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Computer Vision Syndrome: a New Challenge for Prevention

Safety

This epidemiological study was conducted on a sample of 314 people, classified into two groups according to the time of use of devices with backlit screens: users (more than 3 hours) and non-users (less than 3 hours). Given that the effect of these practices on the development of sometimes irreversible eye problems has been established, the conclusions of the study indicate the need for specialists to suggest prevention strategies, such as lighting changes, the adoption of healthy posture habits when using computers, the use of artificial Tears, and the use of glasses and contact lenses that are specially designed and treated to protect the eyes.

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Technological advances have had an impact on almost all aspects of our lives. As a result, a personal computer is now a common element in homes, offices, universities, etc. Access to computers has increased rapidly. For example, in 1997, only 18% of homes in the United States had computers; in 2009, this figure increased to 68.7% (U.S. Census Bureau, no date), and in 2013, 83.8% of homes had at least one computer (File & Ryan, 2014). In recent years, other devices have been added to computer use. These include tablets and smartphones that are characterized, among others, by being lightweight and therefore more portable than computers. All of these devices have a backlit screen. These devices are referred to jointly as *video display terminals* (VDTs).

> *In addition to computers, people now also continually use other terminals, such as telephones and tablets, which increase eye health problems and the need for their prevention*

Computers and associated devices are essential in many aspects of modern academic, professional, and social life. Millions of people including children, students, adolescents, adults and the elderly are using VDTs for several hours a day, many days per year and many years of their lives. These hours of use and exposure have consequences for the visual system, neck, and back. The symptoms most commonly reported by users of these devices are eye strain, tired eyes, headache, irritation, burning sensation, red eyes, double vision, neck pain, and back pain that could be caused by the combination of visual problems, improper working conditions and/or usage habits (Cole *et al*., 1996; Collins *et al*., 1998). The condition of a person who experiences one or more of these eye symptoms as a result of using VDT is known as asthenopia in the field of optometry.

In 1987, Grant *et al*. published reports on the problems of asthenopia related to computer use, but the increasing number of people with these symptoms and the increase in the ease of access to VDTs encouraged the American Optometric Association (AOA, 2014) to study, assess, and diagnose the associated symptomatology in greater depth. According to the AOA, these symptoms jointly constitute Computer Vision Syndrome (CVS). CVS is defined as a group of ocular and visual problems caused by the prolonged use of VDTs (AOA, 2014). Specifically, the symptoms identified by the AOA as associated with CVS are: visual fatigue, headache, blurry vision, dry eyes, and neck/shoulder pain. Other commonly occurring complaints include irritation, red eyes, or burning eyes. Shantakumari *et al*. (2014) found that women had a 78% greater risk than men of developing headaches related to CVS. Furthermore, stress, anxiety, and computer-related difficulties were associated with combined symptoms of eye strain and tense/neck shoulders. The most commonly reported problem in approximately 40% of subjects studied was tired eyes, followed by dry eyes and/or eye discomfort (Wiholm, *et al*. 2007).

The purpose of this study was to evaluate the effect of using devices with backlit screens on visual fatigue and its symptomatology. For this purpose, the refractive status, signs and symptoms associated with visual fatigue and the accommodation effort were studied in a sample composed of two groups of individuals: VDT users and non-users.

Sample, Materials, and Method

Sample

An epidemiological study was designed in which 314 people participated, classified according to the time of use of devices with backlit screens into users: more than 3 hours/day (n=122) and non-users: less than 3 hours/day (n=192). All participants in the study signed the informed consent following the guidelines of the Declaration of Helsinki, and the personal information collected remained encoded at all times in accordance with the Data Protection Act currently in force. The following parameters were evaluated in the study: (i) refractive status (ii) symptomatology associated with CVS (iii) binocular vision through analysis of phorias, fusion and stereopsis (iv) dynamic visual fatigue.

Materials and Method

To evaluate the refractive status, a complete optometric laboratory was used with the instruments and tests commonly used for this purpose in optical/optometric practice consisting of a phoropter, cross cylinders, pinhole occluder, slit lamp, ophthalmometer, retinoscope, and other optical devices. Once the refractive assessment was completed, each participant in the study filled out a questionnaire on the symptomatology presented when using the VDT, the questions always being asked by the same examiner.

Binocular Balancing Test

The heterophoria assessment test used, based on the Hugonnier dissociation method, consists of a green stripe and a red dot. Using red-green anaglyphs, the independent vision of each eye is attained and the subject is asked to indicate the position of the dot on the stripe. The width of the stripe is one prism diopter. The classification criterion assumed for the binocular balance status was 6 to 10 prism diopters for orthophoria and below or above these values determined the existence of heterophorias. It should be noted that the evaluation was carried out at two distances: intermediate vision (0.66 m) and distance vision (5 m).

Fusion Test

The fusion evaluation was carried out using a red-green test consisting of a red line (right eye), a green line (left eye) and a cross with two triangles (seen by both eyes). The classification criteria used were as follows: when the 2 lines were perceived to be aligned with the cross, this was considered total fusion; when one or both lines could not be seen, this was assessed as a fixation disparity; and suppression was considered when one line was seen, and alternating vision when the individual saw one line first and then the other.

Stereoacuity Test

Two slightly displaced images are presented that, using polarized filters, independently stimulate each retina. Each eye selects the image corresponding to its filter and, upon fusing them, the system perceives the simulated depth. The complete test assesses stereoscopic visual acuity (SVA) in an assessment range from 3000" of arc to 40" of arc. The patient puts on polarized glasses and was shown a card 40 cm away in photopic light conditions. Methodologically it aims to indicate which of the diagrams the patient considers to stand out from the rest of the figures.

Figure 1. Stereoscopic visual acuity (SVA) test

Dynamic visual fatigue Test

Fatigue can be caused by a prolonged accommodation effort or by rapid alternation of accommodations at different distances. This test consists of presenting 4/10 optotypes alternately in distance (5 m) vision and near (0.33 m) vision. It consisted of two different plates of 5 lines with 3 numbers on each. The time interval between each presentation was two seconds. In each presentation, the keyboard displays indicate the numbers of the lines that the evaluator asks the subject to read. The results were classified as normal (10 correct presentations) or accommodative fatigue when mistakes were detected when reading at the same pace.

Results

The descriptive analysis of the sample can be summarized in the following data. 314 subjects were evaluated, 142 men and 172 women who were between 18 and 30 years old. The average age of the sample studied was 22.4 ± 2.8 years.

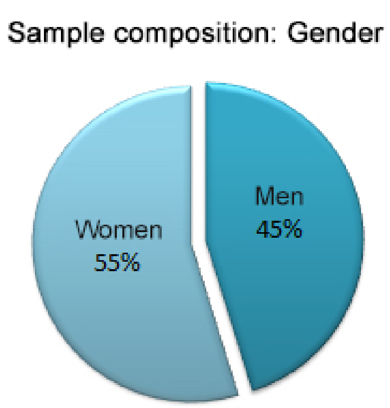


Figure 2. Composition of the sample in terms of gender.

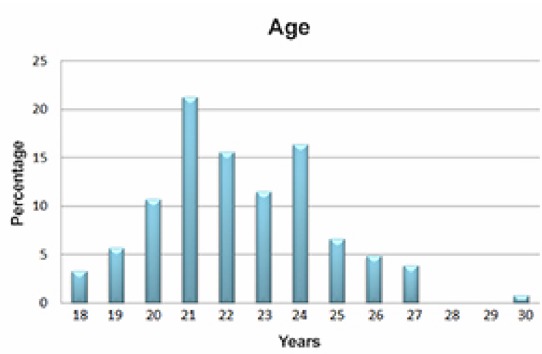


Figure 3. Composition of the sample in terms of the age of participants in the study.

The frequency of use of optical compensation of VDT users as well as the circumstance in which they used glasses are indicated in the following graph 3.

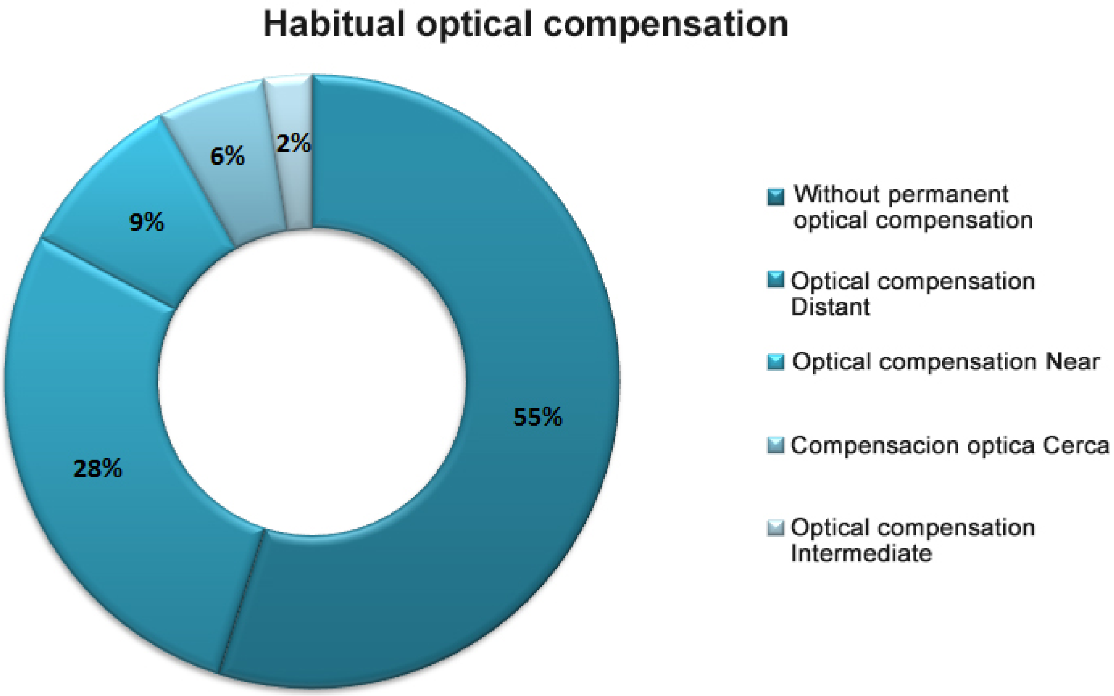


Figure 4. Percentage of people evaluated who used or did not use habitual optical compensation

Analysis of the Refraction Statuses of the Sample

Regarding the analyses of the refraction status of the sample, it should be clarified that the assessment of the refractive statuses was done monocularly, on both eyes, using an objective method (autorefractor). 5 groups were differentiated for analysis of the results: simple myopia and hyperopia, astigmatic myopia and hyperopia and simple astigmatism.

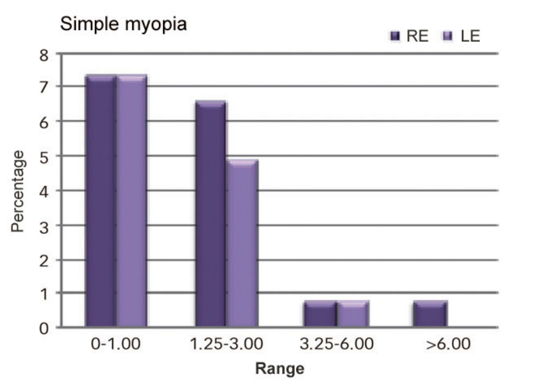


Figure 5. Percentage of eyes (right and left) with simple myopia.

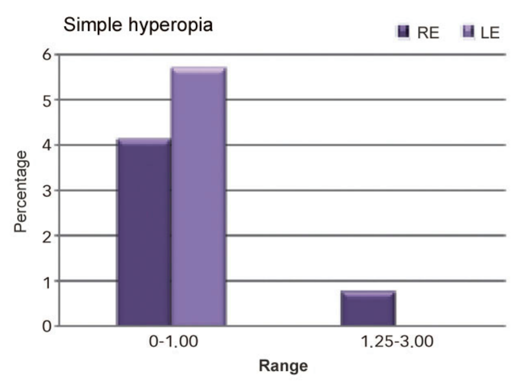


Figure 6. Percentage of eyes (right and left) with simple hyperopia.

In the previous charts, the percentages of eyes with simple myopia and hyperopia are shown. It follows from these charts that around 12% of the eyes evaluated had simple myopia and 6% simple hyperopia. Both ametropias present in different proportions according to the range of classification under consideration.

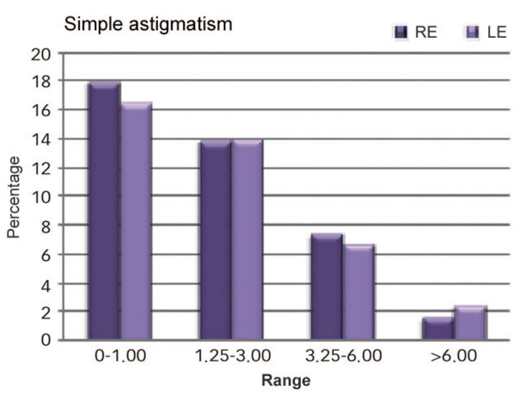


Figure 7. Percentage of eyes (right and left) with myopia and astigmatism

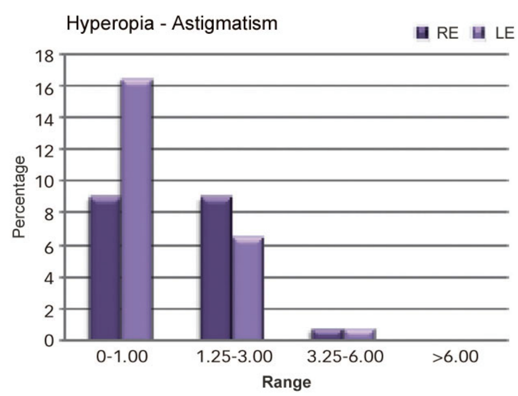


Figure 8. Percentage of eyes (right and left) with hyperopia and astigmatism

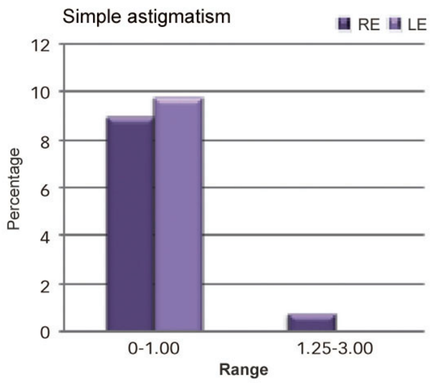


Figure 9. Percentage of eyes (right and left) with simple astigmatism.

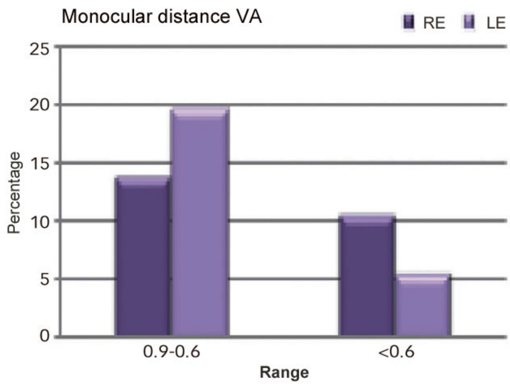


Figure 10. Percentage of eyes (right and left) according to the ranges of visual acuity between 0.6 to 0.9 and less than 0.6.

The three preceding charts show the results obtained for myopia-astigmatism, hyperopia-astigmatism and simple astigmatism. As was expected, for both myopia and hyperopia combined with astigmatism, the percentage of individuals increases regarding simple ametropias.

Analysis of Visual Acuities (Near, Intermediate and Distance)

The results for the analysis of visual capacity diagnosed using a traditional method with maximum contrast optotypes, obtained for both eyes, evaluated monocularly for a long distance and binocularly for three distances, are shown: near (0.33), intermediate (0.66), and distance (5 m). As a classification criterion, visual acuities equal to or greater than 1 in the highest stage were considered. The second value includes visual acuities between 0.6 and 0.9 and finally, in the third group, visual acuities equal to or less than 0.6.

Distance Monocular Visual Acuity

Monocular visual acuity was assessed for both eyes at a long distance.

The results in the entire group show that, for the right eye, 75.8% of the individuals had a visual acuity equal to or greater than 1 with their usual optical compensation while 14.3% had average capacities and 9.9% had deficient visual acuities. Regarding the left eye, visual acuities equal to or greater than 1 were detected in 74.8% of the evaluated individuals, 19.4% in the range from 0.6 to 0.8 and 5.7% with visual acuities less than 0.6.

Distance Binocular Visual Acuity

The binocular visual capacity of the subjects obtained with both eyes for the long distance of 5 meters was evaluated. The results obtained showed 3.5% with binocular visual acuities less than 0.6, 7.3% with visual acuities between 0.6 and 0.9 and 89.2% greater than or equal to 1.

Binocular Visual Acuity for Intermediate Distance

Binocular acuities for intermediate distance showed an improvement in visual capacities when the distance was shorter. The most notable characteristic was the decrease in frequency of deficient visual acuities up to values of 1.6%. Visual acuities between 0.6 and 0.9 were seen in 2.5% of the cases and acuities greater than or equal to 1 were seen in 95.9% of the evaluated individuals.

Near Binocular Visual Acuity

The results were concentrated in high values of visual acuity, and it was observed that 97.1% of the cases presented visual capacity equal to 1 and the remaining 2.9% presented visual acuities in the range between 0.6 and 0.9.

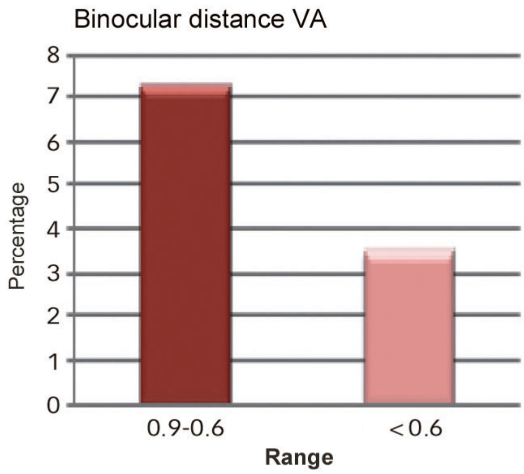


Figure 11. Percentage of distance binocular visual acuity between 0.6 – 0.9 and less than 0.6.

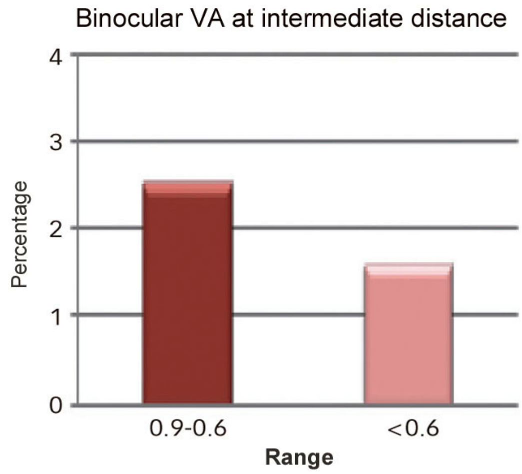


Figure 12. Percentage of binocular visual acuity for intermediate distance between 0.6 – 0.9 and less than 0.6.

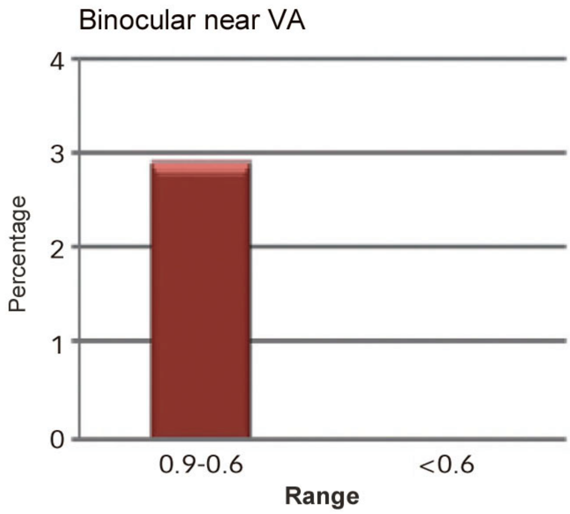


Figure 13. Percentage of near binocular visual acuity ranges between 0.6 – 0.9 and less than 0.6.

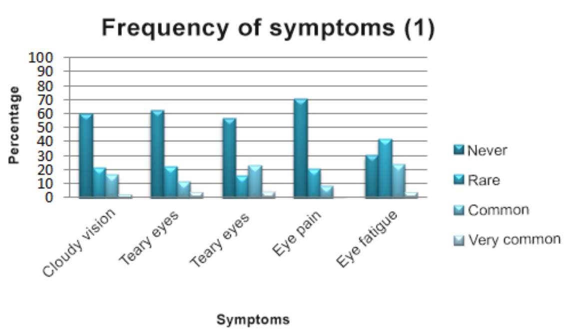
Symptomatology Associated With Using Screens

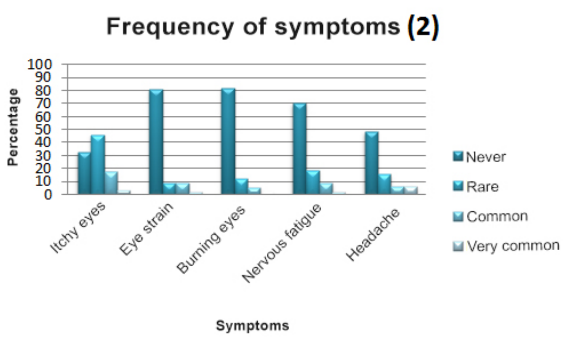
The results corresponding to the analysis of ocular and visual signs and symptoms related to VDT use will be presented in charts that indicate the presence of signs and symptoms and their intensity. It should be taken into account that the results shown were obtained through a questionnaire in which the analyzed subjects answered questions asked by the evaluator.

> *Screen protectors, contact lenses, and eyeglass lenses have been designed, developed, and marketed whose ability to absorb short wavelengths decreases CVS symptoms*

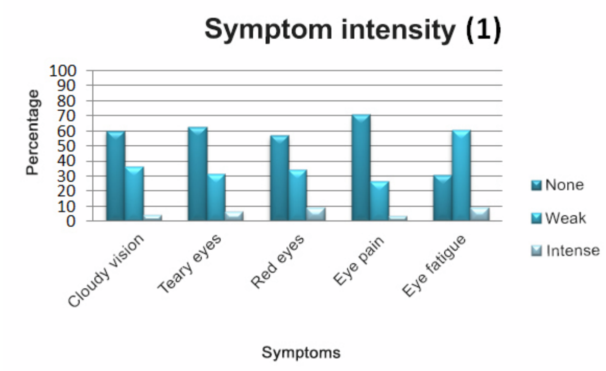
In the first two charts, the symptoms are represented with the data corresponding to the frequency of presentation, and the next two charts show the percentages of intensity with which the previously analyzed subjective symptoms were presented.

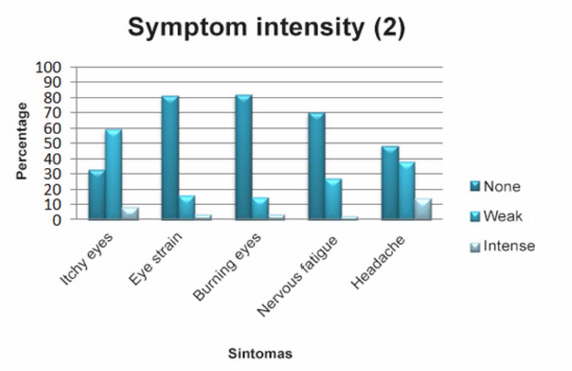
Regarding the percentages obtained for the different symptoms, eye strain and burning eyes stand out, and are probably related to the accommodation needs of working at close and intermediate distances from screens.





Figures 14 and 15. Frequency of symptomatology associated with the use of device screens (smartphones, tablets, computers).





Figures 16 and 17. Intensity of the symptoms associated with the use of device screens (smartphones, tablets, computers).

Study of the Binocular Balance Status

Distance vision

The values obtained for the entire sample (n=314) corresponded to a frequency of 158 individuals (50.3%) with heterophorias as compared to 156 individuals with orthophorias (49.7%).

In the analysis of the results for each group, the differences were not significant with very similar averages and identical typical deviations of 0.50. Regarding the percentages, in the sample of users, heterophorias were detected in 45.9% of the cases and orthophoria in 54.1%. In the group of non-users, heterophorias were presented in 53.1% of the cases and 46.9% had orthophorias.

Intermediate vision

In the entire sample, values were obtained with a greater frequency of orthophoria (60.2%), followed by exophorias (27.7%) and lastly, endophorias (12.1%). These percentages do not coincide with the individual study of groups in which significant differences with a p-value ≤ 0.001 were seen.

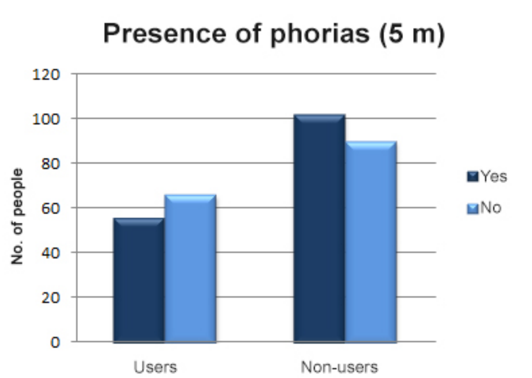


Figure 18. Frequency of individuals with and without phorias, classified according to whether or not they are backlit screen users.

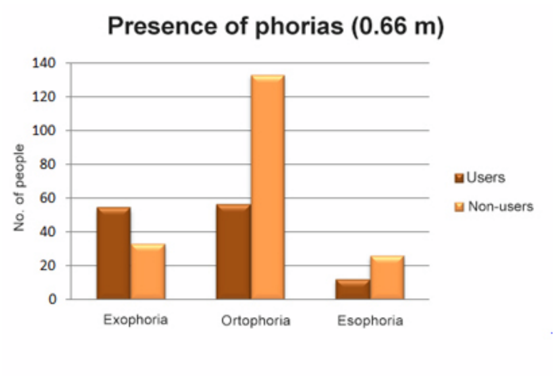


Figure 19. Individuals with exophoria, orthophoria or endophoria, classified according to whether or not they are users of devices with backlit screens.

The variation of frequencies of heterophorias in terms of the study of the entire group stood out. For the group of screen users, 54 individuals were detected with exophoria, 56 with orthophoria and 12 with endophoria, corresponding to 44.3%, 45.9% and 9.8% respectively. For the group of non-user individuals, the values were: 17.2% with exophoria, 69.3% with orthophoria and 13.5% with endophoria.

Fusion Analysis

When comparing the groups, statistically significant differences were obtained, with a p-value ≤ 0.01. In the total population, 77% (244 individuals) presented an appropriate fusion mechanism while in 22.3% of the cases (70 individuals) this mechanism was deficient.

Regarding the sample that uses devices with screens, 104 individuals (85.2%) presented a good fusion mechanism as compared to 14.8% who had inadequate fusion.

In the sample of non-users, 72.9% presented an appropriate fusion while 27.1% had a deficient mechanism.

Stereoacuity

In this last analyzed variable of binocular vision, no statistically significant differences were found in the total sample. The results obtained for the groups of users and non-users were very similar, being adequate in 85.2% and 85.9% and deficient in 13.9% and 13.0% respectively.

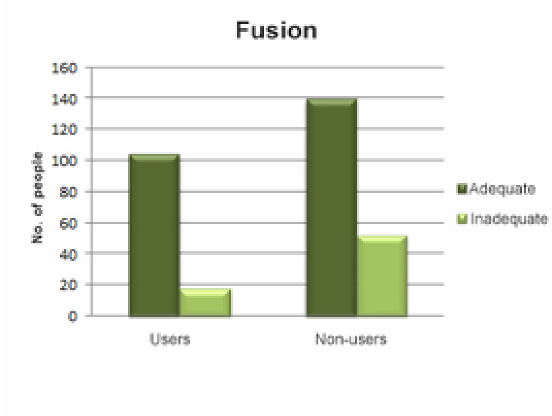


Figure 20. Frequency of individuals with adequate or deficient fusion according to whether or not they are users of devices with backlit screens.

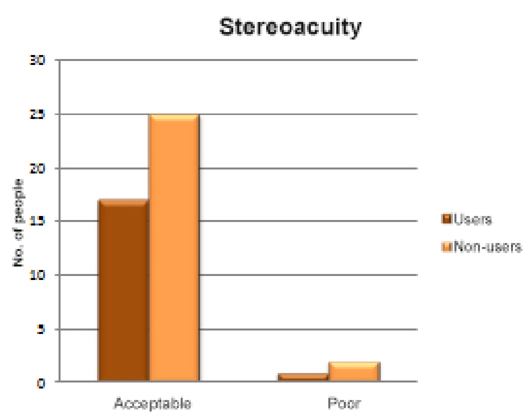


Figure 21. Frequency of individuals with acceptable or deficient stereoacuity according to whether or not they are backlit screen users.

Evaluation of Dynamic Visual Fatigue due to Accommodation Effort

In the test explained in Materials and Method, panels were presented at a close distance and long distance alternately, requiring an extra accommodation effort. The accommodation status in the study population was verified in this way.

The results indicate, without significant differences, a high percentage in both evaluated groups whose error was null; thus, for the total group, 92.4% had an adequate accommodation capacity while 7.6% had errors. Regarding the comparison of the two groups, a value of 94.3% was obtained for user subjects and a figure of 91.1% was obtained for non-users regarding the adequate accommodation levels. This result can be explained by the age range of the members of the sample.

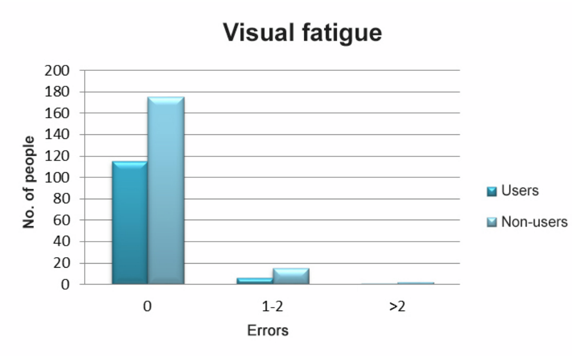


Figure 22. Visual fatigue due to accommodation effort evaluated in users and non-users.

Discussion

As stated in the section Materials and Method, the ametropias in the sample were evaluated in this study, classifying them as simple myopia and hyperopia, myopia and hyperopia combined with astigmatism and simple astigmatism. The purpose of this evaluation was not only to characterize the sample regarding the presence of ametropias but also, which was of significant interest for this work, to evaluate if there were excessive compensations with a spherical equivalent or if, conversely, the astigmatisms were treated as such and used as optical compensation.

The equality between the right and left eyes regarding simple myopia was the first data confirmed from the results, as was the data for individuals with myopias and astigmatisms. The differences were not statistically significant in any case. In this regard, the works of Sanz González Martínez and Muñoz (1994) coincide with the results obtained in this study. The work undertaken by these authors on a population of 103 university students that related the effect of their visual activity to the refraction status shows the inexistence of a refractive difference between both eyes. In the bibliography consulted, many other authors obtained similar results. However, Vázquez (1990), in a study undertaken with a population of younger students, detected a greater number of ametropias, both spherical and cylindrical corresponding to the right eye. In the results, he clarified that these are more abundant in myopic values. The analysis of hyperopia in the studied population focused from the same point of view as myopia and, like ametropia, significant differences were not found in the total population or for each specific sample.

The degree of detected ametropias is moderate, i.e. we found a high percentage of anomalies classified as mild. The result is similar to that obtained by Mûelenaere (1970) in his research to determine the prevalence of composition ametropias (more than 6.00 diopters) in which he concludes that they only affect 3% of the general population.

Headache, eye strain, dryness, burning, feeling of grittiness, stiff shoulders, back pain, and general fatigue are the

Moreover in the doctoral thesis published in 2015 by González, different publications were analyzed to determine if VDT users have long-term alterations in visual function variables such as refraction, amplitude of accommodation (AA) or lateral phoria. In his document, some studies such as those mentioned below *symptoms associated with intensive VDT use*

are notable: firstly, the study published by Yeow (2013) who refers to data make it possible to relate the increase in myopia to the use of vision at close distances for long periods of time. In this regard, Yeow *et al*. published, in 1991, a two-year longitudinal study on a cohort of 243 subjects (178 cases: VDT users + 65 controls: non-VDT users) which describes changes depending on the initial refractive status of the participants with myopias who were under 30 years old with an increase of 0.12 D. Along the same line, Kinge *et al*. monitored the development of myopias over 3 years in a group of 224 Norwegian university students who experienced a significant myopization with an average value of 0.51 D. In contrast to the previous studies, the study presented by Rechichi and Scullica (1996) in which they evaluated the refractive status of 23,000 VDT users and non-users in two phases, with an interval of four years between both, stands out. In this study, the authors did not find significant differences in the development of refractive status between both analyzed groups. It should be clarified that this study was undertaken 20 years ago and that VDTs were not the same and were not used as frequently as they are now.

In populations similar to ours (university students), there are European and American studies that analyze the refractive status leading to widely varying results (Parnell, 1951; Midlefart *et al*., 1992).

Regarding binocular VA and computer use, there are noteworthy studies in which specific tools for visual analysis of VDT users (distance 0.66 m) are designed and they relate them to visual symptoms. Finally, with respect to visual acuity at near distance, the results presented in this study are very positive, even better than those obtained at intermediate distance. Accordingly, the good status visual acuity is confirmed in general in college students who make up the study population. It is also noteworthy that visual acuity improves on bringing the fixation point closer; this statement does not contradict the refraction defects detected, as most of these were due to simple myopic errors or errors associated with astigmatism, ametropia in which an approximation of the near point occurs.

Recommendation for easing eye fatigue: someone using video display terminals (VDTs) for 20 minutes should look at a distant object (six meters) for 20 seconds

In this regard, the study published by Yeow *et al*.. evaluated the development of the amplitude of accommodation over two years, detecting a widening distance from the near point of accommodation among VDT users compared to non-users, although this difference was only significant in subjects aged under forty. The values obtained in the study presented in this paper show that, even considering the start of the decline in accommodative capacity from the age of 20, a very high accommodative reserve remains in the 20-30 age range. Furthermore, the degree of the ametropies detected is mild, allowing for an acceptable visual capacity at different distances.

Regarding the presence of heterophorias, the results presented are consistent with those obtained by Serra *et al*., where the presence of exophorias is verified in regular computer users. In this regard, it is important to highlight the extensive epidemiological study published by Von Noorden and Burian comprising 739 computer users and 126 control subjects in whom different aspects of binocular vision were studied, such as the presence of examined heterophorias and near and far distances and their relation to ocular discomfort. The authors found an increased presence of exophorias followed by esophoria in VDT users. Also they found signs of possible relationships between exophoria and CVS.

An attempt was made to determine, in general terms, the amount of time on average that users must spend in front of the screen before the signs and symptoms of visual fatigue increase significantly. The data item of highest quality in this regard comes from a cross-sectional study conducted in Japan on a sample of more than 25,000 workers, among whom a significant increase in the prevalence of eye strain occurred once length of use exceeded five hours (Nakazawa, 2006). However, when it comes to designing and interpreting studies on this issue, more than the time of daily use should be considered, because recent studies on risk factors associated with the use of VDT have indicated the effect of the amount of time spent staring at a screen without breaks on the increase in ocular and visual symptoms, (Porcar-Izquierdo, 2013; Toomingas, 2014).

Also of note is a study published in 2008 by Fenga, which documented a high prevalence (74.3%) of Meibomian gland dysfunction among a group of seventy VDT users. Although the high proportion of subjects with this dysfunction was subsequently attributed to peculiarities of the sample studied, the study published by Reddy in 2013 recommended the use of artificial tears for rehydrating the ocular surface, as they help maintain tear volume while decreasing symptoms of eye fatigue, dryness and difficulty with concentration, and therefore assist in improving visual acuity.

Health professionals, and especially vision specialists, must explain the risks of overexposure to light emitted by VDTs and the associated symptoms

Elaborating on the latter study, the prevalence of symptoms related to CVS in the study published by Reddy, *et al*. in 2013, was 89.9%, of which asthenopia was 16.4%. Studies from other countries have also reported on the frequency of asthenopia in VDT users, and these results are as follows: 31.9% from Italy (Mocci *et al*., 1996), 46.3% from India (Bhanderi *et al*., 2008), 68.5% from Spain (Sánchez - Romano *et al*., 1996). As can be seen, there is enormous variability in the results, which is attributed to aspects such as the composition of the sample, the geographical distribution and number of hours and the type of tasks performed using VDTs.

As referred by Blehm *et al*., CVS is a common problem, to such an extent that it was considered the most common health problem among VDT users. An increase in symptoms was reported: headache, eye strain, dryness, burning, feeling of grittiness, stiff shoulders, back pain and general fatigue as daily periods of VDT use increased (Acousta *et al*., 1999;

Nakazawa *et al.*, 2006). Table 1 below contains a list of studies showing the frequency of the two most common symptoms reported by VDT users.

Table 1. Frequency of the two most common symptoms reported in computer users. Taken from Reddy, 2014.

	The two most common symptoms are:	
Author and year	First	Second
Shrestha *et al* (2011)	Headache (13.3%)	Tired eyes (21.5%)
Edema & Akwukwuma (2010)	Tired eyes (62.5%)	Blurry vision (59.4%)
Megwas & Daguboshim (2009)	Headache (41.7%)	Eye pain (31.5%)
Bali *et al* (2007)	Visual fatigue (97.8%)	Headache (82.1%)
Singh *et al* (2007)	Burning eyes (31%)	Tired eyes (25%)
Smith *et al* (1981)	Visual fatigue (91%)	Neck and shoulder pain or stiffness (81%)
Reddy *et al* (2014)	Headache (19.7%)	Visual fatigue (16.4%)

It is of particular interest to consider the time spent working in front of VDTs, since classical studies indicate that this is directly related to ocular symptoms; in addition, the longer the period of use, the greater the duration of symptoms, even after the work is finished (Bergqvist and Knave, 1994; Sanchez-Roman *et al.*, 1996).

There is a major controversy regarding the number of hours of use for symptoms to appear. Back in 1996 in the U.S.A. Mutti and Zadnik reported that 75% of VDT users who worked several hours in front of a screen complained of visual symptoms. In the study by Reddy *et al.* (2014), the continuous use of VDTs for more than two continuous hours was significantly associated with the appearance of CVS symptoms. However, Porcar-Izquierdo (2013) concluded that the presence of symptoms associated to CVS are usually mild and transient and decrease after a period of rest. In this sense, Mclean *et al.* (2001) suggest that taking small, regular breaks can relieve the accommodation process, thus preventing eye strain. Breaks during the use of VDTs was the most common preventive measure taken by users to relieve CVS symptoms, using the 20/20/20 rule, as Anshel (2005) suggests. The rule, which could still be recommended, is that the person stare at a distant object 20 feet away for 20 seconds after 20 minutes of VDT use.

Other noteworthy recommendations published to relieve symptoms include the best optical compensation for ametropies and visual problems using glasses or contact lenses to reduce visual fatigue (Sheedy *et al.*, 2000). Notably, in the last decade, contact lenses and eyeglass lenses have been designed, developed, and marketed whose ability to absorb short wavelengths decreases CVS symptoms and also protects the various ocular structures, including the retina, from the damage that this radiation may cause. Regarding the lighting level of both the screen and the room, as referenced in the article by Sheedy *et al.*, 2005, the level of lighting must be regulated, and the average luminance of the screen must not exceed three times the luminance of ambient lighting. In this regard, there have been important technological advances regarding screen backlighting in which LED light sources have been included (with a high ratio of violet and blue light) that significantly increases the energy emitted by the backlit screen. To counter CVS symptoms and possible damage to the macula or the acceleration of cataract formation, recently manufactured screen protectors are proposed which are applied to the surface of VDT screens to block the highest energy light spectrums by absorption without lowering color resolution (see www.reticare.com; www.certificadocsr.com).

Conclusion

The impact of abusing sight in front of the screens of electronic device is scientifically proven. Damage may be mild and reversible, or even serious and irreversible. The increase in conjunctivitis, blepharitis, keratitis, cataracts, and retinopathy is a major public health problem. Preventive medicine can and must address the problems arising from any habit that affects people's health. In this sense, children, adolescents, particularly sensitive people, and the elderly are the populations at greatest risk.

Health professionals, and especially vision professionals, must inform the public about the risks of overexposure to light emitted by VDTs and symptoms associated with the use of these devices. Furthermore, vision specialists must suggest CVS prevention strategies to users, such as lighting changes, positioning knowledge, use of artificial tears, and the existence of new prevention products such as specially treated contact lenses and glasses, and screen protectors.

Other tips such as staring at distant objects, taking breaks, and positioning the screen below eye level can help reduce the symptoms. Furthermore, it is important to use short-wavelength filters to protect the eyes from the highest-energy radiation emitted by VDTs.

The prevention of (reversible) CVS and possible (irreversible) retinal damage must be included in primary healthcare plans, as it is a universal habit whose damage may be exacerbated by increased life expectancy, among other factors. Public awareness of the risks associated with the use of backlit VDT screens must be increased since it is a new event of significant impact.

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