A Case Report of Ophthalmologic Problems Associated with the Use of Information Technology among Young Students in Japan

Tatsuya MARUMOTO[1*],Hiroshi JONAI[2], Maria Beatriz G. VILLANUEVA[3], Midori SOTOYAMA[4] and Susumu SAITO[4]

[1] Marumoto Eye Clinic, Yokohama, Japan
[2] Nihon University, College of Science and Technology, Department of Medical and Welfare Engineering, Japan
[3] Occupational Safety and Health Center, Philippines
[4] National Institute of Industrial Health, Japan
[*] tm@marumoto.com

1. Introduction

An earlier study looked into the role of posture of children while studying in the rising trend of eye problems (Marumoto T et. al., 1999). The results showed that children with impaired vision have shorter viewing distance and lower accommodative power compared to children with normal vision. Posture, however, is not the only factor that has been associated with the failing eyesight of children(Saitou S et. al., 1992). An understanding of the other probable causes of abnormalities in the eyesight of school children is important in the promotion of eye care (Sotoyama M et. al., 1995).

This paper intends to describe the most common visual problems encountered among young patients in an ophthalmologic clinic. The proposed mechanisms for the deterioration of the children's eyesight are also included in the paper. If viewed in the light of continuous use of information technology by children, the findings of this paper will have serious implications when integrating ergonomics in the school or even home settings.

2. Characteristics of the Ophthalmologic Problems of the Young Students

Case 1

This is the case of a ten-year-old boy who came to the clinic because of failing vision. Upon ophthalmologic examination, it was noted that he has anisometropia. His visual acuity was as follows: Right eye=0.3(20/40), Left eye=0.5 (20/63). Accommodation was measured to be: R=5 diopter (D), L=7D. For normal ten-year old boys, the mean accommodation is about 14D. One year ago, he also sought consultation for an unrelated problem and at that time his visual acuity was 1.0 (20/200).

Further investigation of the case showed that prior to the deterioration of eyesight, the patient developed a passion for reading cartoon magazines. It was noted that the viewing distance assumed by the patient is shorter than for usual reading (Fig.1). The right eye was also observed to be dominant and the light eye looks like turned more inwardly during near point vision (Fig.2).

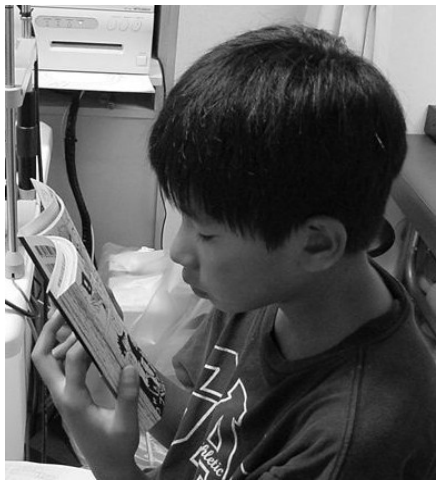

Fig.1 Viewing distance is about 10cm.

Fig. 2. The right eye was also observed to be dominant.

Case 2

A sixteen-year old male sought consultation because of deteriorating vision in the left eye. Visual acuity of the patient was: R=1.2(20/200), L=0.9(20/160). During near point vision, it was noted that the left eye remained in the middle and could not move inward towards the nose. The right eye, on the other hand, moved medially (Fig 3).

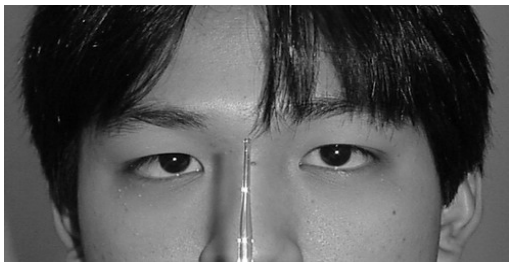

Fig.3. During near point vision,the left eye could not move inward towards the nose.

The patient is a frequent user of short message service (SMS) available to mobile phone subscribers. In the evenings, he sends and reads e-mail using the mobile phone while lying on his back. He usually holds his mobile phone toward the right from the center, closer to the right eye (Fig.4).

Fig.4. He usually holds his mobile phone toward the right from the center.

This practice brought about the loss of binocular vision and the inability to achieve smooth accommodative convergence. Such conditions are often improved by consciously using binocular vision and through the practice of focusing of both eyes on one's finger as it is gradually brought towards the face. Visual acuity is also often improved with the improvement of visual convergence. The patient’s visual acuity of the left eye could improve to 1.0 (20/200).

Discussion

a) Decreased accommodative power.

The number of children, whose accommodation has deteriorated and who have difficulty in seeing things up close, is increasing. During a standard eyesight test performed in the school or an eye clinic, school children usually have their eyesight tested at the 5-meter mark. Because problem with near vision usually develops simultaneously with decreased accommodative power, it is expected that a child, who cannot see well at a distance of 5 meters, will also have poor near point vision measured at a distance of 30 cm.

Prolonged visual work at near point generally leads to a decrease in accommodative power. Examples of activities of school children that involve near point vision are reading cartoon magazines, playing cards in the dark, use of compact displays, such as the Gameboy, and sending and reading e-mail with a mobile phone (Fig. 5).

Fig.5 A mobile phone

Staring at visual targets for long periods may cause excessive strain on the autonomic nerve in the eyes and brain. This eventually results in the focus being fixed on one close point ("focus freezing phenomenon"). This phenomenon serves to protect the eyesight by temporarily impairing children from seeing things at a distance and thus preventing further eyestrain. The deterioration of eye accommodation is brought about by prolonged near point.

Vision at the 5-meter mark as well as accommodation is often improved when the patients are advised to avoid prolonged, focused viewing. It is also important to instruct children not to stare at a computer screen when introducing information technology in schools.

b) Anisometropia.

Anisometropia or the presence of unequal refractive error of the eyes is increasingly seen in children. Disuse of binocular vision is a contributing factor and may increase susceptibility of one eye to develop myopia. The following conditions will repeatedly induce the dominant eye to be closer to the visual target and may predispose to anisometropia:

1) While viewing the television, computer or Gameboy screen at an angle
2) If a child turns or tilts the head when writing
3) When sending and receiving e-mail with a cell phone using one eye

c) Abnormality in Convergence.

Children who have anisometropia may develop secondary abnormalities. If they continue to view objects at close range with one eye, they easily lose the ability to see with both eyes. Smooth accommodative convergence is adversely affected. The conscious use of binocular vision and by practicing to focus both eyes on one's finger as it is gradually brought

towards the face may be done to improve visual convergence and, ultimately, visual acuity.

It is important, therefore, to instruct children to look directly at the screen when using the computer or any visual display. The improvement in vision also would favor the diagnosis that the anisometropia is acquired and not inherited.

d) Uncorrected refractive errors.

Many children with myopia do not wear glasses and their visual conditions may remain undetected because of compensatory measures. It would be this group of children who will frequently have eyestrain and develop myopia since they unconsciously strain to see into the distance. The number of undiagnosed refractive errors among children is much more common than one might imagine.

Attaching a simplified visual acuity chart on the edge of computer screen at a distance of 50 cm from the eyes would be helpful in identifying children with refractive problems. If children cannot see the letters on the chart, they should be instructed to get the proper medical attention. It may likewise be suggested that the children may be encouraged to keep the appropriate viewing distance when using visual displays in order to prevent undue strain to the eyes.

e) Over-correction of refractive errors.

Examination of the eyeglasses and contact lenses of children using retinoscopy have revealed that some were the refractive errors were over-corrected. If children continue to view the visual screen using lenses that would produce over-correction, they are likely to develop eyestrain and a headache.

f) Imbalance in their autonomic nervous system.

Symptoms suggestive of organic brain damage are increasingly seen among school children. They usually complain of acute headache, nausea, and depression. However, in most cases, no particular cause have been found on CAT scan or MRI examination. In most cases, they are eventually referred to an ophthalmologist and an ophthalmologic cause is found.

3. Conclusion

Children these days are showing susceptibilities and eye disorders associated with the increasing use of visual displays in the schools and in homes. The social responsibility of seeking measures to prevent these disorders and to promote eyecare would fall squarely on the shoulders of professionals in the field ergonomics and ophthalmology.

References

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