

MEDICAL AND EDUCATIONAL PROBLEMS OF THE BRAIN-INJURED CHILD*

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In order to lay down standards for admission to our cerebral-palsy schools, the Union Department of Education, Arts, and Science has accepted the following definition of cerebral palsy (drawn up by the Technical Committee of the Cerebral Palsy Division of the National Council for the Care of Cripples in South Africa): 'Cerebral palsy is a term used to designate any abnormal alteration of movement or motor function arising from a defect, injury or disease of the nervous tissue contained within the cranial cavity. The lesion may be localized or diffuse and it may be caused by factors arising before, during, or after birth'.

Among the signs and symptoms present are the following: motor dysfunction, convulsions, speech defects, mental retardation, behaviour disturbances of organic origin, and sensory losses, particularly in hearing and vision.

It is recommended that the handicapped brain-injured child without motor impairment, defined as follows by Strauss and Lehtinen be considered under certain circumstances for admission to a cerebral-palsy school: 'A brain-injured child is one who, before, during, or after birth has received an injury to, or suffered from an infection of, the brain. As a result of such organic impairment, defects of the neuro-motor system may be present or absent. However, such a child may show disturbances in perception, thinking, and emotional behaviour, either separately or in combination'.

The criteria for admission to cerebral-palsy schools are as follows:

1. All children suffering from cerebral palsy in terms of the definition of the National Council for the Care of Cripples in South Africa.
2. The children must be able to benefit by the corrective and educational treatment provided at the school.
3. The brain-injured child (Strauss and Lehtinen) may be admitted provided he can benefit by the school programme and is not aggressive.

The approach to the handicapped brain-injured child without motor impairment is essentially an original approach peculiarly applicable to South Africa. Because of the absence of facilities for educating these children, and because their educational problems are identical with the accepted types of cerebral palsy, we can assist by taking them into our schools. That this decision is a wise one is shown in our own school in Pretoria. This school has been of considerable help to children who were floundering in the ordinary schools, and who are now making good progress. The big advantage of tuition in a special school is the fact that teachers are provided on a basis of 1 to 10 pupils. As soon as a quota of 16 is reached an extra teacher is provided—this is in terms of the regulations and can be demanded as a right. Contrast this with an ordinary school where the teacher has to cope with 30-50 children. You can well imagine what

happens to the retarded or handicapped child under such conditions.

Educational problems arising out of physical defects would not have been discussed at a medical meeting 20 or 30 years ago. The modern trend in social medicine is, however, drawing the physician, and in particular the paediatrician, into a holistic alliance—that is, into treating the child as a whole, and not merely that part of his body which is affected.

It has become important to realize that in the field of cerebral palsy it is not only the numerous medical specialists who are required to treat the handicaps, but that paramedical personnel—therapists of various types, as well as psychologists and teachers—are an essential part of the team. I would say that teachers are the most important but they are unable to carry on their difficult and complicated task without a proper diagnosis and without proper medical guidance. Hence our institutions for cerebral palsy in South Africa are called 'schools' and not hospitals, and the heads of these schools are teachers and not doctors.

A situation has therefore arisen in which medical personnel are inevitably drawn into close contact with lay people. Not only must the doctor at the cerebral-palsy school work with such people at the schools, but, if they are to complete their work in its widest implications—those of helping towards the rehabilitation of the child—they must be in close contact with the parents' associations and with the wider public who support the schools financially.

SENSORY AND MOTOR DEFECTS

This paper is restricted mainly to the sensory defects in the cerebral-palsied child, with and without motor defects, all of which interfere with his education.

Most of the material that is being presented is taken from the data quoted in *Cerebral Palsy in Childhood* by Dr. Grace E. Woods.¹

Visual Defects

These are present in about 60% of the children, the commonest being defective eye movements (32%); a few are blind (3%); a few have defects of their field of vision (4%); and some have impaired vision (15%). The cause in most of these cases is cortical and not peripheral damage. There is cortical damage causing a defect of vision or of memory of visual imagery. The child is unable to perceive the world in three dimensions but as he gets older and is able to move about, he begins to improve and may be able to learn to judge distance, size, and texture. Many cerebral-palsied children lack binocular or stereoscopic vision; this is not always necessarily serious. The defect may be due to occipital damage causing inability to recognize pictures, shapes, and perspectives.

In *muscular imbalance*, in contrast to what occurs in simple strabismus, single muscles are not necessarily involved. The whole nature of the eye movements is at

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fault. This may correlate with the physical disability, e.g. in a severe adductor spasm the eyes may converge. The eyes may become fixed, like the joints, but if the patient relaxes the eyes may have full movements.

In the *athetoid child*, conjugate deviation of the eyes from one side to the other may be related to the persistence of a tonic neck reflex. The eyes deviate to the side of the strongest tonic neck reflex and get pulled over. In some athetoid children there is an alternating squint. Other children will look sideways, and develop an ocular torticollis. They will walk with their heads to one side and with arms and legs in a position suggestive of the tonic neck reflex. Treatment to the whole body may improve these abnormalities, but it has to be given early.

The *ataxic child* may have difficulty in holding his eyes in conjugate deviation, the eyeballs springing back to a central position. He will have difficulty in reading and walking, since he is unable to hold his eyes in the lateral position which will result in visual confusion. In addition there may be parietal-lobe damage which will add to the learning difficulty as a result of the disturbance of spatial perception, number sense, and sense of body image.

In *spasmus fixius* the head shifts from side to side in walking, even when the eye movements are normal.

In *ataxic athetosis*, due to a lesion in the superior colliculus and the cochlear nucleus, there is athetosis with very little tension, defective upper movements of the eyes, deafness, and poor head control.

Hearing Defects

These occur in 10% of the children. They are not due to peripheral or nerve deafness, but to central defects. There are two types of deafness — high-frequency deafness and auditory agnosia. High-frequency deafness is usually due to neonatal jaundice involving the cochlear nucleus. Cortical or sub-cortical lesions cause auditory agnosia. In this condition the child can hear but the sounds are meaningless. There is some specific difficulty in synthesizing sounds and breaking down words into their components. This may increase inattention to auditory stimuli.

Just as the residual hearing in deaf children can be helped if their training is commenced early in life, so can cerebral-palsied children with auditory agnosia be helped if they are taught to hear and listen, by prolonged period approach by means of auditory experience only. This teaching, however, must be started in the first year of life.

In this connection it is most important to know that the Special Schools Act which has been before Parliament makes provision for the 'admission of a child to a Special School from any age, if suffering from blindness, deafness, epilepsy, or cerebral palsy'. This is a great advance in social legislation affecting handicapped children.

Aphasia

This presents a real problem in our schools. That aphasics fall into the definition of brain-injured children must be accepted. It is this type of case that in the first instance made us widen our definition. These cases really should be taught on their own because they are a real

problem in education. In most countries they are taught in schools for the deaf. In South Africa some of these schools admit them, others do not. As a result we have a number of aphasic children in our school in Pretoria who are making reasonable progress. One such child spent three years at our school, and is now attending a normal school and competing on even terms with the children there. We shall probably have to start a special class as soon as we have enough children.

Aphasia is divided into receptive and expressive types (previously known as sensory or motor). Usually both components are present. In receptive aphasia the child can hear, but he is not able to translate what he hears into meaning. The understanding of speech is located in the dominant hemisphere with a subsidiary centre in the non-dominant hemisphere. If the receptive centre of one hemisphere is damaged, the other one can be trained to take over and become dominant. This is because both centres have potential, though not altogether equal, possibilities at birth of being trained as language association systems. In expressive aphasia the child can hear and understand but is unable to speak. The defect is not due to any difficulty of the muscles of speech but is due to a lesion in the motor speech area of the cortex — the frontal lobe on the dominant side. The other hemisphere can take over the function of the speech centre if this is damaged at birth or in early life.

Speech Defects

These are mainly due to lack of motor control of the organs of speech where there is spasticity, athetosis, and ataxia of the movements of the face, lips, tongue, palate, and the organs of deglutition and respiration. The greatest difficulty is with the athetoid child.

EDUCABILITY OF THE CEREBRAL-PALSIED CHILD

Schoolchildren are classified into four main groups, the ineducable, the educationally abnormal, the normal, and those with superior intelligence.

Children who have an injury in the non-dominant hemisphere have, according to McDonald Critchley,² executive difficulties (they forget *how* to do things) whereas in the dominant hemisphere memory is stored and the patient with an injury here forgets *what* to do. It is thus seen that both hemispheres have important functions in learning.

Disorders Due to Brain Damage

Children with brain damage suffer from three main disorders (these do not apply to all cerebral-palsied children):

1. *Lack of concentration* with marked distractibility. A number of factors may contribute towards this. They include inability to focus or discern objects; muscular spasm with loss of power to make efforts to concentrate; severe educational difficulties in which ordinary teaching methods are too difficult for the child, whereupon he ceases to attend; and epileptiform stimuli (without any fits) in which stimuli from the damaged areas may interfere with the normal functioning of the brain.

2. *Hyperexcitability*. The child has difficulty in remaining seated and shows uninhibited behaviour.

3. *Perseveration*. Here there is persistent repetition of an activity once it is begun.

The above disorders result from the disorientation of the child's cerebration and an inability to organize separate and consecutive thought.

Learning Difficulties

These are present as the result of a lowering of the general intelligence and of behaviour disorders in some children. There is evidence of perceptive and conceptual disorders which affect their ability to learn. These children are frequently labelled mentally backward but the difficulties may be due to specific brain injury.

Perception is the activity of the mind intermediate between sensation and thought. It gives a particular meaning and significance to a given sensation and acts therefore as a preliminary to thinking.

In apparently mentally-normal children who have cerebral palsy, certain learning difficulties may present themselves. These include: not understanding the difference between up and down, horizontal and vertical, right and left, round and square; inability to recognize letters or pick out objects in pictures; and difficulty in translating the three dimensions of ordinary vision into the two dimensions of pictures, with the result that the child may not be able to recognize objects.

Difficulties with numbers may be part of a general learning disability in which reading and writing are normal. The child may not know that 4 is greater than 3. He is incapable of giving the correct number of articles on request. There may be difficulty in visualizing the size of groups of pegs on a board. Such children may attend normal schools without anyone realizing the significance of the child's difficulties.

Executive side. Here the child cannot copy simple lines, slanting lines, angles and shapes. The child may be able to read but writing is difficult. He may not be able to copy words but is able to write words or stories voluntarily. There may be mirror writing or upside-down writing. Drawings may be disorientated with the wrong proportions. The child may be incapable of making any organized shapes. These perceptual difficulties may be related to some definite clinical signs.

Sensory discrimination. There is no marked relationship between astereognosis and perceptual difficulties. Some hemiplegic children with astereognosis have no learning difficulties and some with learning difficulties have no astereognosis. In some, both co-exist.

Crossed-lateralism is difficult to assess as a cause of learning difficulties. Children with this defect may indulge in mirror-writing, reversal of words or numbers, and reversal of the direction of writing. These are considered to be minor sources of difficulty.

Body image. With these perceptual difficulties we must associate the difficulty in conception of the shape of the body and its position in space—that is, appreciation of the body image. Ritchie Russell³ defines the body image system as that which makes it possible for appropriate bodily movements to be performed in relation to apparent stimuli.

The development of the body image is fundamental to normal development and behaviour as by this means we are in a constant state of awareness of the position of the body. Lesions in the parietal and occipital lobes of the non-dominant hemisphere may result in interference with the normal development of the body image. McDonald Critchley² describes difficulties in adults. In children this defect may produce great learning difficulties because the child may not be able to distinguish between right and left, or to recognize pictures. There is difficulty in calculation and in the execution of letters. Gerstmann's syndrome, the lack of ability to recognize covered fingers, may result in arithmetical difficulties, because the ability to count on 10 fingers and 10 toes is basic to one's conception of numbers.

CONCLUSION

In summing up I should like to recapitulate some of the essential difficulties with which a brain-injured child may be confronted in his education. They are: mild or severe difficulty in learning the three Rs, recognition of shapes, and execution of shapes; difficulty with numbers; and lack of body image (some may have the feeling of floating in space, without focussing, understanding, or coordinating their activities). Some brain-injured children have none of these difficulties.

The parts of the brain that dominate the picture in the education of the brain-injured child are:

1. The *parietal lobes* controlling perception, body image, and finger agnosia.
2. The *temporal lobes* controlling behaviour.
3. The *occipital lobes* controlling spatial behaviour.

It is the total cerebral damage that determines the learning capacity of such a child.

I have tried to present a picture of the many difficulties facing a cerebral-palsied child in his struggles in life. Being neither a teacher nor a neurologist, I have not been able to present as composite a picture as the subject deserves. I have drawn on information gained from Dr. Grace Woods,^{1,4} Mme. Stella Albitreccia⁵ and Sir Ritchie Russell,³ whom I met at the last meeting of the International Study Group on Child Neurology and Cerebral Palsy held at Oxford in 1958. I have also had contact with this problem at our cerebral-palsy school in Pretoria. These difficulties are real, and present a great challenge to teachers and doctors.

An important contribution to the knowledge of this subject will be research into the normal and abnormal development of the human infant from the moment of birth. Our greatest asset will be early and correct diagnosis of brain injury in patients who can describe no symptoms, and show minimal signs or none at all, a concept which at present is difficult to visualize.

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