Asthenopia in schoolchildren, Orthoptic and Ophthalmological findings and treatment

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Accepted 28 September 2005

Key words: Asthenopia, accommodation, convergence, heterophoria and refractive errors

Abstract
The aim of this study was to describe the orthoptic and ophthalmological findings in schoolchildren with asthenopia, to correlate them with asthenopic symptoms and to evaluate the effect of treatment. One hundred and twenty schoolchildren, aged 6–16 years, were included in the study. They were all referred by school nurses, for asthenopic symptoms. An orthoptic and ophthalmological assessment was performed. The main diagnoses were accommodative insufficiency, convergence insufficiency, refractive errors, and latent strabismus. Reading glasses could help 98% of the schoolchildren with reduced accommodation, and 94% of the children with refractive errors and heterophorias were helped with appropriate spherical, cylindrical and prism correction. Convergence exercise reduced the symptoms in all patients with convergence insufficiency. Ninety-three percent of all 120 schoolchildren were symptom free 3–6 month after treatment had started. By an orthoptic and ophthalmological examination abnormalities in schoolchildren with asthenopia related to visual problems can be identified. Most of the children were relieved from their symptoms by giving adequate glasses, convergence exercises and surgery.

Introduction
Many schoolchildren complain of asthenopia. The symptoms range from redness and a feeling of heaviness, dryness, soreness, pain in and around the eyes, to frontal and occipital headaches, blurred vision, intermittent diplopia for near fixation and difficulty with focusing particularly when reading and writing [1]. The child might close one eye to facilitate reading and writing in order to overcome diplopia. The symptoms are reduced or disappear when the patients are resting or do not use the eyes at close range. At weekends and during holidays, the patient may be symptom free. Asthenopia is divided into two main groups: refractive asthenopia and muscular asthenopia [1, 2]. The former type is the result of uncorrected refractive errors such as hypermetropia, myopia, astigmatism and anisometropia. In the second type latent strabismus, convergence and accommodation insufficiency can be found [3]. For a proper diagnosis, refraction has to be carefully tested, binocular vision and sensory fusion has to be examined as well as all areas of accommodative function [4–6]. Asthenopia due to refractive errors can be alleviated with proper glasses [7]. Asthenopia associated with accommodative anomalies and convergence insufficiency can be reduced in most of the cases by accommodative and convergence training [8, 9]. When glasses are worn there is often an improvement in the accommodative facility and relief of the symptoms of asthenopia [8]. There are several studies on asthenopia in adults and children which separately describe the relation between asthenopic symptoms and the near point of accommodation, convergence insufficiency, hypermetropia, myopia and astigmatism [10–16]. However studies on the evaluation
of asthenopia and the effect of treatment in different combination of asthenopic parameters has not been found. No data have been presented to support that associated symptoms could be the result of interpretation of normal physiological phenomenon [17].

The aim of this study was to describe the orthoptic and ophthalmological findings in school children with asthenopia, to correlate them with asthenopia symptoms and to evaluate the effect of treatment.

Materials and methods

One hundred and twenty students from Haninge, one of the suburban areas of Stockholm, were included in this study. The group consisted of 61 girls and 59 boys mean age 11 years (range 6–16 years). They all complained of asthenopia to the extent that they had problems with their schoolwork. The students were referred by the school nurse for an orthoptic and ophthalmological investigation. The visit to the nurse was initiated by the teachers, parents or students themselves. The asthenopic problems were divided into three different groups: (A) Symptoms such as blurred vision, tiredness, sore eyes, focusing problems and intermittent diplopia ($n=64$). (B) Headaches ($n=17$). (C) Combination of groups A and B ($n=39$). A general medical history was taken, including questions regarding the duration and frequency of the asthenopic problems. A detailed description of the exact nature of the symptoms such as tiredness, uncomfortness when reading or studying and questions regarding the student’s concentration, double vision, losing or missing words, blurring or losing focus when reading and writing was also taken before and after treatment. An orthoptic and ophthalmological assessment was then performed. Visual acuity was tested for distance and near with the KM acuity test (Figure 1) [18]. Cover test was done for distance and near to see whether any strabismus was present. The angle of deviation was measured with the prism cover test. To assess binocular vision the stereo acuity was tested by using the Royal Air Force near point rule (RAF). The near point of accommodation was tested 3 times with the right eye, left eye and binocularly to see whether accommodative fatigue was present. The near point of convergence was also tested 3 times. Ocular motility was observed in the nine positions of gaze.

A cycloplegic refraction was performed. An examination of fundi and media was also done in all students. A comparison was done both between symptoms and the different parameters in the ophthalmological and orthoptic examination, and between the different parameters themselves. In order to extend the analysis of influence of refractive errors, particularly with respect to the

![Figure 1. KM. visual acuity test for distance.](image-url)