

# Vision Related Problems in Visually Demanding Occupations: A Mini Review



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## Mini Review

Vision related problems (VRP) can be defined as a complex of eye and vision problems related to prolong near work when visual demand of the tasks exceeds the visual ability. It can be manifest as a result of formation of blur retinal images due to refractive error, inability to maintain focus and alignment of eyes while performing near work and dryness of eyes due to poor blinking. Vision related problems often manifest as a symptoms of asthenopia [1].

So, a subject with vision related problem may present with an array of subjective symptoms including blur, diplopia, eye strain, headaches, tired eyes and burning eyes. These symptoms can be classified into an external symptoms factor and an internal symptoms factor [2]. External symptoms factor includes burning, irritation, dryness, and tearing. Internal symptom factor comprises strain, headache, eye ache, double vision, and blur to a lesser extent. The causes of VRP are a combination of individual visual problems, poor workplace conditions, improper work habits (prolonged work exposure, sitting in non-optimal posture), higher visual concentration, continuously looking at a fixed object and lesser blinking of eyelids [3]. Visual strain or eye strain is common among employees with visually demanding jobs [4].

For an individual who spends many hours often continuously viewing near objects, it is important that she/he is able to maintain a clear image of the target over time. The presence of any refractive error could impact upon the patient's level of visual comfort during the task. Given the need to achieve and maintain clear and single vision of relatively small targets throughout a near point task, it is important that the retinal image be focused appropriately. The increase in target blur will make performing the task more difficult, thereby leading to increased symptoms such as eyestrain and headache. The presence of uncorrected ametropia may lead to an increase in

symptoms [5]. Uncorrected refractive error also reduces visual efficiency and is etiological factor in binocular vision anomalies such as convergence insufficiency, accommodative insufficiency, accommodative excess and heterophoria. Even a low magnitude of hyperopia may cause asthenopic symptoms of intermittent blur, headache, fatigue, loss of concentration and inattention. Accordingly the high prevalence of symptoms of asthenopia may be related to a high prevalence of low magnitude of astigmatism. The presence of 0.50 to 1.00D of uncorrected astigmatism can produce a significant increase in asthenopia. Furthermore, in myopic astigmatism, no accommodation could prevent blurred vision at distance. Therefore such errors may cause symptoms of asthenopia at near vision because accommodation may place the circle of least confusion in front of the retina. With high astigmatism, ciliary muscles may make minimal effort to correct the error and there may be asthenopia. However, if the degree of astigmatism is low or moderate, patients make unconscious effort to compensate for the error and the ciliary muscle contracts irregularly, causing more asthenopia. Therefore, low magnitude of refractive error especially astigmatism often causes more severe headaches than does a high magnitude [6].

Accommodation and vergence are essential efficiency skills that keep eyes focused and aligned for clear and single image. Stereopsis contributes to judgments of depth and distance. Good binocular vision and Stereopsis critically enhance visual capability and provide more than just depth perception [7]. The main cause of asthenopia is thought to be fatigue of the ciliary and extraocular muscles due to the prolonged accommodation and vergence required by near vision work. In subjects with poor accommodation there also occur headaches while reading. Accommodative dysfunction interferes with the ability of the eyes to focus clearly on objects at various distances, resulting in the lack of clear retinal images. A person who performs considerable amounts of close work is more prone to develop signs and

symptoms related to accommodative or vergence dysfunction. Symptoms commonly associated with accommodative and/or vergence dysfunctions include blurred vision, headache, ocular discomfort, ocular or systemic fatigue, diplopia, motion sickness and loss of concentration during a task performance. That could result from an inaccurate accommodative response during the near task or a failure to relax the accommodation fully following the near vision demands. A patient's symptoms frequently relate to near-visual tasks and inappropriate responses, whether under or over accommodation relative to the object of regard are a common cause of asthenopia [1].

Dry eye like symptoms are a significant component of asthenopia in people working at near. Previous studies have suggested low blink rate to be a cause of dry eye symptoms associated with computer work. Also, low blink rate is suggested to be a potential mechanism for the dry eye like symptoms associated with near work the external symptoms of asthenopia like burning, irritation, and dryness [2]. Blink rate suppression during prolonged near work could lead to tear break up which might lead to degraded visual conditions and asthenopia. Ocular surface related symptoms may result from environmental factors producing corneal drying, reduced blink rate and incomplete blinking.<sup>5</sup> Reduced blinking may also exaggerate the symptoms of pre-existing dry eye, which could be exacerbated by other aspects of the work environment.

Even though problems were initially reported to computer related activities subsequently similar problems are also reported while carrying other types of near point tasks [8]. It is clear that these problems occur to a greater extent in computer workers as well as in workers in other highly visually demanding occupations. In the Shrestha et al. [9] study on visual problems among Video Display Unit (VDU) users in Nepal, there was a high incidence of ocular and systemic symptoms among computer workers. Accommodative in facility was the most common abnormality, while tired eye and headache were the most common symptom reported in the study. The similar kind of reports are noted among computer users in industrially developing countries in University of Benin Nigeria study [10], computer operators of different institutes [11] and computer using students in various studies [12,13]. Vision related problems were also reported among the jeweler manufacturing workers than computer workers and graduate students. The symptoms related to visual, ocular surface, photophobia and musculoskeletal problems were significantly higher for the jeweler manufacturing workers [3,8,14]. The possibility of manifesting such symptoms could be related to the jewelry manufacturing workers having been exposed to lower illumination level and longer duration of work, had shorter blink rate, shorter viewing distances, smaller visual angles and lower contrast jobs. Untimanon et al. [4] reported improvement in lighting conditions, the introduction of short breaks, and correction of visual performance problems could improve the visual strain and the Critical Fusion Frequency (CFF) at one hour

and two hours of work among the electronic workers.<sup>4</sup> Similarly, A significant proportion of call-centre operators also reported both eyestrain and shoulder neck symptoms in another study [15].

Presently, we have conducted a study on vision related problems among Thangka artists considering the possibility that they could be at a greater risk of vision related problems and the fact that Thangka painting demands high visual attention and mental concentration for precision designs, tracing fine designs and details which require high visual attention and mental concentration, and are often near point task. They exposed to a prolonged and repetitive near work using art materials in small and intensely condensed work spaces. The aims to find out refractive error, accommodative and vergence related anomalies and their role on manifesting ocular visual and systemic symptoms among them. The preliminary finding suggests that the frequency of vision related problems among the Thangka artists are high. Accommodative disorders and vergence dysfunction are present in significant number of artists with a significantly high prevalence of ocular symptoms. Overall, from the currently available literatures, it can be inferred that the highly demanding visual task can manifest vision related problems irrespective of the occupation.

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