

## A NEW METHOD OF ELECTROPHYSIOLOGICAL INVESTIGATION OF VISUALLY HANDICAPPED CHILDREN

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### Abstract

422 visually handicapped children are studied for etiology, age of onset and level of visual acuity. Electrophysiological studies are being used to try to understand the basis of the amblyopia and further research in this area seems desirable.

### Key Words

Visually handicapped, amblyopia, electrophysiology, E.R.G. sclero-corneal contact lens, optical fibres, light pencil.

Two associations — the A.N.P.E.A. and the F.N.A.P.E.D.V. have been set up in France to study the problems of visually handicapped amblyopic children. They aim to help the families of these children by a) representing them at the cabinet level of the Secretary of State for Social Action and b) guiding them through the necessary steps with the C.D.E.S. which in turn evaluates the visual handicap, provides medical and educational guidance and grants an allowance for special education.

Only ten orthoptists are working with low vision patients in France. Their main goal is to maximise the use of the patient's residual vision and to promote some degree of self-sufficiency for them. With favourable familial and social environment, adaptive faculties can be developed.

Working in this context, it is not our purpose to measure precisely the level of visual acuity, but to observe the behavioural approach of the handicapped children and watch how they manage to utilise their remaining visual capabilities. Neither is it necessary to introduce classical orthoptic re-education which has little value in these cases. Orthoptists try to help each child with his particular problem. The aim should be to encourage the child to achieve the best possible level of vision, avoiding any preconceived ideas of what the child might or might not do.

From a recent statistical study of 422 children with visual handicap we would like to present the following results:

### 1. The age of onset of the visual handicap:

At birth	24.7%
0 – 1	35.1%
1 – 3	18.5%
4 – 6	11.5%
7 – 8	5.1%
9 – 15 yrs	5.1%

Almost 60% of children with low vision show age of onset before the age of one year, and 30% between one year and six years of age. Half of those children with late onset had suffered trauma ie 5%.

Awareness of the visual handicap varies but often it is the parents who notice that their child does not follow objects at the age of three months. At this age initial electrophysiological investigation is possible. The problem then is to decide whether it is a pure visual handicap, an encephalopathy or a psychomotor retardation.

### 2. The visual acuity:

Below 0.05 (6/120)	50%
Between 0.05 – 0.1 (6/60)	25%
No precise evaluation recorded	25%

No information was requested on the visual field. The assessment of visual acuity is important as this is the only parameter which is used to evaluate the visual handicap for the provision of future medico-educational guidance and qualification for grants for special education.

3. Causes of visual handicap in our 422 children:

At birth	23.7%
Premature	11.4%
Cataract	10.9%
Rubella	8.7%
Retinal diseases	7.8%
Glaucoma	7.6%
Diseases	5.6%
Heredity	5.2%
Injury	4.3%
Myopia	3.6%
Tumor	3.3%
Toxoplasmosis	2.4%
Albinism	1.9%
Nystagmus	0.7%
Unknown	3.5%

Parents are often uncertain of the cause of the child's visual handicap. Hopefully, electrophysiological studies of each case will help to define the cause of the handicap more precisely.

4. Handicaps associated with low vision:

Motor handicap	12%
Hearing problems	7%
Brain dysfunctions	9%
Several handicaps	4%
Without other handicap	68%

5. Early schooling: (only 80% of 422 children).

Normal kindergarten	62%
Specialised kindergarten	38%

87% were already classified as low vision children.

6. Braille education:

70% are learning Braille at school but most of the children wanted to be educated only in "black". They wished to be considered as normal students and to join the normal school courses as soon as possible.

The role of the orthoptist is to help these children with their specific problems which are based on the cognitive processes of visual perception. These children may have poor memory for visual stimuli and have poor concentration.

**ELECTROPHYSIOLOGICAL INVESTIGATION**

In order to understand better the etiology and explain to the parents the visual handicap of their child, we have undertaken the development of a new method of stimulating the retina by means of a light pencil conducted through optical fibres from the light source to the pupil of the patient's eye.

For this purpose, the extremity of the fibre is set in a scleral contact lens laid on the eye. This contact lens also contains a measuring electrode for electroretinograms (E.R.G.) which enables the operator to conduct various investigations (static E.R.G., dynamic E.R.G., measurement of retino-cortical conduction time).

This special lens, originally designed by Mr. Dudragne, has enabled us to obtain excellent results. It is made of soft black plastic and is easy to wear. (See fig. 1)

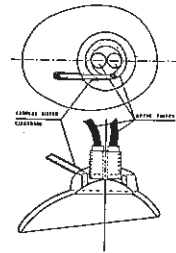


FIGURE 1  
Special Sclero-corneal Lens  
Produced by ESSILOR (FRANCE)

The manufacture and testing of the prototype have now been completed, and the advantages of the system appear to be the following:

- the recording is not affected by the movement of the patient's head, eyes or eye-lids;
- the position of the patient does not interfere with the light source which makes the system very convenient;
- the results are linked to a precise stimulating wave-length, determined by the geometrical characteristics of the optical fibre and by the position and the characteristics of the filter set between the source and the fibre.

This visual electrophysiological procedure is objective and does not require co-operation of the subject. It includes an electro-retinogram for retinal function and a study of the visual evoked potentials for macular function, optic nerve, tract and occipital cortex. It is important to realise that E.R.G. can be recorded in new-born babies. The amplitudes are smaller than in average results but the "A" and "B" waves are separated even in the first days of life.

*Conclusion*

In connection with a recent statistical study of 422 visual handicapped children in France, we

have attempted to introduce the role played by electrophysiological investigation of visual function.

It is essential to make an early decision about the child's near and remote future. The choice of the most suitable medical and cultural orientation will result from better knowledge of the child's psychology, his family and social environment, as well as from a detailed medical investigation.

Thanks to continuous strides in optics, electronics and computing, we hope that in future, we shall have even better tests, allowing more precise and reliable results. Collaboration between ophthalmologists and orthoptists in research should be encouraged in the field of electrophysiology.

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