifestyle and ergonomic factors.[1] Visual display unit eye strain can be connected to high eye strain, dryness of the eye surface, optical requirements and environmental factors.[3] Neck and shoulder pain tends to also occur due to people being stuck in a rigid position when using a visual display unit.[2]

Recent studies have shown digital eye strain to be very common, and heavy smartphone usage can cause neck pain.[3]. However, there is no scientific evidence to show that poor posture will directly cause eye strain, or that simply sitting at screens for long will cause pain.[2]. The links between visual display unit-related eye strain can depend on tasks, devices, individuals and environments.[9].

The ideal approach for an optometrist would be to look at overall factors including vision, ocular surface, device usage, room lighting, desk ergonomics and muscular pain.[2]. Providing the correct glasses, individual ergonomic advice, regular movement and break reminders and referrals to physical therapists can provide a logical solution.[15].

Longitudinal studies and rigorous clinical trials should be completed in future to determine specific causes and what combination of visual and postural solutions can provide the best results.[15].

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