CENTRAL DEAFNESS - PEDAGOGY

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A research that has involved intensive studies of children with communication problems other than those due to peripheral deafness has this year been completed by Dr. I. G. Taylor, Lecturer in Clinical Audiology in our Department. Using electroencephalography he has tested the response to sound, during sleep, of 80 children. **With the collaboration of Dr. N. S. Gordon, Consultant Neurologist at Booth Hall Hospital, Manchester,** the children have had full neurological examinations and their ante-natal and peri-natal histories have been investigated. Subjective tests of their hearing, in the waking state, have been made and their whole physical and mental development assessed. It was found that, in a number of cases, audiograms and results of tests with meaningful sounds were within normal limits when the E.E.G. technique in sleep was used, although subjective testing indicated deafness. **It has been shown that we have children in schools for the deaf and hard of hearing who present these and related problems. With the support and encouragement of our Goverment, through the Ministry of Education, the City of Manchester has undertaken to establish a unit to provide special educational treatment for children with communication disorders. University approval has been given to a plan for us to collaborate in the selection of children for admission and development of procedures for their treatment. This responsibility will be additional to that for the many problem cases which are referred to the preschool section of our University Audiology Clinic and other audiology clinics in which we conduct sessions.**

Penfield and Roberts (1959) have stated „...the indispensable substratum of consciousness lies outside the cerebral cortex... not in the new brain but in the old ... probably in the diencephalon" and that there is „evidence of a level of integration within the central nervous system that is higher than that to be found in the cerebral cortex". Penfield has postulated that comprehension of speech occurs after impulses have been received in the higher brain stem and both cortical auditory areas, and during interaction between the higher brain stem and left hemisphere. From the higher brain stem and left hemisphere impulses pass to both cortical motor areas and thence to the final common pathway to those muscles used in speech.

Taylor 1962 refers to Magouin's experimental studies (19) that have led him to confirm Penfield's conclusion. Magouin has described the „central reticular mechanism" as a „central transactional core" within the brain „capable of grading the activity of most other parts of the brain... as a reflexion of

its own internal excitability, in turn a consequence of both efferent and corticofugal neural influences".

We have come to believe that our educational approach to „central deafness" has to be made in this context of highly integrative cortical and diencephalic functioning, with particular reference to the reticular substance, affecting both hearing and speech. It would seem that damage or deficiencies in any one of these closely related structures affects the functioning of the rest.

Clinically and pathologically also it appears that neurologists are not in a position to specify extent of damage, when, for instance, auditory impairment and linguistic handicap are associated with a history of kernicterus or to a peri-natal anoxia. Penfield and Roberts have stated that when reviewing the cases of „word deafness" they were „unable to find a single case with an isolated defect". Tansley and Gulliford (1960) state that because „the manifestations of brain injury are little understood at present" and because of individual differences among children (which they describe) „we cannot detail the characteristics of the brain injured child".

Educationally speaking, therefore, we seem to have to approach "central deafness" on a broad front, with a combined team of experts representing otology and audiology, neurology, psychology and remedial education, holding periodic case conferences about each child. **Remedial education is begun on a basis of results of initial examinations in each speciality but the joint clinical approach needs to be a continuing process.** Taylor has found in his research indications that maturation, involving late development of the central nervous system, may result in changed audiological findings. He has reported cases in which children, who have at first responded only in sleep to sound within normal limits, have, after several years, done so in the waking state.

This last point has relevance to the potentialities for children with communication disorders of pre-school training which has for so long been an essential part of our work for deaf and hard of hearing children at Manchester University. Our Ministries of Health and Education circularised, in 1961, public health and education authorities, hospitals and local medical committees strongly recommending detection and diagnosis of deafness in infancy and early childhood. Screening tests of the hearing of babies and young children, in the administration of which we give training annually to large numbers of medical officers and of health visitors, are effective, we find, to detect failure to respond normally to sound and to develop speech normally, from any cause. Owrid (1958) confirmed by Sanders (1961) has shown experimentally and statistically that 88 deaf children aged five to eight years who had had home training remained significantly superior to 284 who had not, in the comprehension and use of spoken language, after their admission to school. We have begun to explore, at Manchester, the extent to which similar potentialities exist for children with communication disorders, whether due to central deafness, aphasia or some other cause.

The headings under which progressive case histories, of children who are suspected of coming into this broad category, are needed, as a basis for educational guidance and treatment seem to be (1) audiological examination of response (a) during the waking state and (b) when tested by EEG during

sleep, to pure tones, speech and other sounds that are normally meaningful to children, at diffent ages; (2) otolaryngological examination — with the possibility that a conductive overlay or a perceptive, peripheral deafness may be present as well as a neurological problem; (3) full neurological examination, with family and personal medical histories and particular reference to the patient's ante-natal and peri-natal history; (4) a psychological study in terms of schedules of normal child development, with special attention to the quality as well as to the extent of the patient's responses to a wide range of real-life situations, his play patterns, capacity for social cooperation, and of course all aspects of his linguistic development; if he is ready for intelligence testing evidence of a performance bias may be significant and mental testing needs to be planned with an eye to possible changes in quotients during a long period of treatment; (5) home visits by a psychiatric social worker, we find, help much to assessment of parental and other family relationships and socio-economic conditions as factors in a child's mental growth.

Taylor (1962) has emphasised and repeatedly demonstrated the importance, when exploring capacity to respond to sound in brain-damaged children, of special skill in bringing about a favourable state of attention. The child's interest has to be aroused by one of two members in an audiological team who manipulates bright objects or material appropriate to the child's stage of mental maturity. The situation must not be such that the child himself becomes involved in handling the play material. When the second member of the team considers that the child is well alerted he indicates to his colleague, from behind the child's back, that he is ready to produce a sound stimulus. The colleague ceases movement, so releasing the attention of the child, who frequently in these circumstances will respond to sound that he ordinarily ignores. The successful results of this procedure, repeated with many children, seem indicative of a principle in educational treatment highly significant to the development of response to sound in some cases of „central deafness". It necessitates maintenance of a balance, in their training at any age, between meeting a need to alert them and provide them with an environment that is sufficiently stimulating and yet to contrive times, initially very short in duration, when their attention is set free to be concentrated wholly on sound with priority for sound of the human voice and speech. As with normally-hearing children who are emotionally disturbed, withdrawn and insecure, interest in sound can be stimulated by sounds that are unfamiliar to them; such as that of a melodica. Rhythmic musical sound often proves attractive. When peripheral deafness has been established (for instance by an audiogram by EEG during sleep) in addition to a communication disorder, amplification may need to be used but it seems advisable to avoid very powerful hearing aids.

Tansley and Gulligord have stated that „all brain-injured children are likely to be maladjusted." They report that „a recent examination of twenty-four children selected because they were very restless and distractible, showed that ten had definite neurological signs of organic damage. These ten are responding to psychiatric and educational treatment." As audiologists and educationists, we are familiar in our work with deaf children with emotional and interpersonal problems of parents and children, resulting from inadequacy or absence of means of communication, parental anxiety (sometimes sense of

shame) and awareness of inadequacy, the child's own perception, as he grows older, of being different and other related factors. These problems occur with brain-injured also and tend to be more acute. Our Manchester policy is always, if possible, to guide parents in such a way as to ensure that before a handicapped child begins his school life, his parents have learnt to become his main source of security as well as to give him home training on a broad basis. When diagnosis of communication disorder has not taken place until after a child's admission to school it is still imperative for his parents to have expert guidance and to be given the kind of informal therapy for themselves that usually goes with it.

Play therapy, especially the development of cooperative play enjoyable to the child, has proved to be a good foundation for special educational treatment. With young children, simple games are valuable, for instance, rolling a ball to and for between adult and child, building a tower by giving a child one brick at a time with a request to „Put another one on", assembling a screw-toy by a similar procedure. Older children take pleasure in cooperating in the assembly of a farm scene or a road system. Neurological data help to guide the choice of play material for each brain-injured child to ensure that it is within the scope of his visuo-spatial perception and motor skills and that he can therefore achieve the satisfaction of success and awareness of capacity to control it. With ingenuity, knowledge and sufficient available time, the daily routines of dressing,(e.g. unbuttoning and buttoning), eating and bathing, can be developed into play-therapy situations, but subject always to neurological considerations, including the factor of maturation.

Play therapy provides innumerable opportunities for speech development as well as social motivation for it. Two principles which seem to run through all the literature about brain-injured children have, in our own experience, proved valid, (a) a multisensory approach and (b) simplification of learning situations. To develop speech comprehension children benefit from being trained to watch the faces of speakers. Brain (1961) stresses the value of training in comprehension of sentences rather than single words, in cases of receptive and central aphasia. This method is of course related to normal child development in which verbalisation of acts rather than naming objects is a main feature. The duration of single words, when considered as sound-signals, is exceedingly brief. It is conceivable that for children who have achieved partial capacity for auditory discrimination of phonemes, (c.f. Templin, 1957) sentences offer possibilities of more recognisable clues, as they do to the „normal deaf" lipreader. For some brain-injured children the time factor seems to have another implication — speech can be meaningful to them when uttered slowly with appreciable pauses between sentences. This phenomenon is perhaps explicable in terms of injuries affecting the reception of impulses in the higher brain stem and both cortical auditory areas, with the interaction between the higher brain stem and left hemisphere, that Penfield, quoted above, has described as the physiology of normal comprehension of speech. In pedagogy this implies also that spoken language be presented to some brain-injured children in quiet acoustic conditions, with very clear articulation and therefore very distinct vowel and consonant formant patterns and of course in sentences that are initially short and simple. Von Békésy (1960)

has reported that the quality of speech is best on a line forward from the speaker's lips. Distinctness of facial movement and articulation (in so far as it is normally visible) is important to the brain-injured child who needs to lip-read, as also is the positioning of the parent or teacher, whose face, for a very young child, should be on a level with his eyes.

Echolalia has been described by Brain as likely to be „the result of a lesion in the temporal lobe and the neighbouring part of the parietal lobe". Echolalic children, capable for instance of repeating four-word sentences distinctly, at an age of four years, without the words having meaning for them, present an acute problem. Kindly but firm training in combining lipreading with listening has proved helpful. Initially, speech comprehension has been developed in situational contexts of a very obvious type. The parent or teacher might ask for a spoon when a plate is already on the table. When special practice has needed to be given in associating names with things, real objects or at any rate realistic toy objects have been used that can be felt and manipulated as well as seen. In early stages, real objects have proved more effective than pictures. From the beginning of training words, however specially taught, have been also used in sentences. Later on training has been introduced in comprehension of spoken language used referentialy and in longer sentences.

When brain-injury in children is associated with a condition comparable to that of expressive aphasia it seems particularly important to motivate attempts to talk, even if they result only in phonation. As with children suffering from severe or profound peripheral deafness it can help them to learn to enjoy sounds that they can see, hear and feel themselves making — beating a xylophone, for instance in the case of very young children and for older children playing the melodica. We know that the importance of the auditory feed-back, when it can be brought into action, to phonation and the motivation of speech cannot be overestimated. Motivation of spontaneous attempts to talk takes precedence over correctness of articulation. Brain has described expressive aphasics as being helped to speak by feeling, with their fingers, the articulation movements of their teacher. Every technique that is used at one time or another in training normal deaf children to talk intelligibly, including a pupil's use of mirror to see his own speech movements — visual feed-back to supplement auditory feedback and kinaesthetic feedback, is liable to be needed, especially when „central deafness" is associated with a specific disability corresponding to dyslalia or even dysarthria.

It appears to be generally agreed that, when there are neurological and psychological indications of adequate maturation, reading and writing can be used, by skilful teaching, to promote the linguistic development of many brain-injured children, in association with spoken language and reinforcing it. Brain has referred to Gelb & Goldstein (1942) who devised a series of cards to associate a written or printed letter with the corresponding phoneme, by means of a familiar object, and also with visible movements involved in articulating the phoneme. Written or printed language because of its stability and duration in time is potentially a factor favourable to the mental security of some, perhaps many, children whose auditory speech reception is defective. In the Journal of Educational Research (1962) I have reported a new method much used by E. C. Ewing to associate reading, hearing and speaking.

Listening to sentences spoken rather slowly but otherwise normally, by teacher and child alternately, is combined with reading from a specially selected type of book, the teacher pointing along each line of print in such a way that phrases and sentences are indicated as units of utterance. This technique has been found to promote skills in auditory discrimination, speech and reading. It was devised to help a pupil who was making no progress when taught by other methods.

LES TROUBLES CEREBRAUX DE L'AUDITION — PRINCIPES PEDAGOGIQUES

Dans cette étude on essaye de lier les principes et méthodes de l'éducation pour les enfants atteints de troubles cérébraux de l'audition avec les résultats de recherches approfondies faites par Taylor (1962) sur des enfants qui ont des désordres de la communication. On considère ses découvertes dans le contexte de l'oeuvre de Penfield et Roberts (1959). A ce qu'ils constatent: „le substratum indispensable de la conscience se trouve en dehors de la substance corticale du cerveau... probablement dans le diencéphale", et il existe „de l'évidence d'un niveau d'intégration en dedans du système nerveux central qui est supérieur à celui qui se trouve dans la substance corticale du cerveau". Les neurologues, paraît-il, ne peuvent pas déterminer l'étendue des lésions cérébrales chez les enfants dans lesquels, par exemple, des déficiences de l'ouie et du langage sont associées avec une étiologie de kernicterus ou d'anoxie péri-natale. Dans l'enquête faite par Taylor quatre-vingt enfants, dont l'examen neurologique avait été fait, subirent des épreuves électroencéphalographiques afin de faire voir leur réponse aux sons pendant le sommeil. Dans un nombre de ses cas, y compris quelques-uns dont on avait fait un diagnostic qui dénotait des lésions cérébrales, l'audiogramme électroencépholographique fait pendant le sommeil indiquait l'ouie normale bien que l'épreuve subjective faite pendant l'état de veille montrât la surdité. Taylor ne voulait pas tirer de conclusions définitives au sujet de la potentialité pour l'audition dans l'état conscient de certains de ces enfants.

Au point de vue pédagogique, paraît-il, les troubles cérébraux de l'audition ont besoin d'un traitement qui se base sur des dossiers cumulatifs, avec des épreuves audiologiques (des epreuves électroencéphalographiques faites pendant le sommeil et des épreuves qui se fondent sur les réponses subjectives), des examens otolaryngologiques et neurologiques, des études sociales des cas faites par le psychologue et le psychiatre. Ce mémoire décrit une technique pour procurer dans les enfants un état d'attention qui favorise la réponse aux sons. On considère la portée d'une affirmation de Tansley et

Gulliford (1961). Selon eux: „Tous les enfants qui souffrent de lésions cérébrales sont susceptibles de s'ajuster mal". A cet égard on examine la valeur d'un diagnostic fait aussitôt que possible, du conseil au parents, et des jeux thérapeutiques. En même temps on donne les détails d'un procédé pour encourager le développement du langage par le moyen de divers sens et par une motivation que se base sur le développement de l'enfant. Les méthodes doivent être modifiées pour certains enfants qui se présentent comme souffrant d'écholalie ou de conditions comparables à l'aphasie expressive. Une méthode nouvelle, qui combine l'entraînement auditif avec la lecture et la parole, avance la discrimination par l'audition.

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