BINOCULAR COORDINATION

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The ophthalmologist has several basic problems in the consideration of today's preschool or early elementary youngster:

1. The child with an obvious lack of binocularity or frank squint.

2. The child with a coordination defect resulting in poor reading or lack of attention. Such a defect will not be helped by remedial or rapid reading. The resultant external learner, slow reader and learner may evolve into a college dropout, who, if other physical attributes are plentiful, will become successful though averse to learning by reading.

Either type must be considered a visual cripple and the individuals involved in the care and development of such a child must treat them as such.

The human has a potential visual advantage over other animals because of forward facing eyes with resultant superimposition of large areas of the visual field (including the macular areas). Thus there is an intrinsic demand for binocular single vision. However many factors may prevent the development of fusion.

Some of the factors to be considered are:

1. unequal macular function or foveal demand.
2. unequal or undetermined (therefore uncorrected) refractive error.
3. inadequate or unequal accommodative function. A defect in the ciliary-lenticular mechanism of one or both eyes.
4. resultant imbalance of the accommodation-convergence ratio.
5. inadequate neuro-muscular function of the extraocular muscles. A defect in function of one muscle will result in an imbalance of *all* of the extraocular muscles. This will result in a horizontal or vertical-cyclorotatory defect which will preclude fusion. Even so, a demand for ocular parallelism will result in abnormal and occasionally grotesque head-neck-body position (ocular torticollis and scoliosis).
6. a defect in the ocular-occipital pathway. Either 1 or 6 leading to congenital amblyopia.

Consideration of the resultant lack or defect in binocular coordination requires attention to

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these basic components of fusion. For instance, the child who has an obvious squint. In the past it has been common practice to defer treatment because the child, "might grow out of it" or, "the treatment means an operation and that won't work".

First, the longer an abnormal binocular function is allowed to exist, the more ingrained will the abnormal eye-brain pattern become; therefore, the more difficult to correct.

Second, correction of a refractive defect *early* may allow normal binocular function to develop.

Third, it is the rare child who is found to have a real defect of the extraocular muscles. Therefore, the ophthalmologist who operates on the extraocular muscles without recourse to other means does not offer the patient the full benefit of his knowledge nor does he present the patient a real chance for function.

The child with a frank squint and no absolute defect in function (congenital amblyopia, etc.) should be taught monocular single vision for each eye (diplopia) before binocular single vision is possible. A child with a squint must have some stimulus to binocular function before and after surgical intervention to the extraocular muscles; not only because the extraocular muscles may not be the source of the defect, but because the gross surgical correction involved may not be enough of a stimulus to binocular function. In other words, there are many reasons for the development of a squint. Barring those conditions which absolutely prevent fusion, there are many others which cause development of a squint but are not a result of a defect in the extraocular muscles. Since the usual surgical intervention is towards the ocular muscles, the other factors involved must be dealt with first. Training of binocular function is necessary, both *before* and *after* surgery.

The question may be asked, what symptoms does a child with a squint have? Actually, this is a very complex subject and relates to the type of squint the child has and the reason for the development of the squint. Suffice it to say that during the adjustment phase the child may be extremely nervous and irritable with a short attention span. Once the squint has developed the child's behavior will stabilize. The problem then becomes more serious because of several factors:

1. the potential for fusion may be slim.
2. therefore intervention, particularly surgical may be for corrective reasons alone. If so, surgery can be delayed.
3. intervention in a well stabilized squint may, "rock the boat", and symptoms will return, occasionally much worse than before. The development of suppressed eye diplopia may occur.

Because of these difficulties, the parents must be warned that unless they wish to *work* for fusion there is little to be gained from a trial of therapy. Lukewarm cooperation is worse than none at all and should be condemned. The child must cooperate; if not, therapy will be to no avail.

Possibly more important, and far more common, but incurring less interest, are the children with fusion of an unstable nature. This means that the child may fuse, in fact have third degree fusion or stereopsis, but under conditions of stress, lose fusion, or develop symptoms relative to the demand to retain fusion.

These children will have a measurable heterophoria for distance or near and a "brittle" fusion range. Under conditions of stress these children have the choice of: (1) developing diplopia or blurred vision; (2) symptoms due to their demand for single vision; (3) or if both the above are too difficult they will take some other, or even *no* visual act (sleep).

In any case the eye-brain-hand pattern will not be maintained. The child will have poor attention and poor retention. The eye-brain efficiency will be reduced. Such a child will be a poor learner or reader unless other learning means are developed. Some children with poor binocular efficiency learn by rote, develop auditory retention, and utilize abstract cerebral mechanisms. They are poor readers and therefore do not do well in English, History, or language. They may however, do well in mathematics or science subjects where visual efficiency may not be demanding.

It goes without saying that a child with inadequate binocular function will not gain through remedial reading or rapid reading courses. These may in fact be particularly frustrating and lead to other symptoms.

Recently, some interest has been shown in the astronauts' and other intrepid pilots' inability to maintain passing marks in college. One has only to peruse the eye requirements for a flight physical to determine the reason. Passing visual requirements of 20/20 monocular for distance and near, the pilot candidate has heterophoria measurements for distance alone, a near point of convergence of up to 70 mm., accommodation of up to three diopters less than normal for stated age, a slight refractive hypermetropia. The conditions are perfect for a convergence insufficiency for near. Such an individual must perform real work to function for near. With the passing years, diminution of an already underdeveloped accommodative function will only lead to further aversion to reading work, or if reading is required, the development of symptoms. College level work requires significantly more reading than high school (where the individual can utilize other means to attain acceptable marks) and the individual described above will be headed for scholastic difficulties. Needless to say, the passing of years will only add to the difficulty with close work.

Binocular coordination is a subject of vital interest to the physician interested in the developing child. As noted above the child with a frank squint is only a small part of the total problem.

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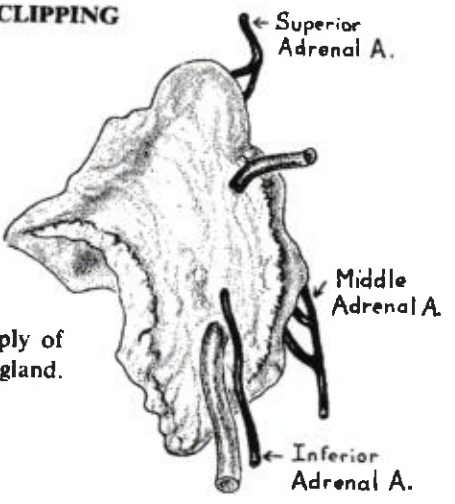

Blood supply of the adrenal gland.