The child's hearing for speech / by Mary D. Sheridan.

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THE CHILD'S HEARING FOR SPEECH

by

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INTRODUCTORY NOTE

THE investigations described in this book were only made possible by the disinterested kindness and help of many people in schools, clinics and hospitals, Public Health Departments and Education Offices all over the country. To them all I owe a debt of gratitude. In particular I should like to thank Dr. A. W. G. Ewing and Mrs. I. R. Ewing, Dr. T. S. Littler and Miss B. M. Elliott of the Department of Education for the Deaf at Manchester University, for many happy hours spent in observation and discussion; Dr. J. L. Burn, M.O.H. for Salford, for his never-failing encouragement and his assistance in collecting some of my most valuable case records; Dr. E. M. Jenkins of the Manchester School Medical Service, my own immediate Chief; Mr. W. O. Lester Smith, Director of Education for Manchester, and Mr. W. T. Stevenson, Chief Inspector of Schools, who permitted me to collect material of all sorts in the schools; Mr. F. A. J. Rivett, the Director of Education for Salford; Mr. W. Parrish, the Deputy Director, and Dr. R. W. Hitchcock, Chief Inspector of Schools, who granted me similar facilities in Salford; Sir E. G. Savage, Education Officer for the L.C.C. and Mr. S. P. Heath, Director of Education for Cornwall, who allowed me to review the speech of several hundreds of children in their schools; Mr. H. Robinson, the Principal Administrative Assistant for his help in starting the audiometer clinic; Miss M. Ashworth, the senior speech therapist, for her friendly co-operation; Nurse M. M. Jones, without whom the Clinic could not function at all; Miss A. M. Shaw, who taught me all I know about the artistic aspects of voice production and speech; and my two sisters, K. M. Sheridan and F. W. Sheridan, who gave me devoted assistance throughout.

To the best of my ability I have checked every reference. If I have anywhere failed to make due acknowledgment to other workers the omission is inadvertent and I most sincerely regret it. The opinions expressed are entirely my own and nobody else can be held responsible for them should they prove unacceptable. For this reason I have decided to write straightforwardly in the first person instead of more gracefully designating myself 'the present writer'. I trust the apparent egotism will be excused. I am deeply and humbly conscious that my labours have been devoted to a very small corner of the vast medico-educational field, but it seemed to me to need cultivation. I have had no laboratory facilities other than an audiometer, a trained ear and access to an unlimited number of school children. If I have helped to draw attention to one aspect of the problem of the handicapped child in the ordinary school I shall be more than content.

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CHAPTER I

THE RELATION BETWEEN SPEECH AND HEARING

THE association between the child's ability to acquire speech and his mental capacity has for so long been recognized, that, to a large extent, we judge what we call his intelligence by his accuracy in articulation and his fluency in language. Indeed, the commonest forms of intelligence tests now used by school medical officers and psychologists are based almost entirely on language, since, even when some performance tests are included, the instructions are given verbally. The child whose linguistic development is delayed is at a severe disadvantage when compared with his companions, and that this delay is not always due to mental backwardness was one of the objects of my research to show.

In 1928 when I was first engaged in school medical work, I saw in Hoylake a girl of 10 who was referred by her teacher as a case of dumbness. The child was well grown, quick and graceful in movement and she had every appearance of being intelligent. When asked a question her whole attitude was so alert and responsive that she gave the impression of being about to reply at any moment; but she had never been heard to speak a recognizable word in school. She could 'make noises', the teacher said, and she was certainly not deaf. She knew when doors banged and when the school bell sounded. I verified this by several rough tests such as clapping my hands, dropping books, and tapping an enamel bowl behind her back. Each time she turned immediately with a bright, eager, questioning smile. I watched her at play with her companions. They accepted her disability very naturally making only occasional signs to her which she was quick to interpret, and once, when a companion chased her, she ran wildly across the playground with her mouth open shouting loudly. There was obviously nothing wrong with her lungs or her larynx. Her mother, when interviewed, was rather truculent and said the child could speak if she wished, she just did not want to. She had been bathing with her sister a few days before and had said 'water cold' quite distinctly.

I came to the conclusion that the child was suffering from some unusual form of cerebral lesion beyond my powers of diagnosis. I suggested that she saw a specialist at the Liverpool Children's Hospital, but the mother refused. I left Cheshire soon afterwards and so lost sight of the case. In spite of every effort I have not been able to trace her since.

During my first few years in Manchester I saw another girl,

Joan aged 6, in an Infant School. I was told she had never spoken but could make 'grunty noises', and her teachers were convinced that she could hear. She came when she was called. She showed every sign of understanding simple questions and commands. I verified this by making various noises behind her back at distances ranging from one to 10 feet, and it was when she turned to me with that same bright-eyed, questioning smile that I was struck by her resemblance to the Hoylake case. Her elder sister was a certified mental defective and it appeared only too obvious that Joan was also mentally retarded. For three years I kept her under observation. She was no trouble in school, cheerful and amiable with her companions, clean in her habits, quick in her actions and neat with her fingers; but apart from shouting sometimes in the playground and uttering those 'grunts', which I now realize to have been vague and toneless vowel sounds modified by one or two labial consonants, she made no attempt at articulate speech. At 9 years old, since it was obvious that she could not possibly follow the ordinary curriculum of the Junior School, I reluctantly certified her mentally defective, and she was transferred to the same special school her sister had attended.

In the special school, with its superior opportunities for individual observation, it was soon realized that in general behaviour, muscular control and handwork she was vastly superior to the other children, and that, although she could certainly hear some sounds, she was apparently deaf to speech. It was decided to send her to the Manchester University for a hearing test. Her audiogram showed that she had only islands of hearing and was therefore completely deaf to certain tones of the speech range. She was immediately de-certified and admitted to the Royal Manchester School for the Deaf.

Two years later I saw the child being taught, with a group of others, by Dr. and Mrs. Ewing's combined lip-reading and hearing-aid methods [1]. She recognized me as soon as I entered although it was so long since she had seen me, and she gave me one of her old eager smiles. Her teachers said the child was acutely intelligent with a distinct gift for mathematics. It caused me considerable distress to realize that if I had recognized the case earlier as one of deafness she would have had several extra years of expert teaching. But without the specialized knowledge I now possess, and in view of the family history of mental defect, the mistake was a natural one, and I fear it may have been made, in spite of all their care and devotion, in many other places by many other school medical officers.

The mystery of that child in Hoylake was at last illumined, and I realized that the mother had not been inventing the child's words 'water cold' (as I had ignorantly believed) but merely improving them. Harvey Fletcher [2] has shown that 'ɔ:' ('aw') is the

easiest of all speech sounds to hear, and 'ou' ('o' as in 'sole') the fifth easiest. The child would be able to imitate 'w' through lip-reading, and would probably also be sufficiently aware of the rhythm of speech to 'time' the words recognizably. What she probably said was 'wɔːə ou-u' ('wa'er o-oh'). This realization taught me always to pay attention to the mothers' account of the history no matter how fantastic it might appear. I found that they were often inaccurate, and sometimes deliberately misleading, but occasionally their descriptions were triumphantly vindicated by later investigations.

These two cases prompted me to take an interest in the whole question of speech and language, and led me to reconsider them in relation to their physical rather than their psychological aspects, and I discovered that although much work has been done by the child psychologists both in England and in America on the acquisition of *language* nobody, so far, appeared to have investigated the development of the actual *sounds* of speech. It occurred to me that some sort of classification of speech defects in children according to their nature and frequency would be valuable. But a person's speech is as individual as his face or his mannerisms, and it was difficult to arrive at a satisfactory grouping. It was obvious from the first that certain standards would have to be adopted regarding what constituted a defect of speech.

After much consideration it was decided that cases of gross anatomical lesion such as cleft palate (seen fairly frequently in school) and all the various neuro-pathological conditions (seen very rarely anywhere except in hospitals) were not suitable for investigation, since the reason for the speech abnormality was immediately obvious, and the resulting defect of articulation fairly constant. Cases of adenoidal speech in the absence of actual phonetic substitutions were also excluded, and all cases of stammer, since most investigators are agreed that these cases are usually of psychological and not physical origin, although the recent investigations of Golla [3] into the electro-encephalograms of people using auditory imagery in association with 'inner speech' make one begin to wonder if these cases, too, may not be in the nature of a neuro-muscular dysfunction.

Next it was necessary to decide at what *age* a child should be considered to have outgrown the experimental stage of baby speech and to have established a more or less permanent habit of articulation. Most intelligent children, given normal hearing and a good environment, articulate with complete intelligibility by 3 years old, although to the trained ear their speech still contains numerous phonetic peculiarities, which I later discovered in an extension of the investigation into the speech sounds of children under 5 years to be fairly constant. After 3 their vocabulary grows enormously and their patterns of articulation gradually approach and finally identify

themselves with the standards of their environment. The process is usually complete round about 4½ years. Since, however, children with a less favourable background and less quick intelligence take at least six months longer to stabilize their speech habits, it was decided to rule out all cases of speech defect (however interesting) under 5 years old.

How does one acquire speech? The educational psychologists tell us that we learn by observation and imitation, by an experimental system of trial and error, thus making our own discoveries and drawing our own conclusions; and, by deriving such a satisfaction or feeling of power from the results of our imitations and discoveries, that we go on repeating the action until it has become a fixed habit. This process of repetition involves *memory*, and memory for speech chiefly involves three imageries, the auditory, the visual and kinaesthetic, and probably, to a less extent, a fourth, the tactile. Of these, the most important is the auditory one, since normal children learn entirely by ear (only the deaf mute is obliged to make his first attempts at speech by imitating the visible 'shape' of a word), but the muscular memory must also be exceedingly important, since the child who has become completely deaf (that is deaf to bone conduction as well as air conduction) as a result of meningitis, does not lose the speech sounds, not even the vowels in which the tactile memory of the tongue, lips, palate, etc., is not in any way involved, so quickly as the speech inflections or 'tunes' which are guided entirely by ear. The vowel sounds must, therefore, be preserved by the muscular memory of the tongue. I know that this statement is at variance with Cyril Burt's [4] suggestion that we learn and recall our vowel sounds by auditory and our consonants by muscular memory, but although, naturally, I feel some diffidence in questioning his opinion, I can only say that my own observations have led me to a different conclusion.

The visual memory in speech is developed later than the other two, but it is of some importance even in the pre-school period (of how much importance I did not realize until I investigated the speech of blind children), but once the child begins to read it assumes considerable significance, since in learning to read a visible printed pattern is for the first time associated with the spoken word, and for ever afterwards the written letter is inseparable in the memory from its auditory sound. In learning foreign languages at school the visual memory is probably no less important than the auditory. Indeed, looking back, I think I learnt Latin almost entirely in visual symbols.

Having decided that the lowest age for investigation should be 5 years, there still remained the vexed question of local accent. In Liverpool, for instance, the terminal consonants 't' and 'd' are over-emphasized. In London and in parts of Lancashire they are

often omitted or replaced by a glottal stop. (The Liverpool child would say for ' We've got a lot of those at home ', ' We've got ter lot tov those at tome ' ; where the Cockney would say, ' We've go' e lo' o' vose e' ome '). But the difference between this degenerate speech and a true defect was soon resolved by asking the child to recite or read during part of the interview, when the more formal speech of the classroom immediately replaced the ordinary colloquial conversational style. I found that in more formal speech these terminal consonants were seldom omitted unless there was very good reason. (Harvey Fletcher in *Speech and Hearing* mentions the sound ' t ' as being of particular interest in that it is scarcely affected by ' filtering ' all the sound frequencies below 1,500 cycles whereas it is one of the first to be lost if the components above 1,500 are removed. I have often wondered if this fact does not explain the frequent dropping of the sound in certain accents, while an over-anxiety to retain it may explain its emphasis in others. Similarly, the person who has at last learnt to put in his aitches often exaggerates them unduly.)

In order to eliminate, so far as possible, the influence of local accent I examined the speech of children in London and Cornwall as well as in Manchester. These places were chosen because the local accents of these districts differ about as widely as any three in the country and because facilities happened to be available to me. The results of my findings are summarized later, but it was soon obvious that it is the vowel sounds and not the consonants that give a local accent its distinctive characteristics. Anybody, by taking a little trouble, can cultivate a crisper and cleaner delivery of consonants, but the vowel sounds at once give away a speaker's social and geographical background, and they can only be altered after years of teaching and practice. It seems as though, in learning the vowel sounds, the tongue is lifted or lowered entirely under the guidance of the ear, and the ear naturally takes as its standard the vowels of its environment, hence the enormous importance of presenting good speech patterns to the young child ; but thereafter the muscle memory of the tongue takes charge, so that, as we grow older, it becomes increasingly difficult to alter the habits of a lifetime. Those who have studied elocution can testify to this, although it is true that after some months or years in a new environment, particularly if we possess a ' quick ' or ' attentive ' ear, we do tend to approximate our vowel sounds to those of our neighbours, but this approximation is seldom complete.

For the purpose of this review, a vowel was not considered defective unless a completely different sound was substituted, for instance ' u: ' (as in ' p*oo*l ') for ' i: ' (as in ' sp*ee*d ') or ' æ ' (in ' h*a*t ') for ' ʌ ' (in ' c*u*t '). It was soon obvious that vowel substitutions, even in the ' hard-of-hearing ' group, were very rare, and

this is not surprising since Harvey Fletcher has shown that the vowels are spoken with much stronger phonetic force than the consonants and therefore have a much higher carrying power or resonance; and that their sound cycles, except for 'i:' which has certain important components among the higher frequencies, are lower in scale. (Why 'i:' with these high components filtered out should sound resemble 'u:' is very beautifully demonstrated in the 'acoustic spectra' given by Dr. Harvey Fletcher in *Speech and Hearing*.) This earlier stabilization of the vowel sounds made the work of classification easier in the school children. Later I discovered that the younger child's vowels were much more variable and unstable.

Having decided what constituted a speech defect, I began to collect every case I encountered in the course of my ordinary day's work in schools and clinics. The clinic cases included school children of all ages over 5, but the cases found in school were later incorporated into separate groups. Since the ordinary routine medical examination at that time included:

(1) new entrants into the Infant School, aged 5 years;
(2) juniors, aged 8 years;
(3) seniors, aged 12;

it was found convenient to analyse the speech of the children in these groups, since they had to be examined in the ordinary way. The children examined in Cornwall and London were of corresponding age groups. In this way the speech of some 1,500 elementary schoolchildren was eventually analysed and charted.

Next it was decided that, since intelligence was so closely connected with speech, I must examine the speech habits of children of superior intelligence as well as those of inferior mental capacity, and this was accordingly done. First the speech of 770 grammar school entrants aged 11–12 years (670 girls and 100 boys) was charted, then, by the kindness of the head mistresses of four special schools, three in Manchester and one in London, I was able to chart the speech of 100 educable mental defectives. By the courtesy of several authorities I was next able to chart the speech of 100 blind children. I now had records of 1,500 normal elementary schoolchildren; 770 intelligent children; 100 mental defectives; and 100 blind children.

Last of all it was important, since I was now becoming convinced that the association between hearing and speech defects was much closer than I had hitherto realized, that I should examine children known to have subnormal hearing, and in sufficient numbers to make my conclusions scientifically reliable. It was at this stage that I learnt that Dr. Burn, the M.O.H. for Salford, was conducting an audiometric survey of his entire school population, using group audiometers to sort out the 'normals' from the 'subnormals', and

then giving every child in the 'subnormal' group an individual pure-tone test. He kindly gave me facilities to examine all these cases, and so I was enabled, for the first time so far as I could discover, to analyse the speech of a large group of 'hard-of-hearing' children (100), and to compare each child's phonetic usage with a scientific record of his hearing.

In the meantime I had been studying something of the physics of sound, the psychology of hearing, the science of phonetics, the history and philosophy of language, and the art of elocution; and as my eyes became keener to watch the movements of the mouth in speech and my ear more sensitive to note the finer distinctions in vocal sounds, several interesting facts began to emerge. It was found, for instance, that children, unless they are very hard of hearing, rarely omit a sound, except those terminal t's and d's of which I have spoken; they usually replace it with another sound which *to them* (and this is an important point), if not actually a satisfactory substitute, is at least a sufficient one. It was necessary to chart these substitutions, which, as most speech therapists know, are fairly constant—'t' for 'k', for instance, 'w' for 'r', 'f' for 'th'. The question for me was why were these substitutions sufficient to the child? Was the reason auditory, visual, muscular or tactile?

The psychiatrists speak of 'emotional blocks' which interrupt normal physiological processes, and I have, in the course of twenty years' practice among children, encountered a few cases of hysterical mutism, but none in the period under review; and I wish firmly to state that, in my opinion, although it is possible that some as yet undetermined psychological factor may be involved (if the word 'psychological' means a physiological and not a pathological mental process), none of the substitutions and omissions analysed in my research were due to any *purely* emotional cause. It is true that the persistence into the school age of certain recognized phonetic patterns which are characteristic of 'baby speech' may occur even in intelligent children who are encouraged by the mother's foolish desire to perpetuate the child's infantile habits of dependence upon her, but such cases rapidly improve once they reach school. These cases are referred to in more detail later. In my experience the children most likely to persist in baby speech are the neglected, the spoilt, the mentally retarded and the partially deaf, and boys far more frequently than girls.

Through the whole period under review, and in all the various groups analysed, the boys consistently showed a greater tendency to defective speech than the girls. I cannot believe that the additional 'spoiling' that is always lavished upon the sons by mothers accounts for all this sex difference in speech defect after the beginning of school life. I think, with Professor Burt, that girls have

undoubtedly a superior linguistic sense, which is by no means always associated with superior intelligence. They learn to speak earlier than boys, they use words more judiciously, they write superior 'compositions' in school and are more anxious to improve their standard of pronunciation. In adult life they talk more fluently and write more gossipy letters. Fashions in pronunciation, the phoneticians tell us, are set by women, and women are in the forefront of all 'refining' influences that affect speech, although it is men who invent new words, and who popularize new abbreviations ('bus, 'phone, auto', 'plane, blitz') and short-cut usages, such as making nouns into verbs (to loan, to contact, &c.). I am also of the opinion that what for the want of a better term I can only call 'auditory attention' develops more quickly in the girl than in the boy; but this attention certainly does not wholly depend upon auditory acuity, nor upon a discriminating musical sense, although I suspect it may depend upon the girl's earlier maturity of intelligence. At present I am unable to define it more accurately.

Having read all the available books on Speech Pathology and Speech Therapy, I went to considerable trouble at first in testing for what the Americans call 'laterality', i.e. left or right handedness, eyedness, &c., but the results, at least in relation to defects of phonetic usage, were so entirely inconsistent that I did not consider there was sufficient justification in pursuing this particular line of investigation.

It is necessary to point out that the analyses given in the following pages are all based on my own personal auditory and visual observation. Every individual has his own auditory as well as his own visual field, and Harvey Fletcher has shown that with age there is an increasing loss of hearing, analogous to the increasing presbyopia of middle life. The first 'notch' in the audiogram usually occurs in the 4096 region, probably because the endorgans for this frequency are situated in the basal turn of the cochlea where they are most exposed to damage by infection or injury, then the auditory loss involves the neighbouring high frequencies, and finally begins gradually to spread down the scale.

The figures given below are taken from those of Bunch, charted by Stevens and Davis [5]:

Age	Frequency	256	512	1024	2048	4096	8192
30		—	—	—	—	5	5
40		—	—	—	5	15	10
50		—	—	5	15	20	25
60		—	about 5	10	25	35	45

This loss may be exaggerated or accelerated by illness or trauma. Many of our young airmen, for instance, begin to show the notch at 4096 after about 100 flying hours, although they are not subjectively

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CHAPTER II

THE AUDIOGRAM

UNTIL recent years we possessed no instrument calibrated to measure individual hearing with scientific precision, nor any means of recording the result so that the chart could be universally interpreted. Otologists were obliged to use various unstandardized tests with watch-ticks, bells, whistles, pitchpipes and monochords; while estimates of the hearing for speech were based upon exceedingly unreliable voice tests, such as a few numbers and simple sentences whispered or shouted at varying distances from the ear. With the invention of the audiometer in the nineteen-twenties accurate estimates of hearing became possible. There are two types of audiometer at present in common use; the gramophone audiometer, and the pure-tone audiometer. The newer 'Speech Audiometers' are still in the process of refinement.

The gramophone audiometer calls a series of numbers in groups of two or three, each group being delivered at gradually, but accurately measured, decreasing levels of loudness, until finally they cease to be audible. At the same time the listeners, using earphones applied first to one ear and then to the other, fill in the numbers they hear in the appropriate columns on a blank chart (Fig. 1). The gramophone audiometer provides a very convenient method of testing large groups of children over the age of 7 or 8 years, since any number up to forty can be tested simultaneously, and it has been very largely used by Local Education Authorities during the past ten years, but it has certain disadvantages. The instrument is difficult to standardize and service. Adults and older children, who are experienced listeners, can often distinguish spoken numbers from their vowel sounds alone although they are not actually hearing all the consonants. The test therefore resolves itself, in some degree, into an estimation of maturity, intelligence, experience and ability to write speedily at dictation, as well as a test of hearing.

The pure-tone audiometer delivers into the earphones a series of sounds at measured intervals of pitch and intensity. There are two varieties of instrument, one suitable for group testing and one for individual testing. The individual pure-tone audiometer has been largely used in university laboratories and by otologists to record the hearing loss of their patients, but it is only recently that school medical officers have realized its potentialities in the estimation and treatment of educational deafness, and its importance in the differential diagnosis of speech defects.

GRAMOPHONE AUDIOMETER CHART

MEDICAL INSPECTION

Test No.....
Date of Test.....

Name..... Date of Birth..... Address.....
School..... Dept..... Standard.....

INSTRUCTIONS

YOU WILL HEAR NUMBERS SPOKEN BY A PERSON WHO IS MOVING AWAY FROM YOU. THE VOICE WILL GET WEAKER AND WEAKER. LISTEN CAREFULLY AND WRITE AS MANY NUMBERS AS YOU CAN.

Hearing Loss	RIGHT EAR			
	1	2	3	4
30				
27				
24				
21				
18				
15				
12				
9				
6				
3				
0				
—3				
HEARING LOSS————				

DO NOT MAKE ANY NOISE AS IT WILL SPOIL THE TEST

LEFT EAR				Hearing Loss
1	2	3	4	
				30
				27
				24
				21
				18
				15
				12
				9
				6
				3
				0
				—3
HEARING LOSS————				

FIG. 1

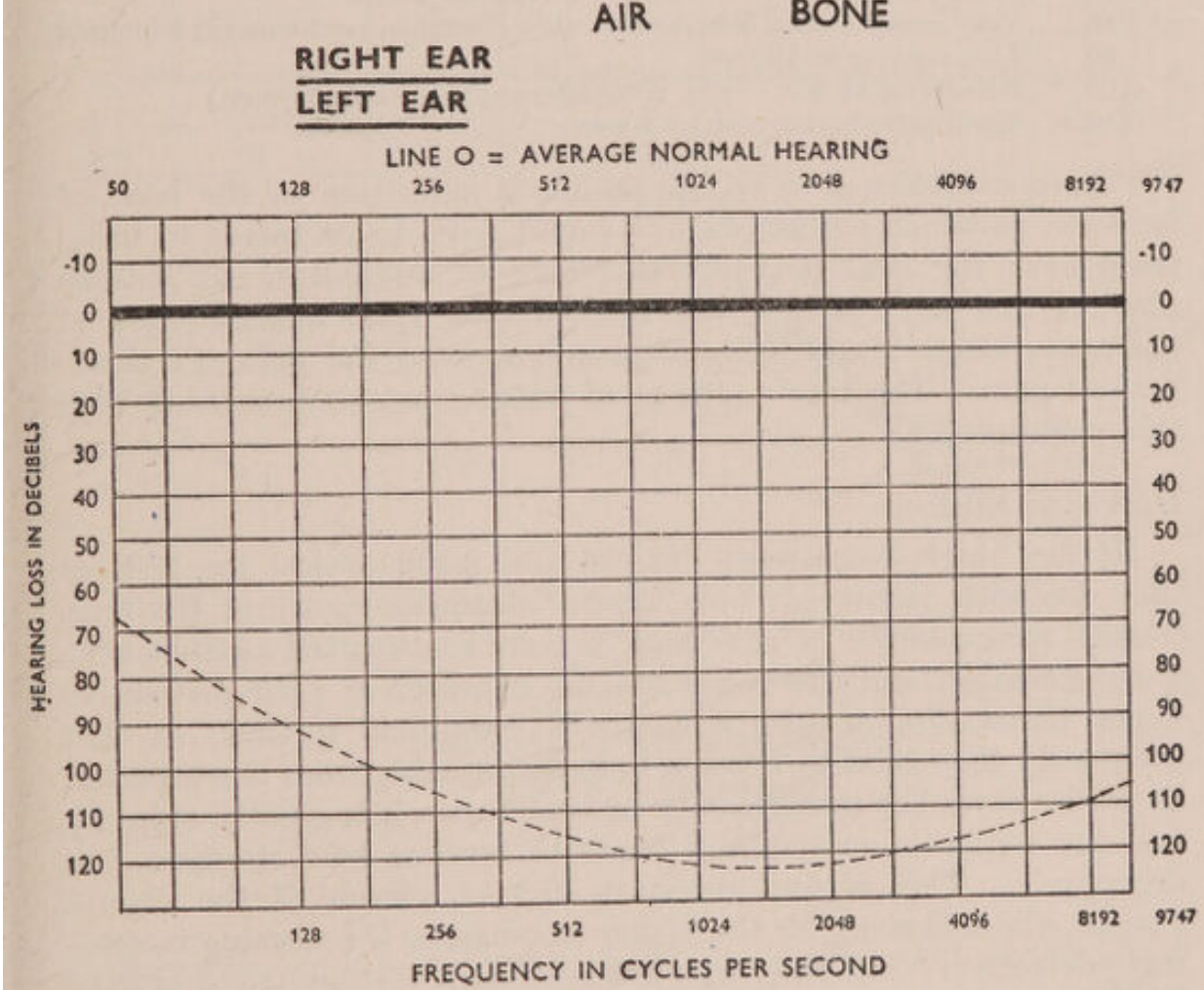
In my own tests the hearing both by air conduction and by bone conduction is recorded. The air conduction curve shows what the child hears through an ordinary radio earphone held firmly against the ear and protected by a circle of sponge rubber so that all extraneous noises, as far as possible, are excluded. This curve gives a good indication of the child's normal school hearing. The bone conduction curves are obtained from the hearing for sounds heard through a vibrating receiver held against the mastoid process of the temporal bone. When the auditory nerve itself is functioning this curve is approximately normal. The two readings, therefore, taken together give a clear indication of the nature of the deafness, and demonstrate whether the fault lies in the sound-conducting apparatus of the middle ear (the tympanic membrane and the ossicles) or in the sense organ of the ear (the cochlear apparatus, including the endorgans of the auditory nerve itself). The vast medical and surgical implications of deafness have been deliberately excluded from this study, except in so far as they affect the child's scholastic attainment, since the research was directed rather towards a solution of the educational problems of the child with impaired hearing than to suggest new methods of clinical treatment. But, whether the child's loss of hearing is considered as a medical or as an educational problem, the first necessity in treatment is accurate diagnosis, and for this not only his pure-tone audiogram, but records of his reactions to standardized voice tests are essential.

The Audiogram

A full description of the audiogram, or hearing chart, and how it was evolved, is given in Harvey Fletcher's book *Speech and Hearing*, first published in 1929 [1]. Dr. Fletcher is a physicist employed by Bell Telephones of America to investigate the transmission of speech sounds over telephone circuits and radio networks. He was able to demonstrate the existence of a normal auditory field extending over some ten or twelve octaves, about half of which are used in speech, and by exhaustive research into the auditory acuity of eighty-two young adults between 18 and 25 years old he standardized the chart we now use.

The numbers on the *horizontal* scale of the chart represent the number of sound cycles per second of the various pure-tones used in the test. A 'pure-tone' is the fundamental note deprived of all its musical overtones. It is not a pleasing note, being similar to the 'pips' of the radio time signal. Thus 256 cycles represents the fundamental note of middle C on the piano; 5 octaves above this (512, 1024, 2048, 4096, 8192 cycles) and 1 octave below it (128 cycles) are used in speech, i.e. approximately 6 octaves (actually 90 to 8,000 cycles). Good auditory perception over this entire 'speech range' is necessary for the perfect hearing of speech. The

late Dr. Phyllis Kerridge of University College Hospital, London, in her report *Hearing and Speech in Deaf Children* [2], considered the 'middle frequencies' (512, 1024, 2048 cycles) to be the most important for speech recognition; but Dr. and Mrs. Ewing, who have been practising audiometry at Manchester University since 1927, suggest in their book *The Handicap of Deafness* [3] that a minimum range of 250 to 5,000 cycles is necessary for accurate appreciation of speech.



THE AUDIOGRAM BLANK

FIG. 2

The numbers on the *vertical* scale represent the intensity level of sound in decibels. A sound that is too weak to be heard is said to be outside the 'threshold of audibility'. The tone that is so strong that it causes discomfort is said to be approaching the 'threshold of pain'. Between these two extremes (which differ for each individual) stretches the 'auditory field'. Dr. R. T. Beatty in his book *Hearing in Men and Animals* [4] gives a very interesting 'Ladder of Noise', demonstrating in homely equivalents the steps between 10 decibels, the intensity level of the faintest audible sound,

and 130 decibels, which is about the limit of human endurance. Steps on this ladder include :

Decibels	
10	Rustle of leaves in a gentle breeze.
20	Whisper at 4 feet.
30	Quiet suburban street, London.
40	Centre of New York, quietest time of night.
50	Conversational voice at 4 feet.
60	Busy traffic, London. (Dr. Kerridge, conversation at 1 foot.)
70	Loud peal of thunder. Busy street, New York.
80	Very heavy traffic, New York. (Dr. Kerridge, loud voice at 6 inches.)
90	Lion roaring at 18 feet.
100	Riveter at 35 feet. (Dr. Kerridge, airplane 10 feet away.)
110.	Steel plate hammered by 4 men.

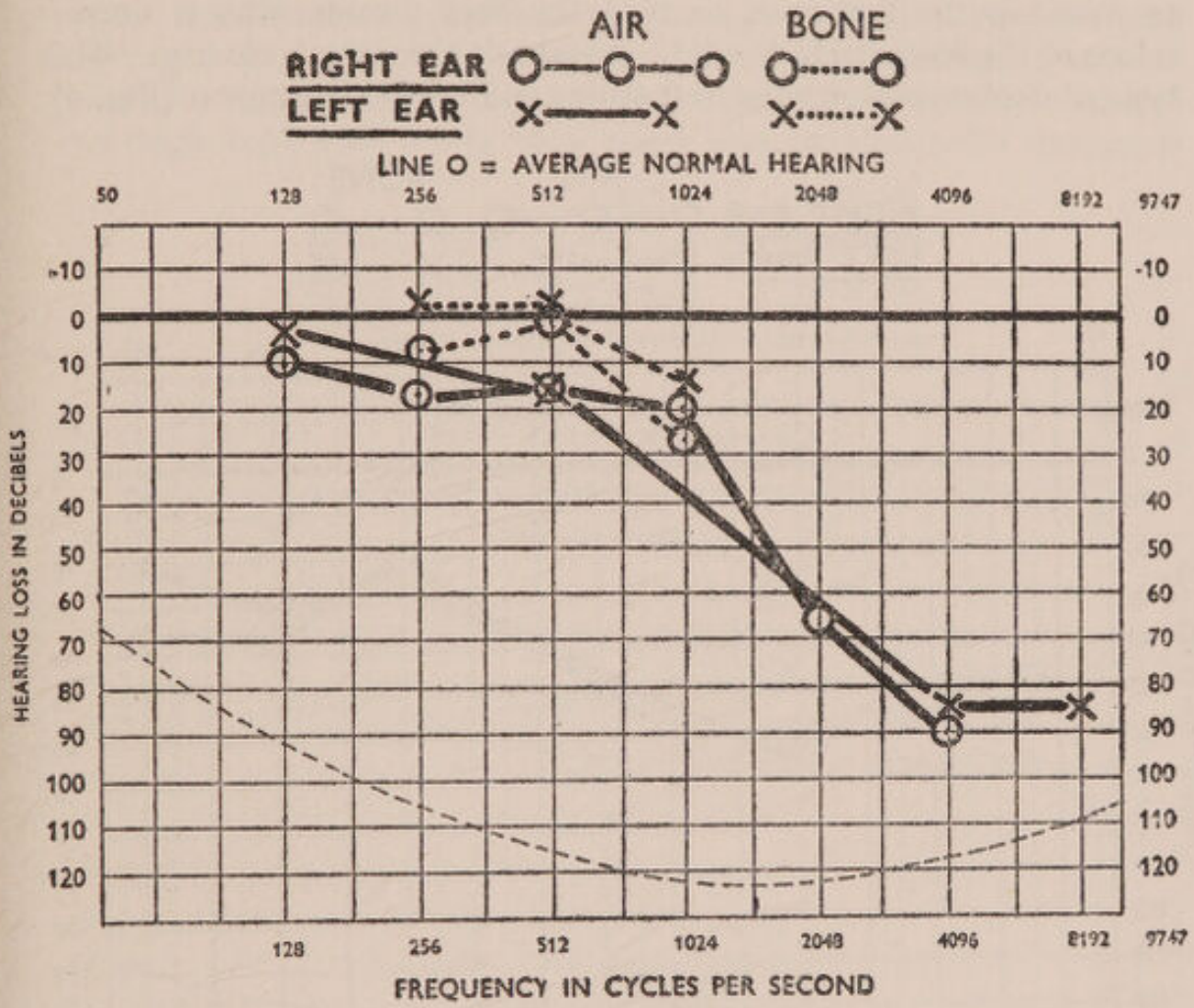
These examples give an approximate indication of the level of loudness to which certain sounds would have to be raised to bring them over the deaf patient's threshold of audibility. It will be obvious that with high or low tone loss an equal magnification of the entire range would bring some sounds over the patient's threshold of pain. The whole science of hearing aids is concerned with this problem [5].

High-tone Deafness

If the ' high frequencies ' (4,096 and 8,192 cycles) are lost, as they are with ' inner ear ' or ' nerve ' deafness, many of the finer sounds, for example ' s ', ' f ' and ' θ ', are so distorted as to become unrecognizable, and the vowel sounds, deprived of their distinctive upper harmonics, acquire a flattened unmusical quality, so that eventually they tend to become indistinguishable from one another. In severe cases the intelligibility of heard speech is greatly reduced, and the patient's own speech tends to become loud, toneless and degenerate. This is well demonstrated in speech of the elderly patient whose hearing for the higher frequencies is becoming increasingly defective. The child who has been born with impaired hearing for high tones, or who has developed it before his own speech habits have been fully established, will never acquire the finer sounds naturally, that is ' by ear ', but will be obliged to learn them by visual and kinaesthetic memory. His own untaught speech will consist largely of vowel sounds repeated as he hears them, together with a few of the easier consonants. In severe cases the resulting speech is so distorted that he appears to be using a language of his own invention. These children are often mistakenly thought to be not deaf but mentally retarded. Deprived of any means of communicating their difficulties, they spend their school life in a state of utter intellectual confusion.

The audiogram of high-tone deafness shows a moderately good hearing over the lower frequencies with a steep loss over the upper,

and sometimes over the middle part of the range, and the curve slopes downwards from left to right. The bone-conduction readings demonstrate a normal curve for the lower tones, but proportionately



MARY ($12\frac{9}{12}$ years)

High-tone Deafness

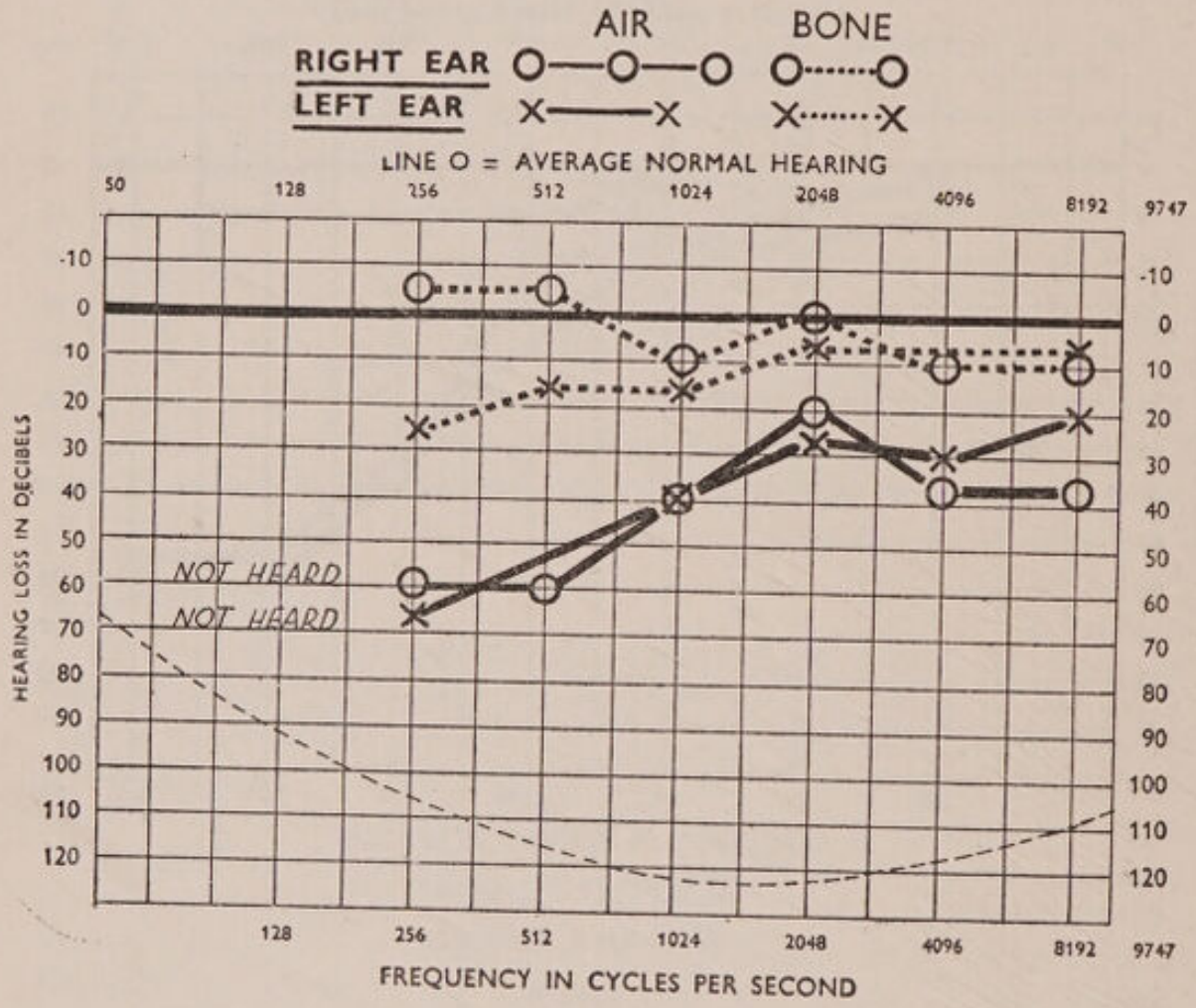
FIG. 3

an even steeper loss for the high tones, showing that the auditory nerve itself is deficient for this part of the range. Often in these cases the hearing for high tones measurable by bone conduction is absent altogether (Fig. 3).

Low-tone Deafness

Loss of hearing over the lower frequency range (128 and 256 cycles), as in otosclerosis, does not usually seriously affect the consonants, and so these remain distinct, but the vowels are diminished in force and deprived of their rich 'carrying' resonance, so that heard speech, although always intelligible, acquires a thin, reedy quality. The patient's own speech is very quiet but remains tuneful and correct. The child with low-tone deafness usually chooses himself to sit in the front row in the class, where, by intently watch-

ing the teacher's lips, he soon becomes a fairly expert 'lip reader'. He will often say that he hears better in a noise (as in a tram or a bus), but this is partly because the normal speaker raises his voice to over-top the low roar, so that the deaf person, who is unconscious of the noise itself, hears the speaker's voice more clearly. This type of deafness often runs in families and tends to progress (Fig. 4).



WILLIAM

Severe Low-tone Deafness

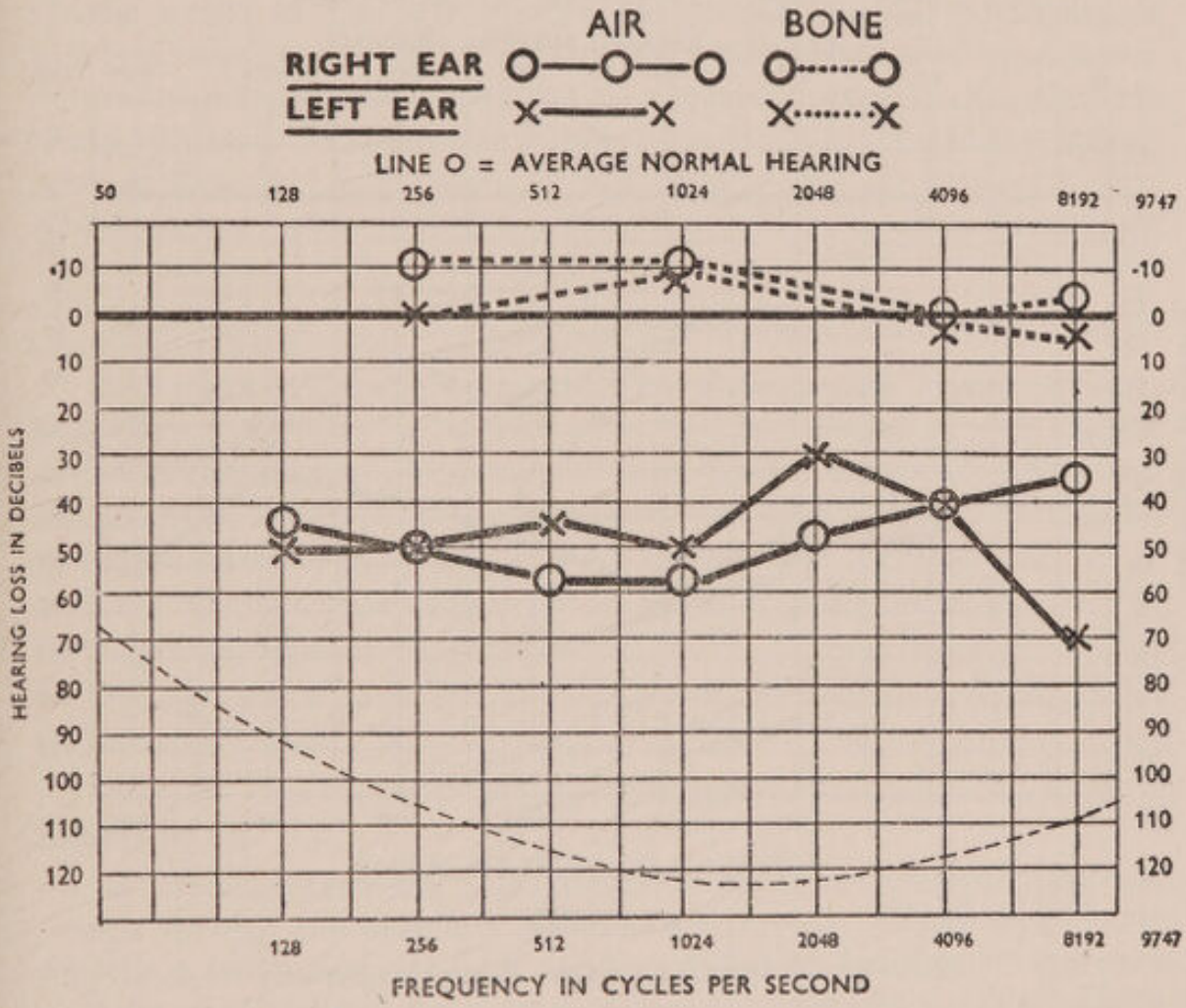
FIG. 4

The audiogram of low-tone deafness shows a loss over the lower frequencies with a slant upwards from left to right. The bone conduction readings are usually within normal limits over the whole range, showing that the deafness is due to a deficiency of the conducting apparatus and not of the nerve. This type of deafness is usually noticed at home and in school, but if the child is intelligent its severity is often underestimated.

Loss over the Whole Range

The third type of audiogram commonly met with shows a more or less even loss by air conduction over the whole range. The

bone conduction is often normal, but sometimes shows a ' dip ' over the higher frequencies. This type of curve in children is often associated with chronic otorrhoea (or ' running ears '). The speech varies considerably according to the age at which the deafness developed (i.e. whether the child had already established normal speech or not), but it will often show the effects of combined low and high tone loss, being very quiet and toneless with numerous



JOHN

Loss over whole range (*Chronic Otorrhoea*)

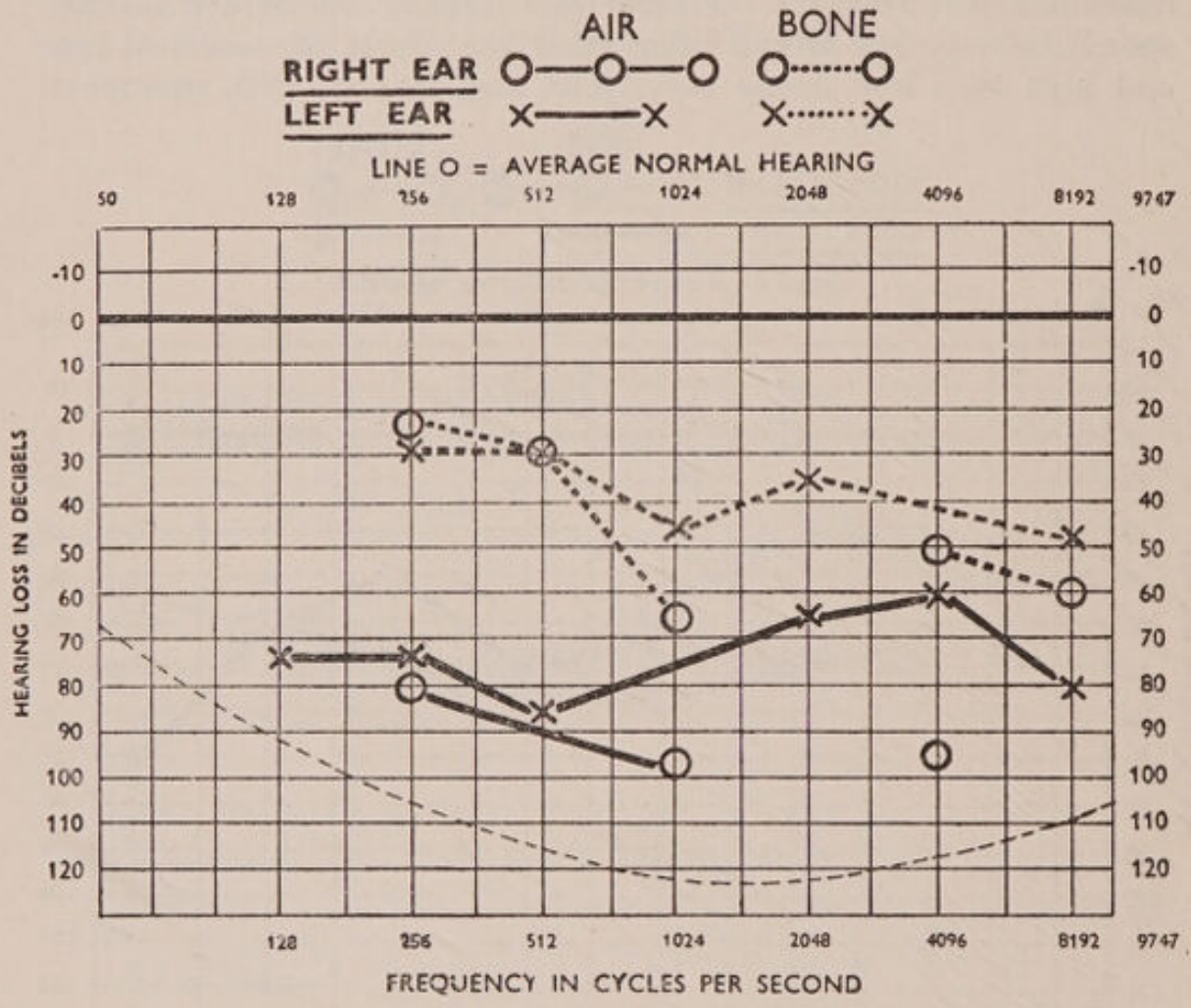
FIG. 5

phonetic peculiarities. This type of deafness is usually obvious at home and in school (Fig. 5).

' *Islands of Hearing* ' are illustrated in Fig. 6. In these cases only parts of the range can be made audible to the child. If both ears are seriously affected speech will not be acquired, i.e. the child will be a ' deaf mute '.

The decibel scale thus provides a very convenient standard for measuring and recording the auditory perception for pure-tones over the entire speech range. In order to test the hearing for speech itself, however, it is necessary to include a clinical voice test. This

is most conveniently carried out by using standardized lists of words and sentences (such as those compiled by Fry and Kerridge) [6] spoken at measured distances by a speaker specially trained to deliver them. It is more scientifically applied by using electrically recorded



ALFRED

Islands of Hearing, Right Ear (Congenital)

FIG. 6

transcripts delivered through earphones at various standardized decibel levels. I use the ordinary voice tests myself since I find they give me so much valuable information concerning the child's intelligence, reaction time, and the probable extent of his normal *school* hearing.

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CHAPTER III

DEFECTS OF SPEECH IN SCHOOL CHILDREN

IN the course of the investigation the speech of some 3,570 school children was examined and charted. A sound was considered defective only if it was consistently mispronounced or substituted. Many children, for instance, replace 'θ' by 'f' in 'thirty-three' (saying *firty-free*) when they would never think of replacing this sound in any other words. Thus they will say 'free *th*ousand'. This is because 'three' is a baby word, learnt before the sounds are differentiated, whereas 'thousand' is learnt later when the ear has acquired a finer power of selection.

Defects of every speech sound were encountered sooner or later, but those of 's' and 'θ' were by far the most common, with defects of 'r' coming next. Harvey Fletcher [3] has shown that the first sounds to be affected by 'filtering out' the high frequencies are the voiceless sounds 'θ, f, and s' and their voiced equivalents 'ð, v, and z', so that my own findings seem to indicate some lack of discrimination for the highest tones of the speech range in certain groups of children. (This matter will be discussed in more detail later.) Defects occurred singly or in combination.

SINGLE DEFECTS

Defects of 's'

's' defects were the most common in all the groups examined except among the certified mental defectives. (Their chief fault was the substitution 'θ = f'.) I found that no less than 83 per cent of these cases showed some form of malocclusion of the jaws. (Seth and Guthrie [1] found an even higher association, i.e. 90 per cent.) This indicates a mechanical as well as an auditory factor in defects of 's', but I have also observed that malocclusion itself cannot be the sole factor since some children with grossly deformed dental arches will still articulate 's' well, showing that, given normal hearing, intelligence and effort will overcome the anatomical disability. The principal imperfections of 's' were the ordinary lisp (the substitution of a sort of 'θ' for 's'), and substitutions of 'ʃ' and '$\overset{l}{o}$' a voiceless sound similar to the Welsh 'double l' in the name 'Llewellyn', and, particularly in very young children, of 't'. In some cases 's' is entirely omitted, especially in double consonants ('spoon' = 'poon', 'school' = 'kool') and in the middle and at the ends of words ('pu-y cat', for 'pussy cat', 'sick bag of coal' for 'six bags of coal'). Occasionally 'θ' and 's' are confused

(thus ' thimble ' = ' simble ', ' something ' = ' somesing ', ' another ' = ' anozzer ').

Defects of ' θ ' and ' ð '

' θ ' and ' ð ' defects are very common. The usual substitutions are ' θ ' = ' f ' and ' ð ' = ' v ', but occasionally ' θ ' = ' h ' or ' t ', and ' ð ' = ' d ', but ' θ ' = ' s ' and ' ð ' = ' z ' are also encountered.

It was immediately obvious that the voiceless sound was incorrect much more often than the voiced, so that the child would say ' mother ' and ' weather ' but ' fick ' and ' fin '. After 7 years old the defect was no less than five times commoner in boys than in girls. We know from Harvey Fletcher's list of difficulty in recognition of consonants in nonsense syllables that the voiceless ' θ ' and ' f ' are the most usually mistaken of all the speech sounds. For this reason one would expect to meet it most persistently in children with impaired hearing, but, for reasons discussed later, this is not so. In the majority of cases the defect appears to be one of listening rather than of hearing, and the tremendous disproportion between the numbers of girls and boys showing this defect can only be explained, I think, on the grounds of the girl's superior auditory attention, or perhaps her earlier maturity of intelligence. The mistake is so common in young children of both sexes as to be almost constant, but by 6 years the child should have corrected it spontaneously by ear. In any case it should disappear once the child has learnt to read ; in other words, when he has grasped the difference between the visual symbols and the visible mouth movements, as well as the difference in sound. But although this is true of the majority of girls, it appears to be less true of boys. I discovered ample proof that a distinct confusion does exist in many children's minds. A child having learnt that ' θ ' and not ' f ' is used in some words will use this sound in the wrong place. Thus a boy told me that he sat in ' the thirst bench in the thront row ' ; a little girl recited : ' I met a little elth man once ' ; and a boy said he had cut his ' thinger with a knith '. It is easy to imagine the difficulty the child must experience in learning to read with this confusion existing in his mind. The child has no idea why sometimes the eccentric grown-ups write ' f ' and sometimes ' th ' when he hears a similar sound for both symbols. The intelligent child, of course, rapidly learns the difference and sets about unlearning the muscular movements which he has hitherto employed, but the dull child never sorts them out, hence the greater frequency of this defect in mentally retarded and immature children, and in degenerate speech generally.

Defects of ' r '

Imperfections of the ' r ' sounds rank next in importance although they are much less common than defects of ' s ' and ' θ '. They are

still something of a mystery to me. According to Harvey Fletcher's [3] list ' r ' should be a comparatively easy sound to hear, but it must always be remembered that Fletcher's investigations concerned American speech sounds, and I have noticed in myself a tendency to confuse ' r ' with ' l ' on the radio and over the telephone, while young children very frequently interchange these sounds. They also confuse them with ' l ' and ' j ', (thus a ' rabbit ' becomes a ' wabbit ' or a ' yabbit ' or a ' labbit '). All these sounds have their fundamental notes among the lower vowel frequencies and they are all voiced continuants; probably it is by their higher harmonics that the ear distinguishes them from one another. In any case they do appear to form a distinct auditory group, just as ' ɵ ', ' f ', and ' s ' do, and they are never (in my experience) confused with any other sounds but those of their own group. Why this should be so cannot be made clear until the physicists have prepared ' acoustic spectra ' for all the English sounds, but I feel sure that this further research will prove their close auditory relationship. Sir Richard Paget [2] particularly mentions the similarity of the high-frequency components of ' w ' and ' l ' to those of the fricative ' r '. Sir Richard Paget worked out the various acoustic properties of speech sounds entirely by ear and published his findings some time before Harvey Fletcher determined them by laboratory methods. On comparing the two sets of figures one can only be astonished by the accuracy of Sir Richard's acoustic appreciation.

Other and Single Defects

The last common fault, found usually in the very young school child, is substitution of the front stops ' t ' and ' d ' for the back stops ' k ' and ' g ', thus ' kitten ' = ' titten ', ' motor-car ' = ' motor-tar '; and, more seldom, the reverse substitution of ' k ' for ' t ', thus ' toy ' = ' koy ', ' doggie ' = ' goggie '. This fault rarely persists beyond 5 or 6 years and can usually be left to take care of itself. (In Manchester it does persist however, even into adult life, in association with a terminal (dark) ' l ', so that a mother recently said to me when I suggested some orthodontic treatment for her child, ' She's having it seckled at the Denkle 'Ospickle ', in Liverpool (where the Welsh ' light ' ' l ' is used), this would have been ' Sett-tled at the Dent-tal Hospit-tal ', and in London (where the ' l ' has been dropped altogether), ' Se'aw e' the Den'aw 'Ospi'aw' '. Thus local accents are a fascinating study in themselves, as their auditory and phonetic implications become more and more obvious !) The only other single defects encountered were ' ŋ ' = ' n ' (thus ' huntin ' and ' fishin '), this defect was once considered fashionable but is now practically confined to infantile speech; ' v ' = ' b ' and ' f ' = ' p ' (thus ' five ' = ' pibe ') an obvious auditory confusion; and an omission of the modifying ' j ' sound before ' u ' in words

like 'you' (thus 'beautiful music' = 'bootiful moosic', another example of infantile speech).

Multiple Defects

From an examination of the charts of children showing two or more phonetic abnormalities it soon became obvious that the most usual multiple defects were combinations of the most common single ones, i.e. 's', 'θ', and 'r', with an interesting addition, the significance of which did not occur to me until, later, I began to investigate the child's acquisition of speech sounds. These additionally defective sounds were the affricatives, 'tr' and 'dr' (as in 'train', 'drink') 'ts', 'dz', ('boats', 'roads'), 'tʃ' and 'dʒ' ('church' and 'judge'), 'tθ' and 'dθ' ('eighth' and 'width') and certain combined consonants, e.g. 'θr' ('thread'), 'skr' ('screw'). In these cases the double or treble consonant sounds were reduced to a single sound, or to one correct sound combined with a familiar substitution, thus 'train' would be 'tain'; 'boats' would be 'boat' or 'bo'; 'thread' would be 'fed' or sometimes 'fwed', 'fled' or 'fyed'; 'split' would be 'pit' or 'prit'; 'screw' would be 'koo' or 'kloo' or occasionally 'skoo'.

All sorts of other eccentric substitutions, combinations and omissions occurred among these children. I have encountered 'k' for 's'; and 'l' for every consonant that was not a labial or a nasal; and even one case where 't' or 'd' replaced every other consonant; but these were rare and were usually associated with gross, and therefore easily recognizable auditory or mental defect, although a pure-tone test was often necessary in order to make the differential diagnosis between deafness and mental incapacity. These are the cases of classic idioglossia. These children's speech is often completely unintelligible even to the experienced ear, although their own families and playmates, from long experience of their vocabulary, can usually understand them. Their scholastic attainments are usually poor but their comprehension of other people's speech is often surprisingly good, particularly for simple requests and commands. It is these children who are in most urgent need of expert investigation and treatment.

SUMMARY OF SPEECH DEFECTS IN VARIOUS GROUPS OF SCHOOL CHILDREN

ELEMENTARY SCHOOL CHILDREN

The children examined were unselected pupils attending school in Cornwall, Manchester, and London. The percentages of defects were :

	Single Defects		Multiple Defects	
Group I, aged 5 years . . .	Girls . .	21%	Girls . .	5%
	Boys . .	27%	Boys . .	7%
Group II, aged 8 years . . .	Girls . .	15%	Girls . .	3%
	Boys . .	16%	Boys . .	4%
Group III, aged 12 years . .	Girls . .	13%	Girls . .	2%
	Boys . .	15%	Boys . .	2%

The analysis of the actual defects showed that at all ages the boys were not only more inclined to show speech defects than girls, but also to make the particular substitution 'ɵ' = 'f'. After being roughly twice as common at 5 years and at 8 years, it suddenly became five times as common at 12 years. In other words, the girl tends to correct this defect spontaneously much more frequently than the boy. The girl's tendency to 's' defects (usually the ordinary 'lisp', i.e. 's' = 'ɵ') is more common than the boy's, but at each age group the association between her 's' defect and a dental irregularity is also more marked. It is difficult to explain why imperfections of 's' should show this disproportionate tendency to persist in girls unless it is that 'lisps' of all sorts are more tolerated in girls than in boys, some mothers actually considering them 'pretty'. The 'r' defects were nearly all substitutions of 'r' = 'w', but a few showed that confusion of the whole 'r l w j' group, which I later discovered to be so common in the pre-school child.

In every case of multiple defect one or other of these defects of 's', 'ɵ' and 'r' were present, and often all of them. The importance of these three defects has, I think, been fully established. It is unnecessary to emphasize the desirability of training the teacher, and especially the teacher of young children, in elementary phonetics so that she can recognize the child's difficulty with these sounds in speech and in spelling and help him to distinguish them. If they persist after 6 or 7 years of age the assistance of a qualified speech therapist will be necessary in order to prevent the child establishing permanent habits of defective articulation.

GRAMMAR SCHOOL CHILDREN

The speech of 770 'entrants' (670 girls and 100 boys) aged 11 to 13 was examined. (The disproportion between boys and girls was due to administrative difficulties.) The schools chosen were

municipal high schools to which the pupils had all been promoted from neighbouring elementary schools on the result of a competitive entrance examination. This ensured that the children were all of superior intelligence, but drawn from the same social grade as the other groups examined. This eliminated as far as possible the factor of more advantageous speech training at home.

The first children examined showed signs of self-consciousness when asked to recite, so a short prose passage (given below) was prepared which introduced fairly complete samples of the full range of English phonetic usage, but did not sound too 'manufactured' when read aloud. It began simply but became more difficult as it progressed. This was specially designed to give some indication of the child's powers of combining the normal cadences of everyday speech with the more complicated phonetic combinations of 'literary' language.

ORAL READING TEST

It was more than thirty-three years since John Rowlands had last visited Thornton, where he had spent the happiest days of his youth. His first swift thought, when he rounded the bend in the road and stood on the edge of the village green looking across to the little Norman church, was that the whole place had shrunk surprisingly, the cottages had become mean and ramshackle, the gardens derelict.

In his memory the sun was always shining, the roses bloomed in profusion, and the birds sang eternally from a blue sky. He looked up at the huge grey clouds scurrying before the wind, and saw a flight of seagulls wheeling low over the tossing trees, crying mournfully. It was a sure sign of stormy weather, he remembered, when the gulls came so far inland. The paths beneath his feet were slippery with sodden leaves. They gave out a sad odour of Autumn and decay. Summer was over, and Spring might never have been. His consciousness was pierced by a sudden, almost unbearably vivid realization of the impermanence and disillusionment of life.

This test, designed originally for convenience, revealed the enormous potentialities of using set passages in oral reading as in voice tests, since I found it rapidly standardized itself in my own mind. I soon learnt to startle the children by asking some particularly good reader if he was 'top' for English, and he nearly always was. The oral reading skill is very closely allied to the speech skill, and that instinct for revelling in the mere sound of words, which the 'verbalizing' child possesses, is unmistakable. It shows itself in the child's cadences, his breath groups, his pace, his pauses, his immediate comprehension of what is being read. Again the girls appeared to have developed this faculty of enjoyment in reading aloud earlier than the boys, and, since intelligent girls soon recognize the value of good speech as a social asset, their 'accent' was much

better. These children showed the liveliest curiosity in the test, especially the boys, but this may have been because the girls had met me at the school medical inspection several times before, whereas to the boys I was a complete stranger. The girls may have been kindly and politely ignoring my apparent eccentricites, while the boys had no such reason for humouring me.

The defects charted were all single in number and slight in degree, involving only two sounds, ' s ' and ' r ', and they were imperfections of the standard sounds rather than actual substitutions.

	Single Defects	
Girls . .	8·6%	(56 ' s ' defects, 2 ' r ' defects in 670 cases.)
Boys . .	9·0%	(7 ' s ' defects, 2 ' r ' defects in 100 cases.)

Not one child, therefore made the substitution ' θ ' = ' f ', although (judging from the findings of the Salford audiometer survey, mentioned later) an appreciable number of them must have been unable to distinguish these sounds by ear. The intelligent child learns spontaneously to match the sound of the whole word with its visible ' shape ', and later with its visual pattern in print. In the case of ' θ ' and ' f ' the articulatory movements are obvious. With ' s ' and ' r ', however, the lip and tongue movements are not sufficiently visible to enable the child whose hearing may be slightly impaired to correct any imperfections in his pronunciation ' by sight '.

MENTALLY RETARDED CHILDREN

The speech of 100 certified mental defectives, (i.e. with I.Q.s below 70) between 11 and 13 years was examined, 75 in Manchester and 25 in London. 45 were girls and 55 boys. 55 per cent showed defects; these defects were grouped as follows:

	Single Defect	2 or more Defects
Girls (19 out of 45)	24·5%	17·7%
Boys (36 out of 55)	41·8%	23·6%

The first striking fact was the high incidence of speech defect in these children compared with children of similar age in the two former groups. It was again obvious that the boys were more inclined to defects of speech than the girls.

An analysis of the actual defects showed that the commonest was the substitution ' θ ' = ' f ', which was present either singly or in combination in no less than 48 of the 55 cases. In about three-quarters of the cases the voiced sound ' ð ' was also defective. ' θ ' was also confused with other sounds with high-frequency components, principally ' s ' and ' t ' for ' θ '; thus ' somesing ' (something), ' tank-you ' (thank you); and ' z ' and ' d ' for ' ð '; thus ' mudder ' (mother), ' anozzer ' (another). The other common defects involved ' s ', the ' r ' group and the front or back ' stops ',

but the number, variety and eccentricity of these children's phonetic substitutions were enormous. Their method of producing the sounds was often unorthodox. For instance, one boy made all his labial sounds ' p ', ' b ' and ' m ', by dropping his lower jaw, protruding his tongue, and smacking the blade vigorously against his upper lip. Excessive salivation and over-nasalization of vowels were also common in these retarded children, although there was no evidence or history of actual paralysis of the soft palate. During my years of practice I have observed excessive nasalization following the removal of adenoids in several cases, some of them in highly intelligent children, and it has sometimes proved very intractable. In the absence of actual injury to the motor nerve, it is due probably to a shortness, or a weakness, or even perhaps an ' atrophy of disuse ' of the soft palate, which can no longer close the entire post-nasal space now that the mass of adenoid tissue, which used to form part of the ' block ', has gone. Nasal speech also follows diphtheria when the soft palate has been paralysed. But there was no question of a post-operative or a post-diphtheritic cause in these mentally defective children. It is probably only another manifestation of the child's general clumsiness and lack of muscular control. Four children were suspected, from their speech and attitude, to be deaf, and their audiograms confirmed this suspicion.

BLIND CHILDREN

The speech of 100 sightless children, 57 girls, 43 boys of corresponding age groups (11 to 13 years) was examined. In spite of their presumably highly trained auditory attention they showed a far higher percentage of defects than the ordinary school children. The number was 45 per cent, which is not so much less than the mental defectives' 55 per cent and is actually much larger than the numbers for the Elementary 5-year-old group (30 per cent). This may be due to delayed maturity of intelligence and experience caused by deprivation of one highly important sense organ, or it may be simply the actual inability to see the ' shape ' of the sounds.

	Single Defects	2 or more Defects
Girls (23 of 57)	25·4%	15·6%
Boys (22 of 43)	38·1%	13·9%

The defects were principally those of ' s ', ' θ ', and ' r ' and combinations of these, with the ' θ ' defects again leading. In other words, they showed the usual tendency of all children to confuse these sounds, but for a longer period and to a more marked degree. This confirms me in the belief that not only are these sounds the most difficult for the child to distinguish by ear, but also that vision normally plays a definite part in learning to discriminate between all the finer consonants ' s ', ' f ', and ' θ '.

CHILDREN WITH IMPAIRED HEARING

Dr. J. L. Burn, the M.O.H. for Salford, using a gramophone audiometer and a group pure-tone audiometer, conducted a hearing survey of his entire school population over the age of 8 years. He found that some 5 per cent of the children failed to reach the normal standard. These children were then given an individual pure-tone test, and more than half of them proved to have normal hearing, but some 2 per cent showed an impairment of hearing sufficient to cause them inconvenience or actual difficulty in following the ordinary school curriculum. I was able, through his kindness and interest, to chart the speech of 100 of these children, and I found that 57 of them showed speech defects. The greater the degree of deafness the more distorted the speech, until those with the largest hearing loss showed so many substitutions, elision and omissions that their speech was practically unintelligible even to the trained ear.

Harvey Fletcher [3] suggested that, since the sound frequencies 512, 1024 and 4096 cycles are the most important for speech recognition, a ' percentage of hearing loss ' can usually be calculated by taking an average of the decibel loss at these three frequencies and multiplying this average by 0·8. (A more accurate method of calculation has since been evolved, but my results were tabulated according to the method then in use.)

The percentage loss is not of great clinical significance, since so many other factors, such as age, intelligence, experience and attention, have to be taken into consideration, but I soon found it a most useful standard to apply in tabulating results. The children were seen in no particular order, but just as they could be brought to the clinic. I made no attempt to classify them until the end, but it was soon obvious that, as a rule, the children with the greatest hearing loss had the most numerous and severe speech defects. (In no less than 65 per cent of the cases there was a history of otorrhoea and in many others, where there was no such history, scarring of the drum pointed to old ear disease. The significance of this finding needs no emphasis to anyone interested in preventive medicine.)

The numbers examined were as follows :

Loss of Hearing for Speech	Under 10%	10-20%	Over 20%
Girls	24	16	13
Boys	19	20	8
Totals .	43	36	21

The incidence of speech defects was :

Hearing Loss	Under 10%	(% of cases)	10-20%	(% of cases)	Over 20%	(% of cases
Girls . .	10	(41%)	8	(50%)	9	(69·2%)
Boys . .	7	(36·8%)	15	(75%)	8	(100%)
		Average		Average		Average
Totals .	17	(39%)	23	(63·8%)	17	(80·9%)

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his tongue towards the accustomed position, but does not realize that it is not working with the old delicate precision. The ' s ' is thus probably made increasingly farther back and lower down in the mouth until finally it ceases to be recognizable to the listener. This progressive degeneration of speech is sometimes very marked even in older people who have become deaf. It can be readily understood how much more rapid the process may be in a child. The necessity for expert speech training in these cases needs no emphasis.

Defects of ' r ' were (to me) surprisingly common, but I now realize this to be another common manifestation of impaired hearing. The ' r ' defects, like the ' s ' defects were not always recognizable substitutions, but rather degenerations of a sound that has once been normal or approximately normal. The trained ear, however, cannot fail to notice the distortion.

When ' θ ' defects did exist they were found in combination with other defects—particularly of ' s ' and ' r', but sometimes with defects of the plosives, and the double consonants which were sometimes reduced to a single sound, and sometimes substituted ; and as the hearing loss increased elision or omission of weak syllables became more frequent. Vowel substitutions were still rare, but one or two cases occurred where ' i: ' (as in ' speed ') and ' u: ' (as in ' pool ') were confused—a substitution always suspicious of high-tone loss—and in several cases some ' lowering ' of the short vowels was noticed, so that ' i ' (sit) became ' e ' (set), ' e ' became ' æ ' (sat), and ' ʌ ' (hut) became ' ɔ ' (hot).

The clinical and educational speech ' picture ' of impaired hearing, and particularly of high-tone loss, may thus very closely resemble that of mental retardation. The difference between the two groups is difficult to describe, but it is sufficiently obvious to the experienced eye and ear to prompt further investigation. The speech of the mental defective may be degenerate and unmusical enough, but it usually possesses the cadences of normal speech. (The physiological problems of artistic voice production were first studied by Dr. Aikin [4], but much remains to be investigated. Apart, altogether, from that variation of pitch and precision of articulation which is necessary for intelligibility, the beauty of any vocal sound probably depends upon a nice selection, by the ear, of harmonious overtones in tune with a note determined by the mind, and set in motion by the vibrations of the vocal cords. These selected overtones are then judiciously reinforced by an exceedingly delicate adjustment of the resonating cavities of the mouth and nasopharynx. Hence the supreme importance not only of good hearing, but of a discriminating and trained intelligence in the production of beautiful speech.) The speech inflections of the slightly deaf child are invariably more level and monotonous than the normal, the syllable stress is more even, and the quality of the voice itself is often nasal,

toneless and lacking in 'carrying' power or resonance. Also the slightly deaf child soon learns to watch a speaker's lips. His whole attention is immediately engaged, his attitude is motionless, his expression one of disciplined, anxious listening. Sometimes he appears pathetically bewildered and strained. The mental defective seldom focuses his attention for long. He fidgets and his eyes wander. He appears to be completely indifferent to much that is being said to him. The deaf child is *organically* unconscious of many of the finer sounds of speech, the mental defective is *functionally* unaware of them. His auditory discrimination is primitive just as his muscular control is clumsy and his intellectual processes immature and slow. Can it be, therefore, that what I have tried to describe as 'auditory attention' is, after all, a function of the mature *intelligence*? Spearman [5] himself seemed uncertain whether attention was a attribute of the mind or was the mind itself. In any case, it is obvious that the retarded child who has a speech defect involving more than two substitutions, before being classified as mentally defective on the results of intelligence tests involving language (either in their application or their response), should be examined by a school medical officer who is not only experienced in the diagnosis and treatment of ear diseases but also in audiometry and phonetics.

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CHAPTER IV

THE TECHNIQUE OF EXAMINATION

THE experience gained in examining the speech of the children in Salford proved most valuable when I was able to start my own clinic for the Manchester Education Authority. A routine technique had already been evolved, and this, with certain minor modifications, has been followed in every case from the beginning. In this way recognizable standards gradually established themselves in my experience.

The child's personal and family history is entered on a special form (Fig. 7) by the nurse in attendance. This form is cyclostyled on the back of the audiometer blank. I have been fortunate in having the assistance of the same nurse throughout the entire series of clinical examinations. She was deeply interested in the work and made several useful suggestions regarding the actual performance of the test and she soon learnt to make audiograms herself with neatness and accuracy. She also dealt with the entire clerical side of the work, notifying cases, filing records, keeping card indexes, copying charts and acting as liaison officer between the audiometer clinic and the visiting otologist.

The ears, nose, throat, teeth and palate are examined and any abnormality noted on the form. The child's general physical condition is noted, and his vision with and without glasses, since this may be an important factor in his ability to lip-read. If his intelligence quotient has already been estimated this is also noted, and any particulars regarding his family, work or behaviour which his parent, teacher, or school nurse have supplied.

The speech is then examined. This is usually done by engaging the child in ordinary conversation, and, if he is too young to read fluently, asking him to count or to repeat some familiar poem or nursery rhyme. Then, if a sound is observed to be defective, simple sentences containing several repetitions of the suspected sound may be given. With very young children it has been found more convenient to show them brightly coloured pictures, and ask them leading questions. The practised medical officer usually has little difficulty in obtaining a response from normal children, but with speech defectives, retarded children, and children with impaired hearing, this part of the examination is often very difficult and requires much patience and tact. Even when a response has at length been elicited it is often so fragmentary and whispered so inaudibly that it is difficult to assess it. If the parents are sufficiently

PARENT PRESENT

FAMILY HISTORY of Deafness

PERSONAL HISTORY Position in family Walked Spoke

Previous Illnesses : Measles Whoop C. S.F. Diph. Mumps
C.S.M. Influenza Colds Nasal C. Tonsillitis
Otorrhoea R. Mastoid Operation R.
L. L.
T's and A's Operation Other Operations

Deafness first noticed

PRESENT CONDITION NUTRITION SPEECH

Teeth
Palate
Nose
Throat
Ears R.
L.

VOICE TESTS WORDS 3 metres 1 metre
Back Turned (25)
Facing (25)
SENTENCES
Back Turned (5)
Facing (5)

ATTENTION

VISION Distant R. Near R. With Spectacles R. R.
L. L. L. L.

OBSERVATIONS

FIG. 7

interested it is possible to suggest a second examination a few weeks later, but where parental co-operation is doubtful one must do one's best to arrive at a decision during the first interview, as it may be months before the parent can be persuaded to attend the clinic again and in the interval precious teaching-time may be lost.

The child is then given the pure-tone test by air and bone conduction. With older children it is comparatively simple to obtain accurate results, but three points require mentioning: first, the child must thoroughly understand what he is expected to do; second, he must not be able to guess the correct response, nor allowed to watch the examiner's hands moving the dials and working the switch which initiates and interrupts the pure-tones; and third, each response must be carefully checked.

The child is placed at the opposite side of a small table facing the examiner, with the audiometer between them. The instrument used for all the tests recorded in this study was 6A Western Electric model. The pure-tones are delivered through a radio-telephone receiver, protected by a circle of sponge rubber. This is held firmly against the ear, with the elbow resting on the table in order to relieve fatigue in the supporting arm. The model in use is fitted with a small neon lamp set into the top of the instrument. When the lamp is lit it indicates that the electric current is switched on. A bell-push is provided which, when pressed, turns off this lamp. I found that the attention of some children was so distracted by the light flickering in and out, and by their anxiety not to make a mistake over pressing the small bell-push, that their nervous energy was rapidly exhausted and their responses became erratic. I therefore discarded the bell-push and now instruct the child to shut his eyes and listen, then when he hears a sound, no matter how faint it is, to lift his free hand silently, and only to drop it when the sound ceases.

The pure-tones are delivered in 'pips' each long enough to be fully appreciated, but at unequal intervals. If the tones are given too regularly the child will rapidly learn to register a response automatically, and the inexperienced examiner may be deceived into believing he hears them. The intelligent child will also rapidly learn to make a correct response by watching the examiner's hands. Even when every precaution against this correct guessing has been taken each final decibel level should be checked two or three times before being charted. This checking takes only a few seconds and is well worth the extra trouble involved, since the resulting charts are as accurate as it is humanly possible to make them. In testing children it is absolutely essential to use an instrument with an interrupting switch. I have seen older models in use without an interrupter. The patient was told to signal when a decreasing sound finally ceased. The tone was 'turned on' at about 70 decibels, and the volume gradually decreased. I observed one child—an

intelligent boy of 12—who signalled three different decibel levels on three immediately consecutive tests. The first reading differed by 30 decibels from the last. I then understood why certain otologists had told me that, in their experience, audiograms, although interesting, are unreliable. It is essential, too, that whoever operates the instrument should be properly trained in its use. I have seen audiometers used with what I can only describe as wild inaccuracy.

Harvey Fletcher [1] has pointed out that it is easier for the ear to appreciate its threshold of audibility by using a decreasing rather than an increasing sound. The pure-tones are therefore delivered first at the louder levels then decreasing at 10-decibel intervals until the child fails to respond. The volume dial is then moved back (increasing the tone) at 5-decibel intervals until the child again responds. This reading is then checked at least twice.

The right ear is always tested first so that there can be no mistake in charting. The most extensive area of the auditory field is in the 1024 region, so this is the first tone given. The tones above it, 2048, 4096 and 8192 are then tested, the child being told to expect very high (' squeaky ') notes. After 8192 has been charted the child is warned that the next notes will be lower tones, (' booming like a big ship '), 512 is then given, then 256 and finally 128. The test is then repeated for the left ear. Finally, a bone-conduction test is made through a receiver applied first to the right and then to the left mastoid process. The frequencies normally given are four, 256, 1024, 4096 and 8192. 128 is not given as the vibrations are sufficiently slow to be felt. Three readings, 256, 1024, 4096 were at first considered enough, but the 8192 recording gives so much information that this frequency is now always included. It has proved of special interest in cases of severe speech defect where function, or the faculty of ' listening ', rather than the structure of the auditory nerve itself, is suspect.

With very young children it was discovered that their interest was more conveniently held by employing a play method of examination. A suitable toy was found (it was a small carved head of a Red Indian with full feather headdress) and the child was asked to ' make the man look over the wall (i.e. to lift it over the edge of the instrument) whenever he heard a noise, even a little noise, in the wireless set '. This was used successfully for many months, and is still used with most small girls, but later it was found that small boys preferred to signal the response by banging a wooden mallet on the table. This reply of one noise to another appears to afford young children considerable satisfaction, and the performance holds their interest with certainty to the end of the test.

In order to enlist the parents' sympathy and co-operation a few sample sounds are demonstrated and the finished chart is always shown to them, with a simple explanation, such as ' The child should

hear the notes up to that black line, but you can see that in the right ear he only hears halfway up the chart, and in the left ear even less. That means he probably does not hear very well in school. Now we will give him a voice test which will give us some idea how much of the lesson he does hear, but you must remember that this room is much quieter than any classroom, and if he does not hear me here he will certainly not hear the teacher in school.' The intelligent parents are always deeply interested in the various phases of the test, and the older children will usually ask numerous questions concerning the instrument.

The voice test is essential if one is to give useful advice to the child's teachers. The chart demonstrates the child's actual level of hearing for pure-tones, but only the voice test can provide reliable information concerning the child's comprehension of ordinary speech at varying distances, with and without the aid of his vision. The voice test is also a test of the child's intelligence, his experience, his attention and his eyesight, but all these factors must be taken into consideration when prescribing educational treatment.

In the examination of the original Salford cases I first gave a whisper test as well as a voice test, partly because for many years this had been my usual method of examining a child's hearing, although I had for long mistrusted its validity ; and partly because I wished to compare its results with those of the more elaborate test by words and sentences. My results in Salford proved it to be completely unreliable and I have since entirely discarded it. The method of applying this test was demonstrated to me, when I first started school medical inspection, as the one recommended by the (then) Board of Education, but, so far as I know, it was never properly standardized, and I later discovered that those school medical officers who used it at all applied it quite differently. My own method was as follows : the examiner stood at a distance 20 feet from the child (this distance was usually paced and one just did one's best if the room was not long enough), and choosing a couple of numbers at random, one for each ear, took a deep breath and delivered them slowly and deliberately in a sort of stage whisper. The child, meanwhile, stood sideways with his distal hand over the corresponding ear, and was strictly forbidden to look towards the speaker lest he should be able to ' guess ', or, in other words, read the examiner's lips. Usually only one number was given in each ear. If the child failed to repeat it he was brought 5 feet nearer, i.e. to a place 15 feet from the speaker, then to 10 feet, then to 5 feet, and finally to within a few inches. The result was charted as 15, or 5, or whatever it might be, and the teacher was instructed to place the child in the front row ; and there the matter usually had to end.

The fallacies of this test are now very apparent to me. For

instance, the intelligent child quickly learns to recognize a number from its vowel sounds alone. Moreover, if I happened to hit upon the number '44', in which (according to Harvey Fletcher [1]) the main vowel 'ɔ:' (aw) has a phonetic power of 680 as compared with the weakest phonetic sound 'ɵ', which is 1, the child would have a far better chance of hearing it than if I chanced on '53', in which the phonetic power of the vowels is 260 and 220 respectively.

In order to set some sort of standard for this test, poor though it is, I decided to give four numbers in each ear and to consider three out of four correctly repeated as a pass. The distance was accurately measured and the voice carefully controlled. In spite of this the results were so erratic that I have now given up considering this test of any value whatsoever. In any case the child in school is not expected to learn from a teacher using whispered speech. Common sense demands a test which gives a fair indication of the child's hearing for the normal tunes and stresses, for fully resonated vowels, clearly articulated consonants (voiced as well as voiceless), for connected speech as well as for isolated words, and for speech which he can see as well as hear. This information is most simply and conveniently obtained by delivering standardized lists of sentences, and words, and (in special cases) nonsense syllables. The tests should be standardized, not only because the results are then comparable, but because they give so much other valuable information to the tester who uses them constantly, concerning the child's expression, attitude, reaction time, and special phonetic difficulties. The only standard lists at present available are those prepared by Fry and Kerridge for use in their Hearing Aid Clinic at University College Hospital (*The Lancet*, 14 January 1939) [2], and although they are not entirely suitable for children I have used them consistently from the beginning, but with certain modifications.

First, Distance. Fry and Kerridge chose 4 feet and 16 feet distance for their tests, but I have always used 1 metre for the 'near' test and 3 metres for the 'distant' test. The first distance was chosen because a test at 1 metre gives a good indication of 'conversational' hearing; and the second because 3 metres is a convenient distance to test 'schoolroom' hearing, and because if any longer measurement than this were used the acoustics of each individual room would have to be taken into consideration.

Second, Scoring. All the test words used are single syllables and consist of three sounds, an initial consonant, a central vowel, and a terminal consonant. The sentences contain a noun, a verb, and another noun. The lists are compiled to contain these sounds with approximately the same frequency that they occur in ordinary conversational speech.

SAMPLES OF FRY-KERRIDGE LISTS

Words.	1.	scratch	bears	dole	charm
	2.	beard	germ	part	rate
	3.	job	nest	gin	yawn
	4.	mouse	sheaf	choice	pairs
	5.	gate	king	set	trip
	6.	chief	wood	fears	sock
	7.	time	void	splash	thud
	8.	thief	year	hairs	vote
	9.	shawl	cheese	risk	jet
	10.	desk	rap	veal	spring
	11.	noon	prize	church	fool
	12.	fox	tide	spurt	coin
	13.	ring	chum	ride	bush
	14.	rush	thing	rock	gout
	15.	road	food	gang	mat
	16.	yard	knot	docks	mud
	17.	fright	cord	tub	guide
	18.	voice	shears	thorn	horse
	19.	pet	house	youth	fern
	20.	ford	cart	ward	weed
	21.	tart	rogue	crime	cheeks
	22.	wool	tax	tomb	wing
	23.	cares	pail	gown	jeers
	24.	cat	street	fate	dash
	25.	herd	debt	book	task

Sentences.

1. The woman sat in the park.
2. The boy did his home-work.
3. The players dealt the cards.
4. The girl gets a prize.
5. Carpenters use a chisel.
6. The servant dropped the plate.
7. The crowd looked at the queen.
8. The stranger asked the shortest way.
9. The furniture was moved in a van.
10. The fat child cut her thumb.
11. School children learn lessons.
12. The baker had some more bread.
13. The labourer loads the lorry.
14. Darkness frightens little children.
15. The housekeeper bought the food.
16. Hens have chicks in the spring.
17. The shepherd found the lamb.
18. The maid took care of the clothes.
19. The shopkeeper shows his goods.
20. The infant screamed with rage.

Fry and Kerridge suggested that each list of 25 words should receive 100 marks; one for any attempt however inaccurate, 2 if the vowel was correct, 3 for the vowel and one consonant, and 4 for the whole word. In Salford this scoring was attempted but it proved too complicated to use without the assistance of a trained phonetician to note down the exact sounds repeated. It is easy, however, for any intelligent assistant to score the number of *words*

out of 25 heard correctly, and I soon found that these figures gave me as much information as I needed regarding the child's probable school hearing. It is essential to have an assistant as some children speak so quietly that it is impossible for the examiner at 3 metres to be certain of their replies.

The same technique is always employed. Four separate tests are made, two at 3 metres and two at 1 metre. Five of the sentences are given before each list of 25 words. The sentences all consist of a noun, a verb and another noun linked by common prepositions, adjectives and pronouns. The ordinary cadences of speech are used, so that the ' tunes ' may help the child to appreciate the sense. The number of correctly repeated sentences out of the five delivered is noted ; then the first list of 25 words is given.

The tests are spoken on a medium pitch in an even *mf* voice and at a moderately slow pace. Dr. and Mrs. Ewing and Dr. Littler had discovered, by using an ' output meter ', that under laboratory conditions trained speakers vary only slightly in their vocal loudness levels while delivering lists of words, and my voice test was considered to be sufficiently accurate under clinic conditions. I have many years' training and experience as a speaker ; and I have given all the tests recorded in this study myself. For research purposes the test could not be considered satisfactory if several speakers had been employed, particularly if any of them were inexperienced. The untrained speaker seldom gives equal value, without undue stress, to all the consonants, terminal as well as initial, or full weight and resonance to the vowels. Even so, these or similar lists might be used with considerable advantage by school medical officers and teachers, since they would gradually acquire sufficient skill to obtain reliable information which would greatly assist them in selecting cases for further investigation. With very young or retarded children it has not been found possible to use these lists. For such cases a set of ten very simple sentences has been devised, which at least gives the tester enough information to decide whether or not the child may safely be left in the ordinary school for a further six months until he can be re-examined.

1. The pussy likes milk.
2. The dog barked at the cat.
3. The monkey climbed a tree.
4. Little girls play with dolls.
5. The mother cooked the dinner.
6. All children go to school.
7. The boys caught a bus.
8. The father drives a train.
9. Fishes live in the sea.
10. The baby rides in a pram.

The same technique is followed in every case.

The child is first placed on a certain marked spot, 3 metres from the examiner and with his back turned so that he is unable to lip-read the speaker. The nurse stands beside him and he is given only one simple instruction. 'Tell Nurse what Doctor says.' Five sentences (Fry and Kerridge) are given and the number correctly repeated is noted. Then the first list of 25 words is delivered and the nurse keeps the count, which is immediately noted down at the end of the list. The child is then turned to face the speaker so that he now has the opportunity to match the shape of the words with their sounds. Five further sentences and the second list of 25 words are delivered. The results are again noted down. These scores are usually better, but not always, since so much depends upon those other faculties of intelligence, attention, vision, scholastic attainment and even social experience. The child is then tested with his back turned at 1 metre, and finally facing the speaker at 1 metre. This last score is usually the best of all, but again not always, especially with young children, since the child is now becoming a little fatigued (which is the reason for giving this, the easiest test, last) and his attention, in some cases, beginning to wander.

The clinical value of these voice tests is undoubtedly very high, and taken in conjunction with the audiogram gives as much information as is necessary concerning the child's ability or inability to follow the ordinary lessons in school. It cannot be too strongly emphasized that it is unwise to judge from either the voice test or the hearing chart alone. Time after time, going through the records, one finds how well the attentive child scores on the voice tests compared with the inattentive child whose audiogram is much more favourable; but to judge by voice-test scores alone would mean that some cases of the marked low-tone deafness might be missed. More than once I have had considerable difficulty in persuading the teacher of an intelligent older child that he is deaf at all, his school response has been so good; and yet these cases provide our most anxious problems, since the deafness may be of a progressive type, and the whole question of vocational training depends upon early diagnosis.

As I have pointed out, the Fry-Kerridge lists are the only standardized English voice tests at present available, and I have used them consistently from the beginning, but I soon discovered certain difficulties in their application which, although they are of no great clinical significance, are of considerable practical importance, and I feel they should be mentioned for the benefit of any other worker who decides to use them. Three points must be borne in mind.

(1) *Local Accent.* As I mentioned before, local accent principally affects *vowel sounds*, and since my own are approximately those of standard English, and to many of the children this is a foreign

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and, through the courtesy and interest of the teachers concerned, a vast quantity of valuable specimens and information was obtained. This material is analysed in later chapters. A personal interview and discussion with the child's teacher would have been more useful still, but under wartime conditions, with the limited facilities at my disposal, this ideal was impossible to attain. I feel, however, that I must record my very real gratitude and admiration. Never once, in all those dozens of cases, did my report fail to elicit a reply. In the midst of indescribable anxieties and distractions the head teachers somehow found time to help me.

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(Tests described in *The Lancet*, 14 January 1939, printed on cards. Words, 125 ; sentences, 100.)

CHAPTER V

THE SCHOLASTIC ATTAINMENTS OF CHILDREN WITH IMPAIRED HEARING

IN the course of the first investigation into defects of speech in school children I discovered, by accident, that a girl of 13½ years with a defect involving the 's, f, θ' group of sounds, used no consistent written symbols for these sounds in writing from dictation but interchanged them apparently at random. Unfortunately that first example, from which this investigation into the scholastic attainments of children with impaired hearing originated, has been lost. I only recollect that the phrase 'to and fro' was written 'two and throw'. Her audiogram showed a very slight loss for high tones, but her intelligence quotient was only 72, and this slight hearing loss, in association with retarded intelligence, was enough to cause her visual and auditory confusion. Her resulting mental confusion was obvious. It occurred to me that in order to understand the normal development of hearing for speech an investigation into the actual school work of children with impaired speech and hearing would be valuable.

It was soon decided to confine the investigation to children with impaired hearing over the age of 7 years, for two reasons. Firstly, children showing speech defects in association with *normal* hearing were usually either very young or else mentally retarded. (This field would itself be an interesting one to investigate, especially in relation to the influence of speech therapy on the acquisition of the basic subjects.) Secondly, even where it has been possible to obtain a reliable audiogram under 7 years the scholastic attainments of such young children are necessarily limited and cannot, therefore, be fairly judged. Actually only five 7-year-olds are included. The average age of the children studied was 11 years. This rigid exclusion of the under-7 meant that much interesting and suggestive material was sacrificed. The task of collection alone occupied some three years, since less than a third of the new cases attending the audiometer clinic were found to have hearing loss involving both ears, to be at the same time of presumably normal intelligence, and over 7 years old. As in the case of the children with speech defects, and later of the children under 5, the records were collected as the children came to the clinic. No attempt was made to analyse or classify the material until the whole period of review was ended. Because of this the records were examined with a completely unprejudiced mind.

EDUCATION OFFICES,
DEANSGATE.

To : The Head Teacher,

.....School

Name of child..... Age.....

Address.....

.....

Dear Sir/Madam,

With the permission of ..... I am writing to ask your help in an investigation concerning the scholastic attainments of children with impaired hearing. Will you be kind enough to attach to this form, and return to me, the original and unaided attempt of the above child to perform the following tasks :

(Burt's Mental and Scholastic Tests)

(1) Drawing a man.
(2) A composition on 'SCHOOL' (allow ½ an hour).
(3) Dictation of the passage over page.
(4) Reading the words over page. Please underline the words correctly read.

If the child has left your school, please return this form, giving the name of new school, if possible :

.....

Has the child attended school regularly ? .....

Has the child ever worn spectacles ? .....

Any remarks concerning the child's school work or behaviour which you care to give will be welcomed.

Yours faithfully,

Form sent to Principal Teacher

DICTATION

Please continue until child fails completely on five consecutive words.

It is on a cat but not a dog. I saw her run by in the wet. She came to seek or steal a bird's nest in the grass. The cruel little kitten ! I have asked forty girls this puzzle. None failed. Imitate their industry. Explain every sentence. Employ beautiful style. Should your solution be satisfactory, I believe thoroughly acceptable prizes will be bestowed designed for either sex—pianos, sewing machines, ingenious model yachts, forfeited photographs, excellent bicycles for picturesque adventure—an emphatic sign, genuine if miscellaneous in character, of our conscientious appreciation of your unique proficiency.

READING

Child need read only first words of lines until he falters. Then give him the 10 words of preceding group and those that follow until he fails on 10 consecutive words. Underline words read, please.

to is of at he my up or no an

his for sun big day sad pot web one now

that girl went boys some just told love water things

carry village nurse quickly return
known journey terror obtain tongue

shelves scramble twisted beware commenced
scarcely belief steadiness labourers serious

projecting fringe luncheon nourishment overwhelmed
urge explorer trudging events motionless

economy formulate exhausted contemptuous renown
universal circumstances destiny glycerine atmosphere

perpetual emergency humanity perambulating ultimate
apprehend excessively domineer theory reputation

physician fatigue philosophy melodrama autobiography
constitutionally champagne encyclopaedia hypocritical efficiency

melancholy exorbitant influential terminology palpable
mercenary contagion fallacious binocular microscopical

atrocious phlegmatic refrigerator unique alienate
eccentricity ingratiating subtlety poignancy phthisis

At first it was considered advisable to obtain records of the child's reading, spelling, dictation, composition and arithmetic, but since I could not visit the individual schools for this purpose myself, nor conduct such an unwieldy and time-consuming examination in the clinic, it was decided, for the sake of the teachers concerned, to reduce the formidable list of subjects to be tested. Further experience had taught me that *arithmetic* is usually the subject least affected by impairment of hearing, since the child readily grasps the few visual 'number' symbols required, and learns to relate them to whatever sounds they represent in his own individual auditory field. *Spelling* of isolated words was difficult to record, and, in any case, it was found to be such an unreliable guide to the child's auditory capacity that this test was also discarded. *Reading* and *composition* it was essential to retain since they were the only means of assessing the extent of the child's linguistic appreciation. *Dictation* was also retained since it appeared to be the best method of recording the child's appreciation of connected speech under ordinary schoolroom conditions. Finally, since I had by this time observed the enthusiasm with which all deaf children devoted themselves to writing, painting and handwork, I decided to include a request for samples of the child's drawing.

The next problem was to decide how to make the test. When I first became interested in this matter I merely asked for random samples of the child's dictation and composition, but I soon found that the standards varied so widely from school to school and even from teacher to teacher that it was impossible to make any reliable comparisons. It was essential, therefore, to use some standardized tests. Cyril Burt's *Mental and Scholastic Tests* [1] provided the most obvious solution. They were well known, easy to apply and simple to record, and I had used them for the purpose of assessing mental deficiency for many years, but they had certain disadvantages. They were standardized for London children more than twenty years ago, and it did not necessarily follow that they were equally suitable for children in wartime Manchester. Several other tests were therefore considered, but were eventually discarded, because the teachers whom I consulted assured me that, in their opinion, Burt's scale was still valid, and the tests were undoubtedly the most convenient to apply.

The accompanying form was therefore designed and was sent out to each head teacher concerned, asking for records of the child's attainments in *reading* the words given (which included all those in Burt's scale), in *dictation* of the standard passage of connected sentences (the whole passage was given), in a *composition* on 'School' for which half an hour was allowed, and in his *drawing* of a man, for which no time limit was set. This particular subject (a man) was chosen because it is possible to assign an approximate mental age

to the result. It was hoped, therefore, that the samples sent in would give some additional information regarding the child's maturity of intelligence, as well as his actual neatness in draughtsmanship, a hope which turned out to be completely justified.

In order to increase the number of reliable records obtained, permission was sought from the Salford authorities to extend the investigation to those children whom I had examined in the first (speech) survey, and who were still attending their original schools. This permission was readily granted, and some very valuable material was thus secured.

In every case a personal letter was sent with the form to the principal teacher giving a report of the child's hearing capacity, of the medical treatment advised, and making individual recommendations regarding the educational treatment suggested. The labour and sacrifice of leisure involved in copying charts, writing letters, and making these personal contacts was enormous, but the value of this personal communication to the child, and incidentally to the research, cannot be over-estimated. In all large organizations, by the time the child's record has passed through the various clerical departments concerned, there is a danger that the case may eventually come to be regarded as a name and address to be neatly filled in a card index and consigned, with the best intentions in the world, to some well-defined category. This cannot happen when the medical officer who examines the child is given full responsibility and is allowed to consult the teacher personally. It is a matter which, from my own experience, I wish to emphasize, at least in regard to the treatment of the handicapped child, who must always be considered as an individual and not merely one of a group.

The value of using familiar standard tests was at once apparent when the mass of material thus collected came to be analysed. It was not possible to assign a scientifically accurate ' attainment age ' to any of the tests but reading, since the conditions under which they were performed were not standardized. A true attainment age for all the tests could only be made under laboratory conditions, so that the same individual delivered them and another estimated the results, the distances and voice levels in dictation were strictly controlled, the time limit for the composition was enforced, even the choice of materials, sizes of paper, &c., were determined. To the best of my ability, however, and from eighteen years' experience in applying these particular tests, my assessment of results is unbiased. In order to check my opinion, however, I enlisted the help of my sisters (K. M. S. and F. W. S.), both of whom have considerable experience of teaching general subjects to children of junior school age in elementary and grammar schools and one of whom (F. W. S.) has made a special study of children's art. We decided that, since accurate percentage marking was out of the question, the fairest

estimation of results would be under five heads—excellent, good, average, fair and poor. 'Average' included attainment ages estimated within six months of the child's chronological age. 'Good' and 'fair' represented attainment ratings within six to twenty-four months above or below the chronological age. 'Excellent' and 'poor' included any ratings respectively better or worse than these. Each of us went through the records separately, and where an assessment was open to any doubt the case was carefully reconsidered.

It then occurred to me that the results might be most conveniently expressed in the form of a simple graph. The small chart illustrated was therefore prepared and each child's result was individually plotted. The case records had been filed alphabetically and they were examined in this order. When the final estimations of attainment had been made the cases were sorted into five groups according to the percentage of hearing loss.

	Hearing Loss	Number of Cases
Group 1.	Under 10%	33
Group 2.	10%–19%	37
Group 3.	20%–29%	29
Group 4.	30%–39%	20
Group 5.	Over 40%	16
	Total	135

The averages for each group were then estimated by awarding marks as follows :

No attempt	0
Poor	1
Fair	2
Average	3
Good	4
Very good	5

The calculations were made (by K. M. S.) to the nearest second decimal point, and a composite graph for each group was thus possible. Finally a composite graph for the whole series was made, and, for interest, separate graphs for all girls and all boys.

The results worked out as follows :

	Reading	Dictation	Composition	Drawing
Group 1	3	2·51	2·76	2·64
Group 2	2·43	1·92	2·49	2·78
Group 3	2·34	1·72	2·34	3
Group 4	1·85	1·8	2·3	2·45
Group 5	2·06	1·25	1·69	2·58
Average whole series .	2·33	1·83	2·30	2·73
All boys (66 cases) . .	2·09	1·43	1·93	2·52
All girls (69 cases) . .	2·60	2·28	2·65	2·96

A study of these graphs reveals several significant points. The

most striking perhaps is that once more the boys' performance is well below that of the girls, although the numbers of boys and girls in each group was approximately equal. It is difficult to believe that the thousands of boys examined in the speech review as well as those in this series were all less intelligent than the girls. There may be a time-lag in the maturation of the boy's intelligence as compared with the girl's, or perhaps this time-lag exists only in the

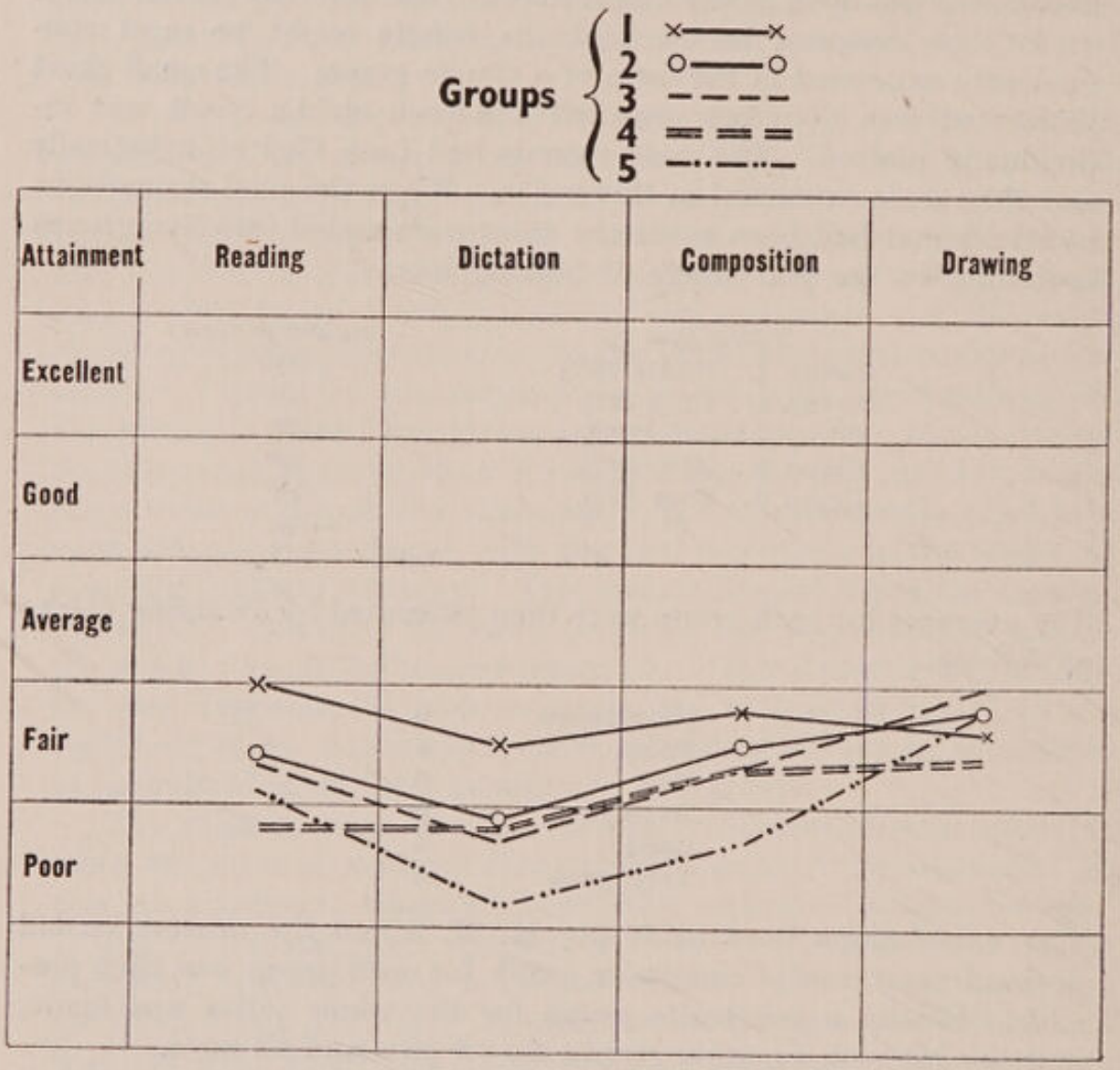


FIG. 8

development of the boy's verbal facility. The boys' average attainment in drawing is also lower than the girls' in my series, but the numbers are too small to be reliable.

The second significant observation is that although with progressive hearing loss there is a general downward tendency in all the linguistic subjects, the figures for drawing are the nearest to normal. Drawing a man was the only test which it was always possible to apply no matter how defective the child's speech and language. When it is remembered that the drawings of children with impaired

hearing provide perhaps the best indication of their mental development (or maturity) as compared with their language development, this result becomes more significant.

The next interesting observation is that the scores for all the linguistic subjects were well below average, and this in spite of the fact that many of the individual children scored 'excellent' for one or more of the three language tests. *Reading* and *Composition* score more or less equal marks, but the scores for *Dictation* are much worse.

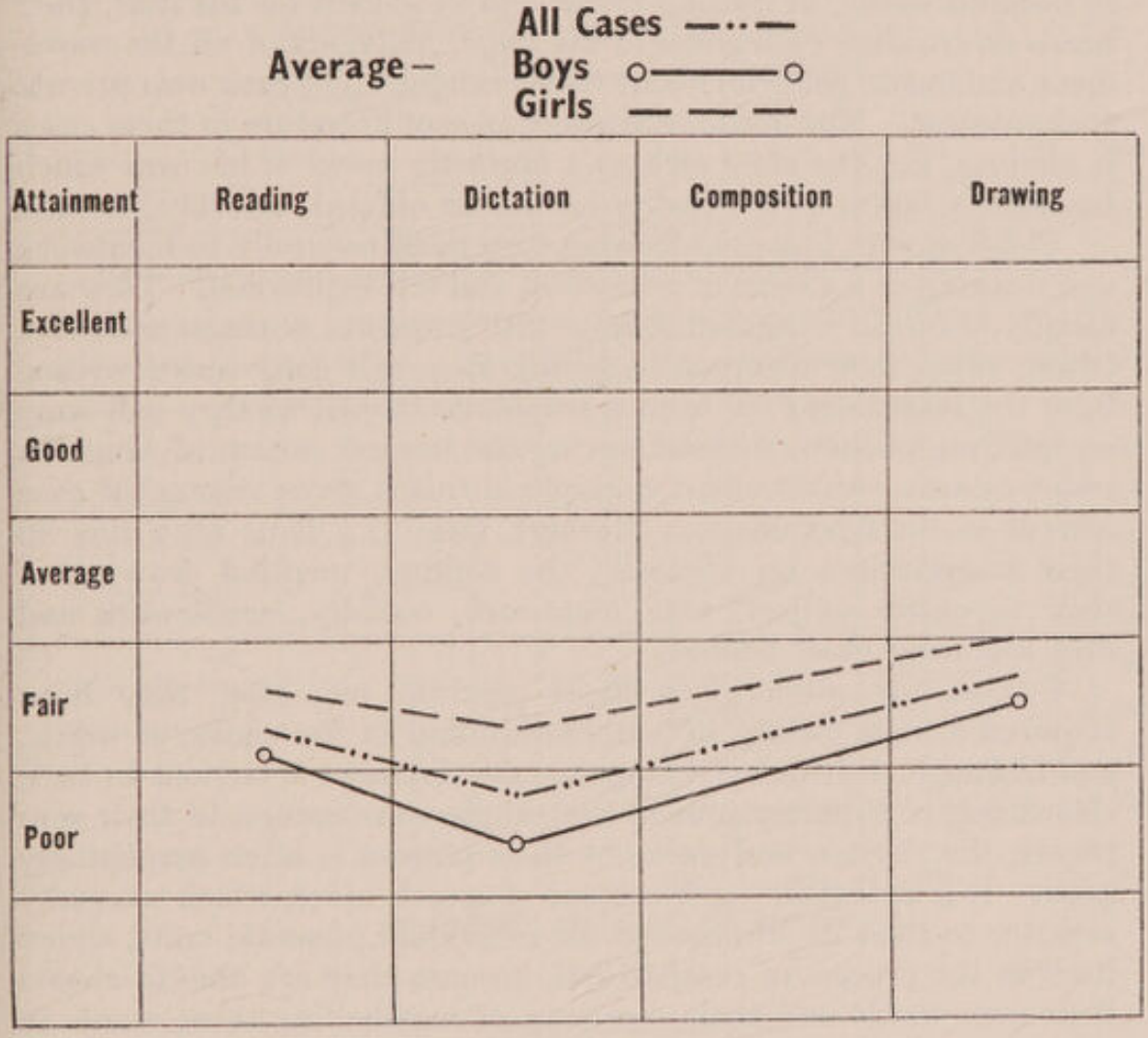


FIG. 9

The reason is not far to seek. In reading the child learns to associate certain groups of printed symbols with certain groups of speech sounds, and although he may not be hearing the whole group of sounds accurately he does see the whole word, and from experience he knows how to relate that seen word to his own auditory field. He also learns that a certain printed word stands for a certain definite unit of meaning, a name, an action, a qualification, etc. Having grasped these main principles he can, therefore, attempt to read words which may not be much less difficult than those considered average for his age, and he will be able to read story books and

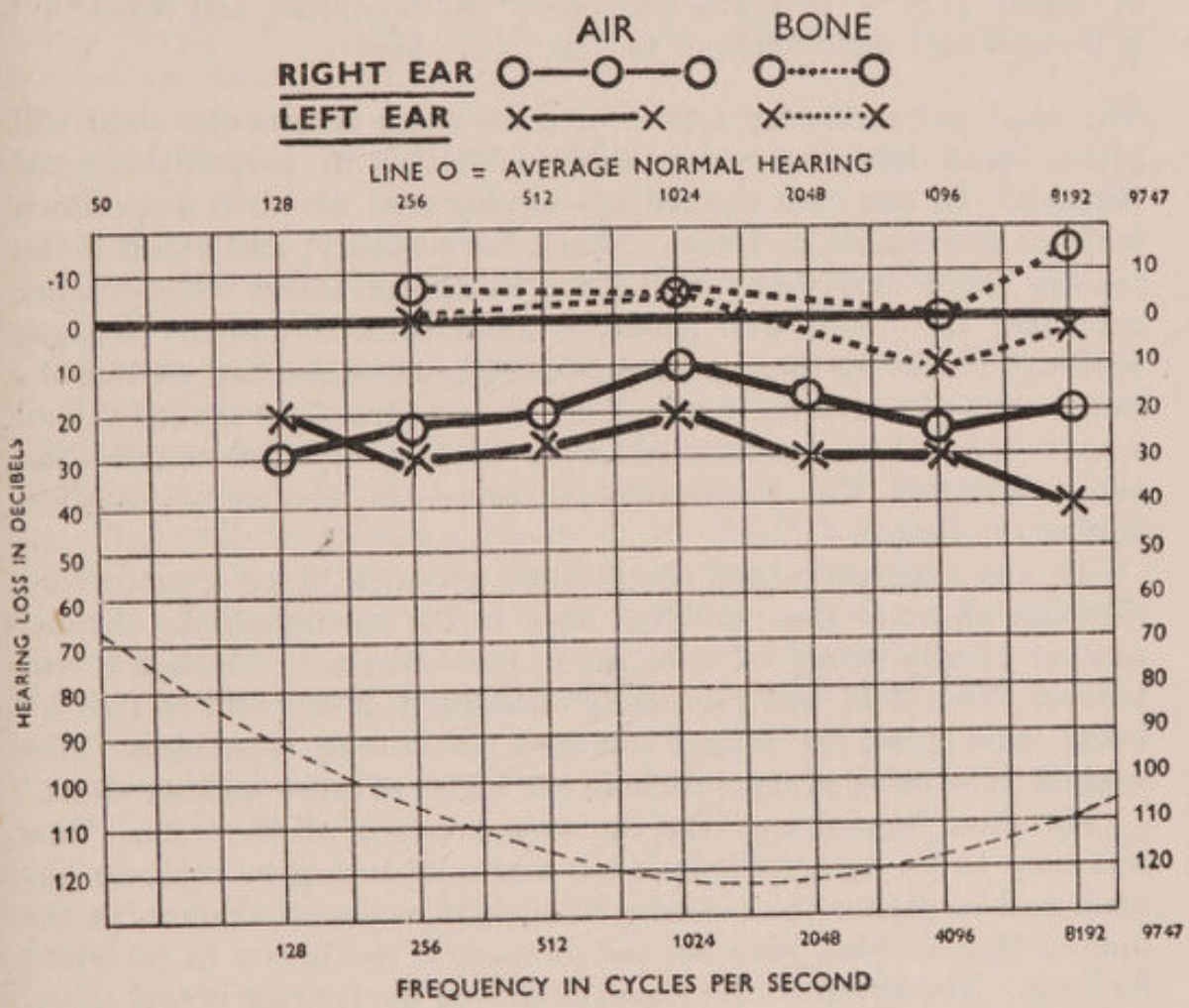
'comics' not very much less advanced in thought or vocabulary than those which form the staple reading-matter of his contemporaries. I say 'will be able to read' purposely. In my experience very few children with impaired hearing do read for pleasure unless they are highly intelligent or have developed their deafness late in childhood. Those unfortunate older children who become deaf as a result of cerebrospinal meningitis usually fly to books as their one solace for the world they have lost. I have seen them many times in hospital wards, in waiting-rooms and in schools for the deaf, their heads down, their eyes glued to the page, oblivious of all the movement and bustle going on about them, caught up in their own private enchantment. The need for a wise choice of literature in these cases is obvious, lest the child creates a fantastic world of his own which has little relation to the reality he will be obliged, one day, to face.

Children with impaired hearing turn most naturally to handwork and drawing as a means of recreation and self-expression. They are usually beautiful writers and draw with exquisite neatness and care. Often, when their deafness is severe, they will copy script writing from the blackboard (or from a neighbour!), just as they will copy any pattern of lines, without having the faintest notion of what the script means. An excellent example of this is given among the case records in the next chapter (Herbert, Case 7). Time after time in their compositions on 'School' the children mention drawing as their favourite subject, with handwork, cookery, needlework and drill following close behind.

Composition often gives them pleasure too, once they have acquired a little facility in penmanship and in the choice of words, and although their delayed language development is obvious in their elementary vocabulary and in the simple construction of their sentences, the rhythm and swing of their phrases is often surprisingly good. It is as if their consciousness of speech tunes, which is usually superior to their discrimination for individual phonetic units, shows itself in the process of composition, because they are able to choose their own words and their own way of marshalling those words in sentence order. A study of children's compositions has led me to think that the unsophisticated intelligence, when composing, mentally *hears* rather than *sees* the words, may even silently *speak* them. We have all seen the small child working his lips and his tongue in sympathy with his pencil. This would account for their very vivid, unselfconscious style. In the upper forms, where the rules of grammar and composition receive considerable academic stress, the appearance of a sentence assumes an altogether disproportionate significance in the child's mind and much of that early innocent charm is lost. (The poet and the dramatist retain this capacity to hear words as well as see them when they are composing. Many of our most famous prose writers seem to have lost it entirely. The

visual imagery they evoke may be most colourful and precise, but their prose is not easy to read aloud.)

In cases of severe deafness the child's composition shows very plainly his incomplete grasp of language forms. Nouns and verbs receive his principal attention, as in speech they receive the most obvious vocal stress, while shorter words, plurals and case endings are omitted. Sometimes the written words are so incredibly dis-



RONALD

Severe Speech Defect

FIG. 10

torted that they are completely unintelligible. Vowels are eccentrically placed, and consonants jostle each other in unpronounceable clusters. The general effect is of a sort of nightmare Welsh. Here, for instance, is the composition of *Ronald*, aged 8 years 10 months. This boy had a severe defect of speech involving the 'ɵ, f, s', and 'r' groups. All his double consonants were reduced to single sounds. The hearing loss was only 12 per cent, but he was also retarded. It was impossible to ascertain his intelligence quotient accurately because of his language difficulty.

Composition on 'School'.

Carlwle

I dolag carlwle do lag a I carlwle dan is the dan it carlwle is veg is it veem I do lac en for re I lac carlwle is veenas dan lac dag.

Note.—The child was unable to translate this when asked to do so later, but 'carlwle' obviously represents 'kool' (ku:l)—his own version of 'school', i.e. 's' of double consonant 'sk' is omitted, and vowel 'u:' is lowered and diphthongized to 'au', i.e. 'kaul'.

The most extraordinary aspect of these cases is that the child will often 'read back' this incredible gibberish in perfectly normal English. In one case the teacher having sent me such a specimen without a translation, I sent it back for curiosity, and asked if the teacher could supply any sort of key to the meaning. The teacher consulted the child, who promptly read back the whole passage, although it was by then at least two weeks since she had written it; but she may have been recalling the sense rather than the individual words. (Another excellent example of this type of composition complete with the translation is given in the next chapter. Barbara: Case 6.)

It was noticeable that composition often involved a more considerable effort to these children than to the normal child. As one teacher vividly described it to me in conversation. 'It was a real labour. The child was physically exhausted at the end of half an hour. She stuck her tongue out and was almost breathless. She seemed to be using every muscle in her body, so great was her effort.'

Dictation, however, proved the most severe of all the tests. This was only to be expected, since the strain of trying to hear, to lip-read, and to gather the meaning of spoken words all at once, in the limited time allowed between the phrases, is too heavy to be borne for long. The strain on the vision as well as the hearing is enormous, as anybody can prove for themselves if they plug their ears and try to write some unfamiliar passage from dictation, remembering also that adults have a trained 'attention', and a knowledge of words sufficiently good to allow them to guess the whole word from hearing the merest fraction of it.

The teachers often remarked, after the nature of some individual child's deafness had been explained to them, that they had noticed, in ordinary class dictation and in oral lessons, that the child had appeared eager and attentive at first, but would soon 'give up trying', and had therefore been considered to be 'lacking in concentration'. Actually these unfortunate children are obliged to concentrate to the extreme limit of their capacity from the first moment, and, as the lesson proceeds, the time-lag between the teacher's utterance and the child's interpretation becomes longer

and longer, until finally their fatigued brains fail to register any meaningful associations at all. When this has happened the intelligent child quietly proceeds to occupy himself with drawing or copying, or mentally retreats into fantasy. The more retarded child fidgets, or behaves rebelliously, so that he becomes a nuisance to the teacher and a serious distraction to the rest of the class.

The children whose speech patterns were immature scored very badly in this subject. They often repeated, in their written symbols, their errors of auditory discrimination. Frequent mistakes were 'steal' = 'teel', 'seek' = 'sake' or 'see', 'industry' = 'indutrie', 'none' = 'nine', 'imitate' = 'imitae', 'or' = 'all', 'believe' = 'beal', 'cruel' = 'grool'. (In composition this was much less obvious, but one child wrote 'flont' for 'front', and another wrote 'parore' for 'parlour'.) More often the children failed to make any attempt to write down the words they did not easily hear, so that their dictation was full of blanks.

It was not dictation, however, but composition in which there was the largest number of failures to make any attempt at all. Drawing was always attempted, reading next often, then dictation, and finally composition. It speaks much for the devotion of the teachers and the gallant courage of the children that they learn to read so well as they do. It also demonstrates the deaf child's natural aptitude to train his visual memory. It also indicates that, in teaching children with poor auditory discrimination, the visual, tactile and muscular memories should be encouraged, so that they may compensate, in some slight degree, for their auditory impairment.

The actual figures for failure to attempt the tests were:

	Reading	Dictation	Composition	Drawing
Group 1	—	—	—	—
Group 2	1	2	4	—
Group 3	2	2	3	—
Group 4	—	1	2	—
Group 5	3	5	6	—
Totals .	6	10	15	—

Whenever a speech defect was present the child's attainments in linguistic subjects were seriously retarded, whether the speech defect was due to subnormal auditory or intellectual discrimination. It had been anticipated that there would be a distinct difference in the average scores of children with low-tone loss and those with high-tone loss. It had frequently been observed that the former, because of their good appreciation of consonants and therefore of the intelligibility of speech, were often exceptionally good at lessons; while the latter, because of their difficulty in distinguishing the finer consonants, which meant that they were always struggling to interpret a very distorted jumble of speech sounds, were usually very

poor scholars. This distinct difference, however, did not exist as an invariable rule throughout the series, although it is dramatic enough in some of the cases quoted in the next chapter. The explanation is simple. The ultimate effects of impaired hearing on the child's scholastic attainments depend upon so many other factors than actual decibel loss—previous medical history, intelligence, age of onset, educational and social experience before and after that onset, temperament and general physical condition—to mention only the more obvious. There is no short cut to the resolution of these interrelated problems of speech, hearing and scholastic attainment. A detailed study of the case records merely confirms the necessity for expert investigation in every case, and the importance of basing ultimate decisions regarding the child's future education and training entirely on his own individual physical disabilities and intellectual merits.

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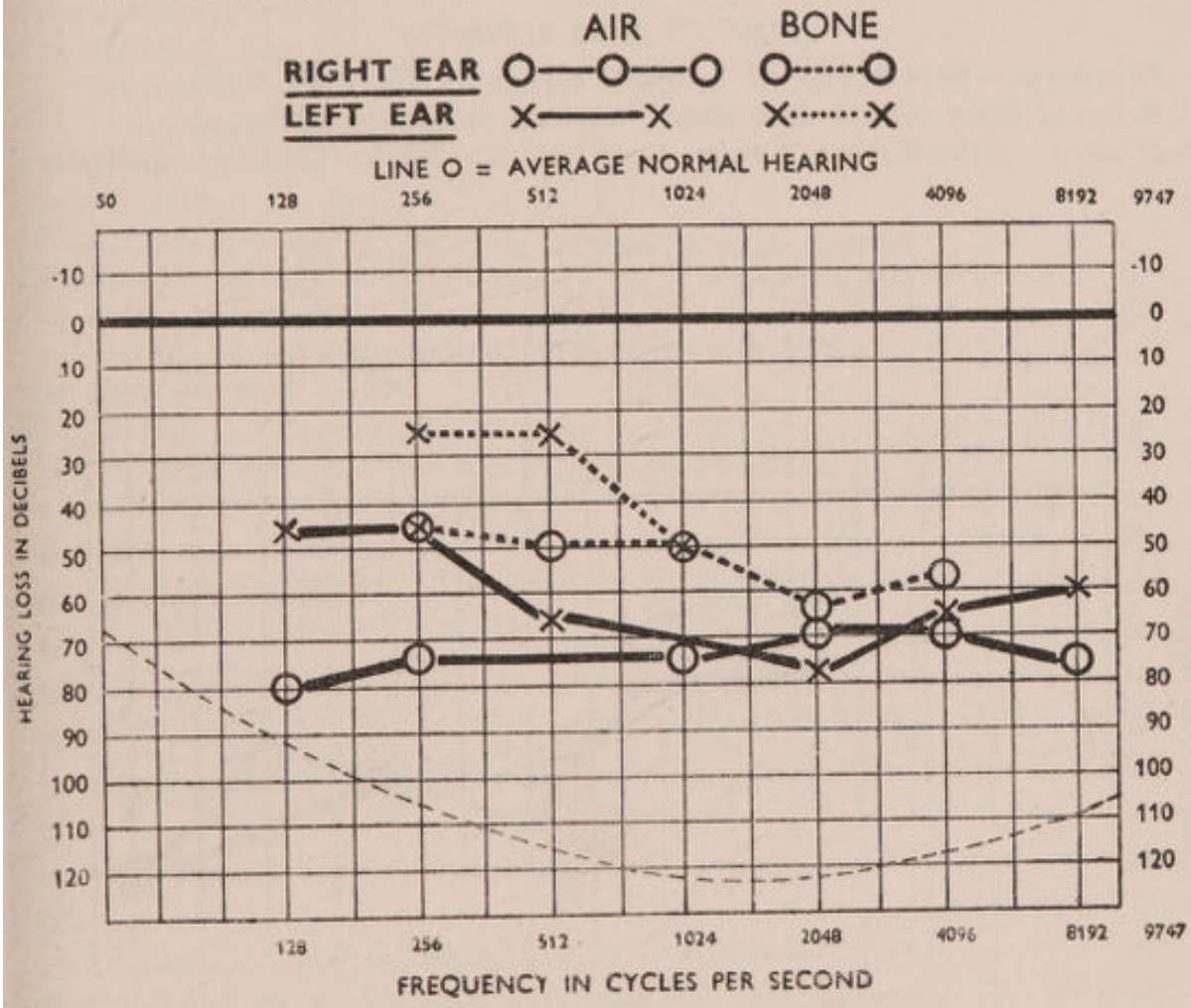
Case 2

BARBARA

(*aged* 8 *years* 1 *month*)

Diagnosis.—Severe loss of hearing over whole speech range.
Referred by otologist from Children's Hospital.
History.—Cerebrospinal meningitis at 5 years 9 months. Mother reports heard normally until then. Has suffered from double otorrhoea. (Now dry.)



BARBARA B.

Meningitis

FIG. 12

Speech.—Very monotonous, soft and low pitched. Obviously acquired normally. Weak syllables and 's' occasionally omitted. Sounds still correct but a little *laboured.*
Voice Tests.—No response even when facing examiner at 1 metre. Child has not yet learnt to watch speaker's lips.
Attention.—Fairly good.
Scholastic Attainments :
Reading, nil.
Dictation, nil.

Composition, nil.
Drawing, average.

Teacher's Report.—'Barbara is intelligent and amenable to discipline, and most anxious to learn, but in a large class of normal children it is impossible to give her the attention she needs.'

Educational Treatment.—School for Deaf.

Case 3

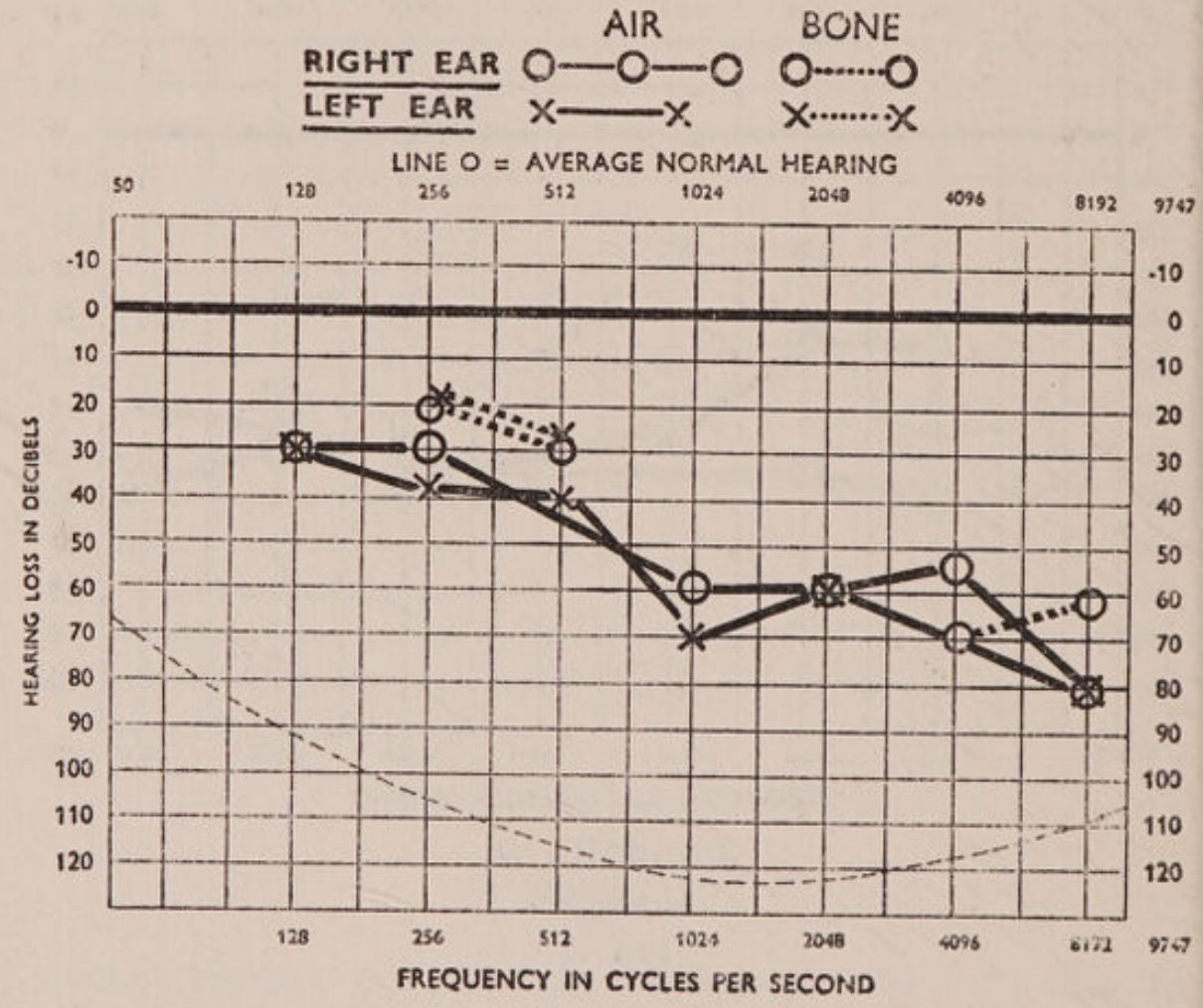
ENID

(*aged* 13 *years* 8 *months*)

Diagnosis.—Severe loss of hearing, especially for high tones.

Referred from school otologist. 'Speech suggests deafness.'

History.—Grandfather 'very deaf all his life'. Certified mentally



ENID

High-tone loss

FIG. 13

deficient. Intelligence quotient 67. Notes mention 'Speech indistinct'. Deafness never suspected at home or in school.

Speech.—Very toneless. Rather nasal back vowels. Consonants formless. 's = t,' 'ʃ = tʃ,' 'r = w.' Gets 'ɵ' and 'f' by lip-reading. Lip-reads well (self-taught).

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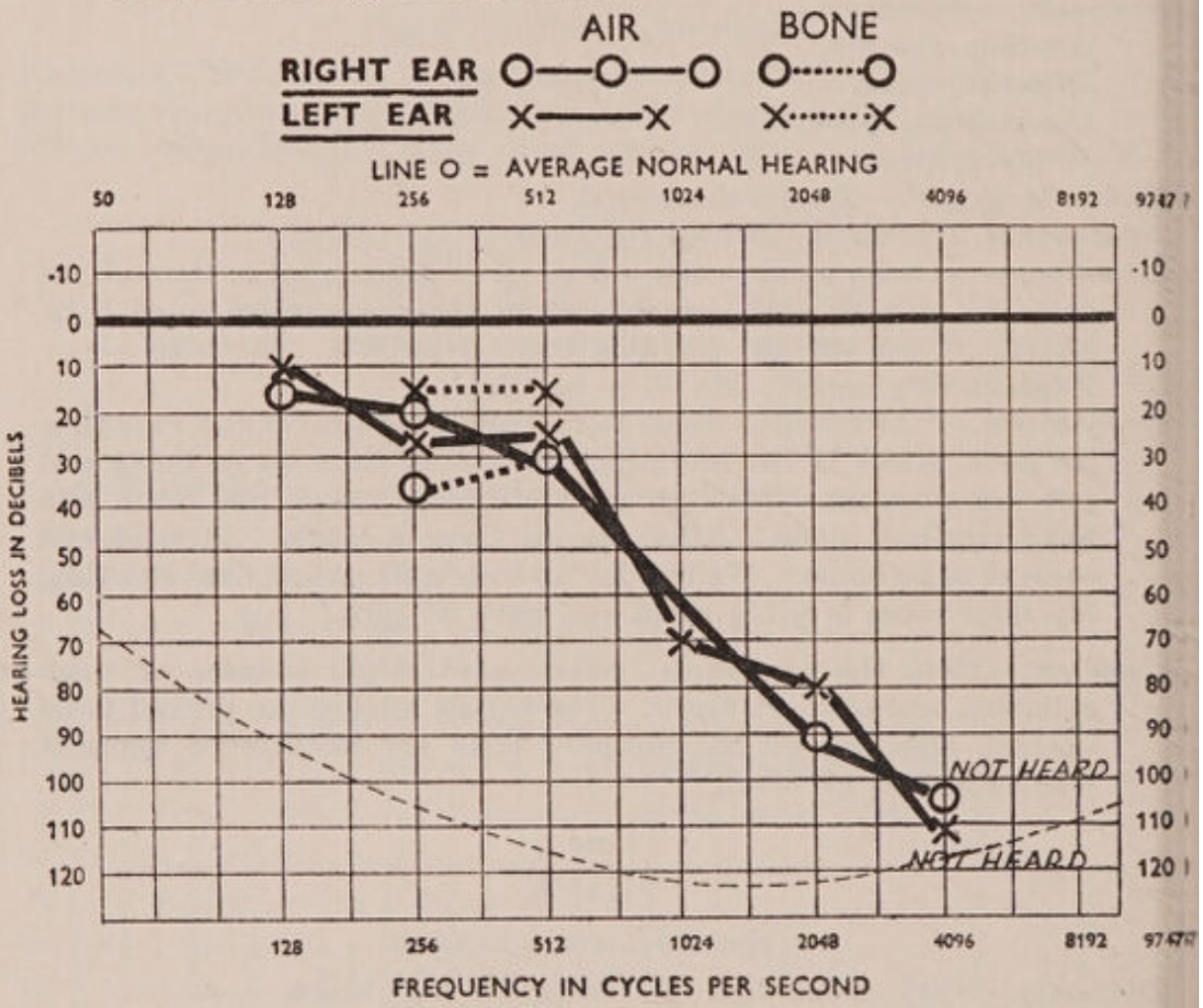
Noted.—' Understands connected speech well at 1 metre.'
Attention.—Excellent.
Scholastic Attainments :
Reading, age 15.
Dictation, poor.
Composition, very good.
Drawing, very good.
Teacher's Report.—' School work only very mediocre, especially dictation. Good at drawing and handwork.'



FRANK (12 years)
High-tone Deafness
FIG. 14

Educational Treatment.—Lip-reading lessons and speech therapy. Recommended training in commercial art.
Dictation.—' It is on a cat that not on a dog. I saw her run by in the wenk. She came to teck her steal a bird's rest in the drat. The trulel little kitten. I have hast furley girls this pestel. Non faild imitiat the inditrit ; exspain every sention empods beyteful tiel.'
Composition.

' *School*

A. Street is the name of our school. It is a very old one. In

fact it is about 80 years old and it is going to be pulled down after the war. It looks very old outside but inside it has been painted to make it look new.

There are eight teachers, five women and three men. The headmaster's name is Mr. X. and he is very good teacher. Mr. X. our teacher is not very much liked by us for he uses his strap a lot. Mr. X. is not liked at all for he has about a dozen canes and they never have any dust on them.

The only lessons I like are drawing and writing. I like drawing best of all but we only have it once a week. On Friday, when we have it, Mr. Z. hangs the best drawing up on the wall of the classroom and a few of mine are there.

Our school has a very good football and cricket team and they win nearly every match. Our teacher lets us have a game of cricket in the park every week. He is a good cricketer and he plays with us.'

Note.—I dictated the passage in the clinic myself at 1 metre. The essay was written for me privately. I told him he could say just what he liked and he availed himself of the opportunity ! There is no doubt that he hears the cadences of speech. The sweep of his sentences, the rise and fall of the phrasing, the admirable choice of words, all bear witness to this and to his acute intelligence.

The defects of the dictation are too obvious to need analysis, but it is interesting to note that the sounds which give him most trouble are those which need good hearing for the upper tones of the speech range. He has no difficulty with the vowel sounds.

This is the most dramatic case of its kind that I have encountered in the research.

Case 5

JANET

(*aged* 11 *years* 3 *months*)

Diagnosis.—Severe loss over middle and high tones.
Referred by M.D.S. ' Speech suggests high-tone loss.'
History.—Deafness suspected at 3 years, as child was obviously intelligent but was slow learning to speak. No family history of deafness. No history of ear disease. Has won High School scholarship.
Speech.—Low and rather toneless. Does not volunteer any conversation, but answers questions readily. Omits ' s ' centrally and terminally. ' r = w,' ' ʃ = tʃ.'

Voice Tests :

	3 Metres	1 Metre
25 words :		
Back turned . . .	0	0
Facing	16	20
5 sentences :		
Facing	4	5

Child is expert self-taught lip-reader.

Attention.—Excellent.

Scholastic Attainments :

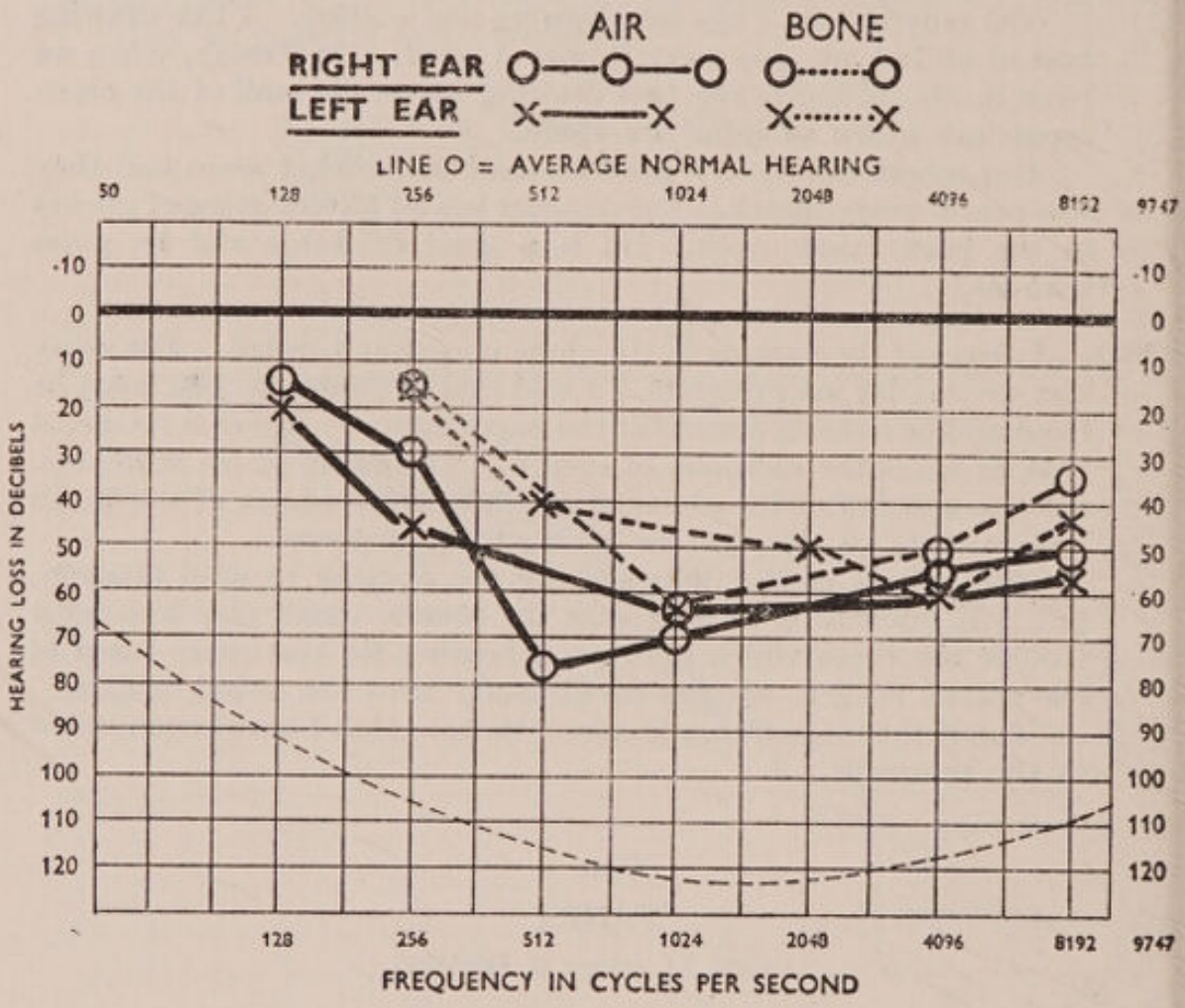
Reading, age 15.

Dictation, very good.

Composition, very good.

Drawing, average.

Teacher's Report.—' We have noticed the child's inability to appreciate the difference between " ʃ " and " t ʃ " in learning French. She also



JANET ($11\frac{3}{12}$ years)

High-tone Deafness

FIG. 15

confuses these sounds in English. She will put her finger on a line of her book when another girl is answering and turn round to watch the speaker's lips.'

Educational Treatment.—Supervision and sympathetic consideration. No special teaching is necessary.

Dictation.—It is unnecessary to give this as it is very good for her age.

Composition.—' Our school is situated in the centre of the city and is called the High School for Girls. It is a good school, you have to learn French, and in the second form there are three languages to choose from which are Latin, Spanish and German. We have a different teacher for every subject. The headmistress is Miss A.,

the second head is Miss B., and my form mistress is Miss C. We have had another geography mistress called Miss D. as our other (one) is away in hospital ill. I like all the subjects and all the teachers. We do not have Domestic Science till we are in the second form, which is cookery and laundry. My friend is called Anne and she is a nice girl. Our games day is on Thursday and we go on a tram to the games field and play rounders, but if it is raining we have prep in the library or form room and then go to the gymnasium, hall or yard and play all kinds of games for which we generally have Miss E. our English teacher who is rather small but she is very nice.

We have three subjects of home work every night except Wednesday. Some of the forms go to High St. Swimming Baths to learn to swim, but our form does not go. We come out of school at half past three and I get the quarter to four train at Y. station to Z. and I go to school with two other girls Margaret and Jean both of which are in IB, and they went to the baths yesterday. We have some prefects three of which I know.'

Comment.—The child is remarkably fluent. This was all written within the prescribed half hour. There is not a single mistake in spelling. Her visual memory must be excellent. This has probably also helped her to acquire her unusual facility in lip-reading.

Case 6

BARBARA

(*aged* 9 *years* 4 *months*)

Diagnosis.—Severe loss of hearing for high tones.

Referred by head mistress as 'Very retarded. Defective speech.'

History.—Deafness never suspected at home or in school. Mother is deaf, but her deafness is of low-tone type. Mother's speech is normal. No history of ear disease. 'Spoke very late.'

Speech.—Grossly defective. Back vowels slightly but definitely nasalized. 'ʃ and ʃs = ɵ, $\frac{1}{0}$' or omitted, 't and d' omitted centrally and terminally. 'r = w,' 'ɵ = f,' 'ð = v.' Double consonants all reduced. Unintelligible in spate.

Voice Tests (allowing for speech defect):

	3 Metres	1 Metre
25 words:		
Back turned	7	9
Facing	18	20
5 sentences:		
Back turned	3	5
Facing	5	5

In repeating words *vowels* are correct, but confusion of 's.ʃ.ɵ.f.v' group and of 't.d.k.g' group very marked.

Attention.—Excellent.

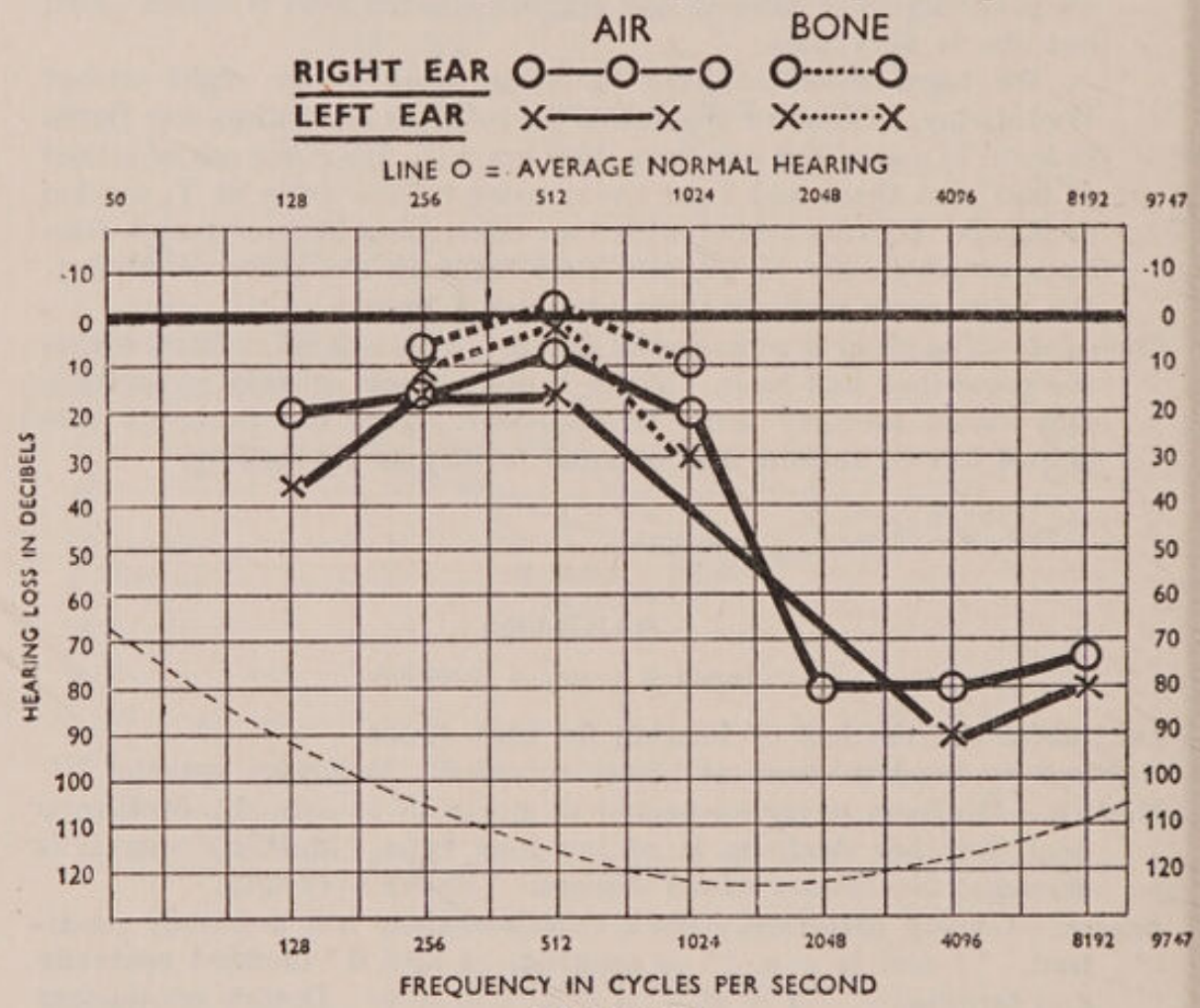
Scholastic Attainments:

Reading, age 5·3.

Dictation, poor.
Composition, poor.
Drawing, good.

Teacher's Report.—' The dictation was a great struggle. I have written out her composition as she read it back to me. She has made very little progress during last six months. I consider that she is retarded mentally 3 years or more, and that she is unable to benefit from normal class teaching.'

Educational Treatment.—Speech therapy and lip-reading tried for



BARBARA

High-tone Deafness

FIG. 16

12 months at mother's urgent request. Progress poor. School for Deaf therefore again advised. Mother still resisting removal. Legal action under consideration as special teaching is necessary if the child is to be enabled to earn a living in the future.

Dictation.—' it is out a cat the boh. I was her ran by in the. she wase to all a hevrn. t in the cog. the little patsey. I have erves leae Boed. hev cervsa. ore thker.'

Composition.—' I like my shlortp weae was it is weae thaer and we bo thresye and we play lileu the Boed eray and are easlsy miss and miss ciresea come in it is at hae shlortp my mothre wiry me my

blory and I so retheye to shlortp and oretges ariksbe aechke I so ariksbe.'

Translation of above as 'read back' by child immediately afterwards.

'I like my school very much. It is very nice and we do sums and play games. The girls read and our teacher and Miss Walton comes in. It is a very nice school. My mother gives me my dinner and I go back to school and at home time I go home.'

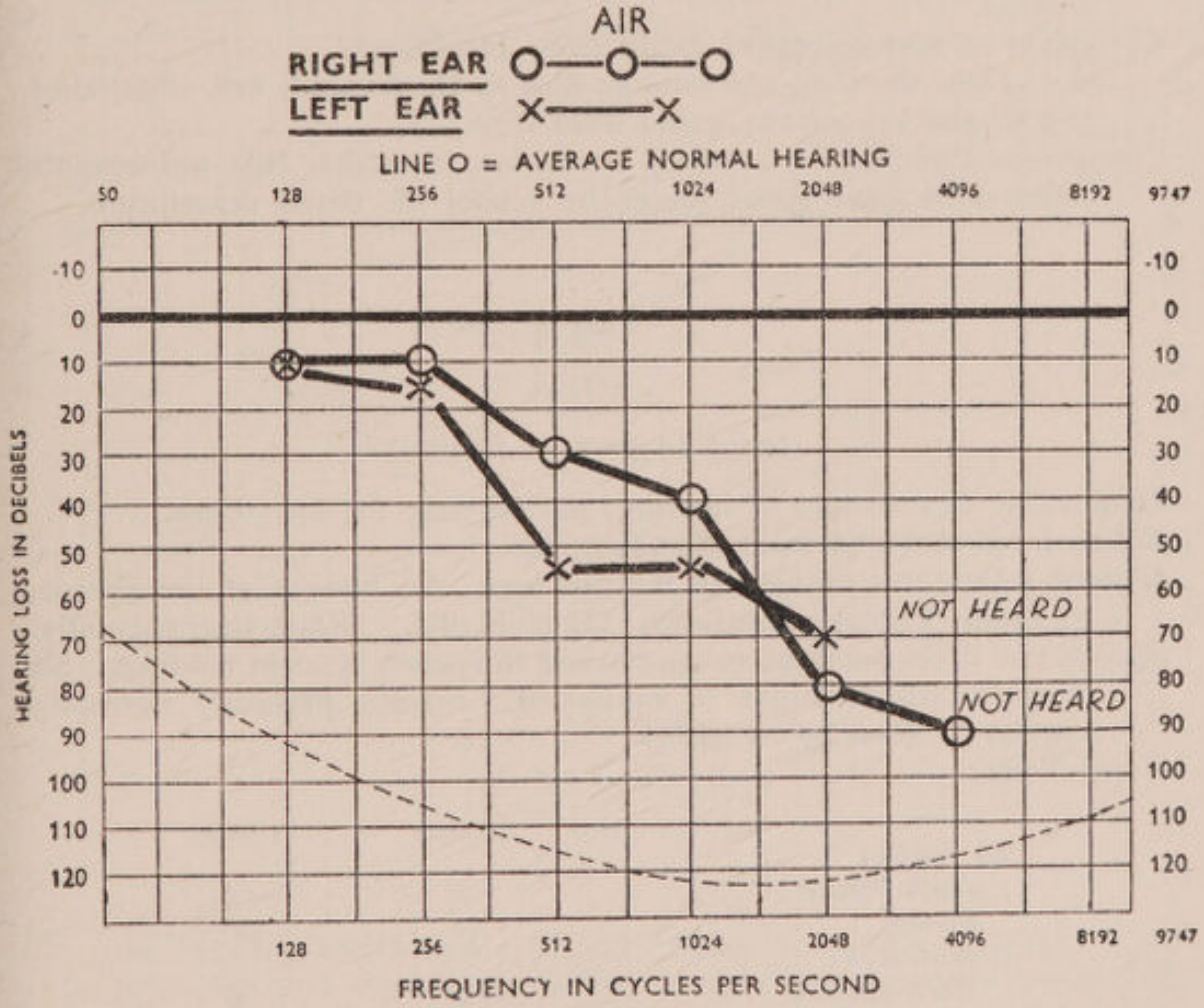
Comment.—Unnecessary.

Case 7

HERBERT

(aged 8 years 1 month)

Diagnosis.—Severe loss of hearing for high tones.
Referred by M.D.S. on account of typical speech defect.



HERBERT (9 years)

High-tone Deafness

FIG. 17

History.—Deafness never suspected at home or in school. Thought to be 'hopelessly defective'. No deafness in family. Younger child normal. No history of ear disease.

Speech.—Unintelligible. Back vowels nasalized and 'ai = ei'. Initially 'ɵ = f', 'p = b', 'v = b', 'r = w' or 'wr', 's = t', 'z = d', 'k = h', 'g = d', 'ʃ = tʃ', 'z = dz'. Terminal and central consonants omitted.

Voice Tests.—Impossible.

Attention.—Fair.

Scholastic Attainments :

Reading, nil.
Dictation, nil.
Composition, nil.
Drawing, fair.

Teacher's Report.—'He made no attempt to do anything on his own initiative. He copied from whoever he sat next to.'

Education Treatment.—School for Deaf.

Dictation.—'rmeiy pivy a bisemnry mecrme inei oneuh iovy ueimensy up mensee um foumey covenry too. the menvmy the tnab tlaimy neremr.'

Correction of above, copied tidily from blackboard.

'They went up the lane as fast as they could, but when they got to the school the gates were shut.'

Comment.—The state of mental confusion in which this unfortunate child must have spent his entire school life defies description.

Case 8

NORA

(*aged* 13 *years* 8 *months*)

Diagnosis.—Severe loss of hearing, particularly for low tones.

Referred by otologist from Ear Hospital.

History.—Deafness noticed 12 months ago. No history of ear disease. No family history of deafness. 7th child of 9. Others hear normally.

Speech.—A little toneless, more marked in speech than in reading. No phonetic substitutions or omissions. Speech probably normally acquired. (See below also.)

Voice Tests :

	3 Metres	1 Metre
25 words :		
Back turned . . .	2	4
Facing	11	20
5 sentences :		
Back turned . . .	0	0
Facing	3	4

Attention.—Very good.

Scholastic Attainments :

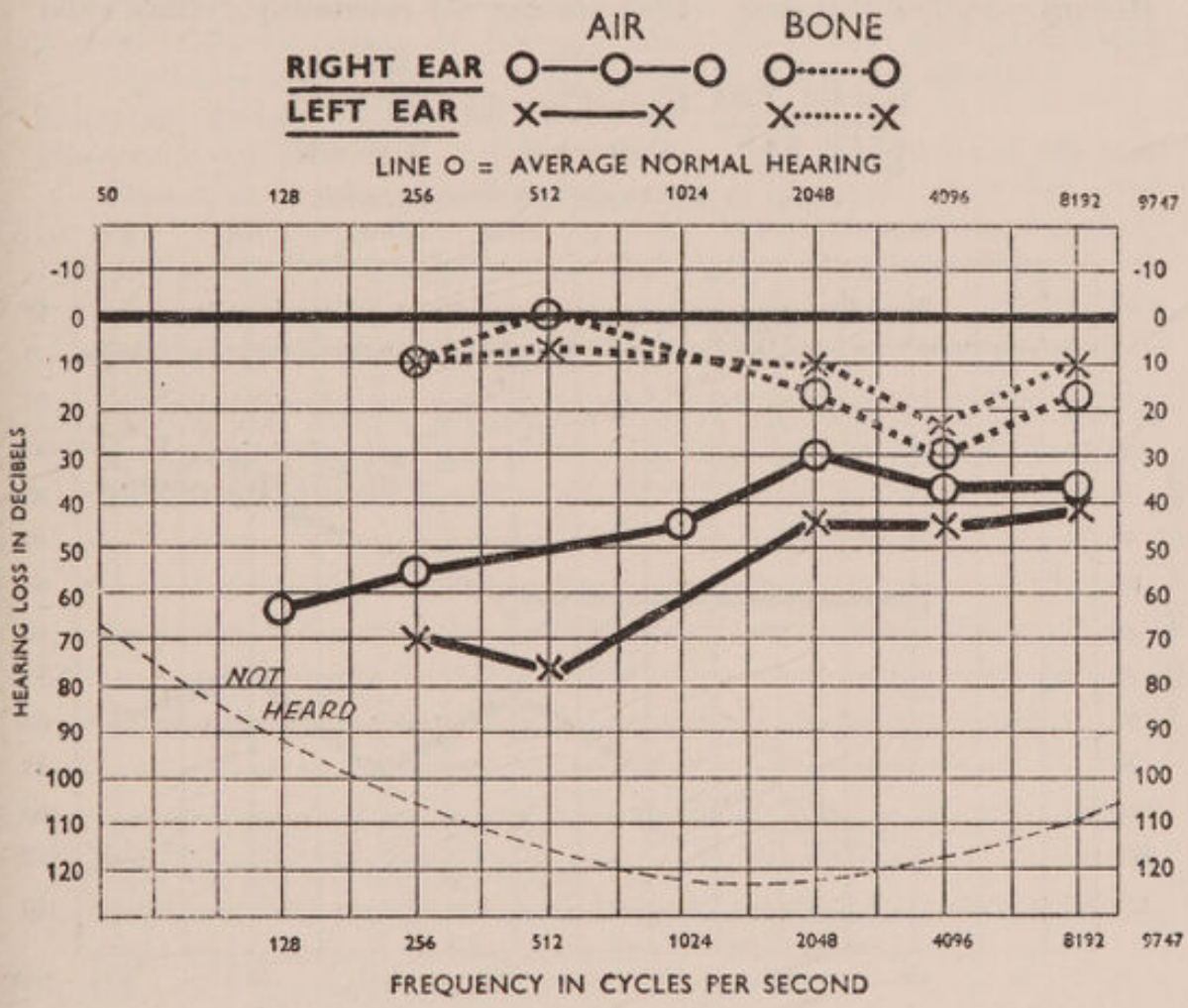
Reading, age 14·7.
Dictation, good.
Composition, average.
Drawing, fair.

Teacher's Report.—' The child is intelligent and an earnest little person. As a little child she was a remarkably clear speaker.'

Educational Treatment.—Lip-reading lessons.

Dictation.—There is no need to give this as it is good for her age.

Composition.—' The school which I attend is named A. St. and it is a large school. The lessons are very interesting. Arithmetic is an interesting lesson. In school there is a cookery class which I attend



NORA

Low-tone Deafness

FIG. 18

on Tuesday afternoons. Friday afternoon we sew or knit. If we have ten red marks we receive a duty for the next week. On Monday morning we have arithmetic. St. VI the class I am in have a library which has many nice books in it. One of the books that I have read is called " Cecily's Highwayman ". Thursday afternoon we have dancing to a gramophone.'

Comments.—This is an example of the type of case for which facilities for vocational training are sadly needed. The medical prognosis is grave. The child's capacity for earning a living in the future is likely to become increasingly impaired.

Case 9

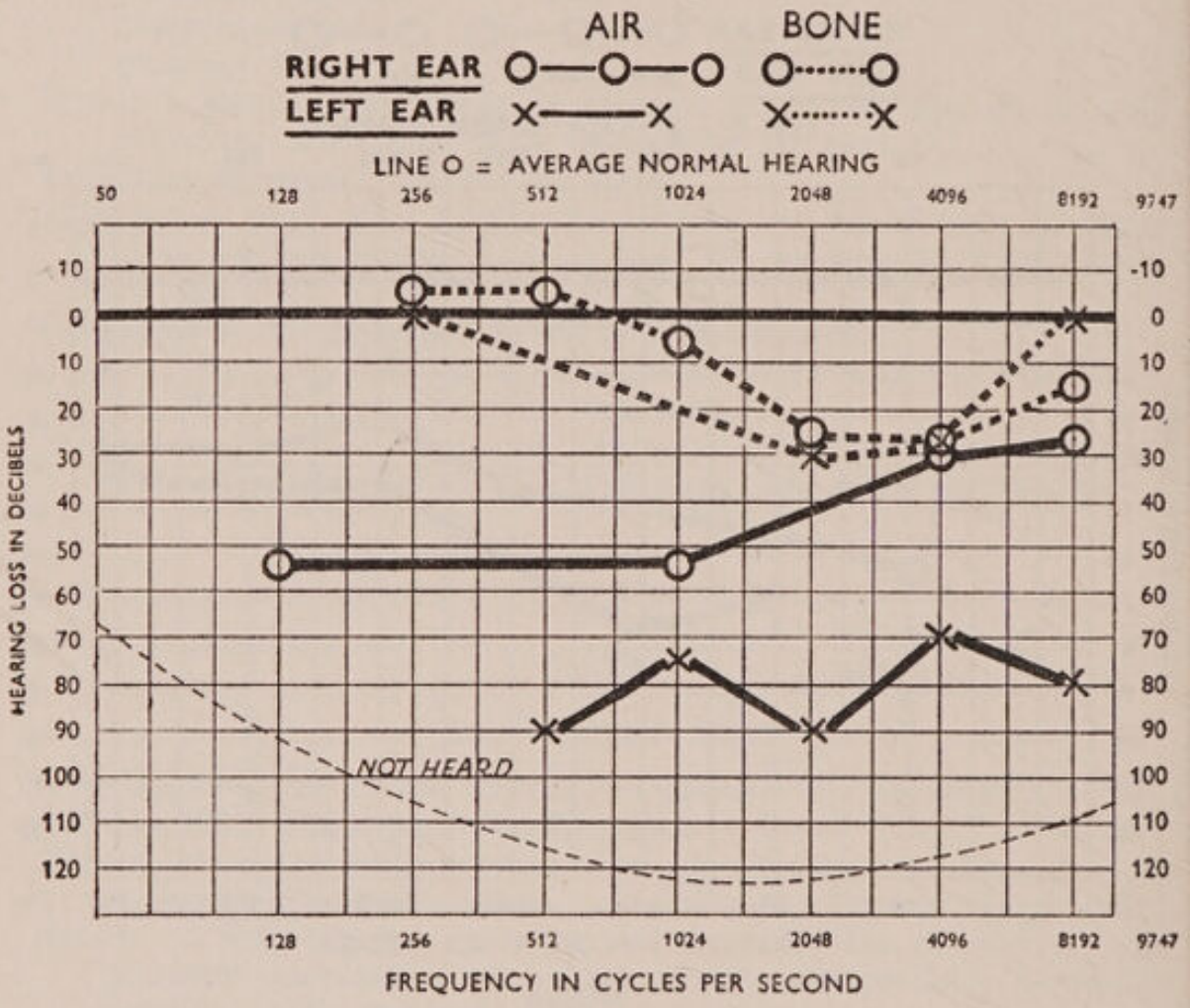
BARBARA

(*aged* 12 *years and* 4 *months*)

Diagnosis.—Severe loss of hearing, particularly for low tones. (This type of deafness is often progressive.)

Referred from school medical officer.

History.—Father also deaf. Uses hearing aid constantly. Only child.



BARBARA D.

Low-tone Deafness

FIG. 19

Good social type. Certified mentally defective. (3 separate I.Q.s given as 66, 70 and 75 and 'slight deafness' noted in records.) Mother admitted 'I was told years ago in hospital that child should be in a school for the deaf, but I would not agree she was deaf. They neglected her in the ordinary school (*sic* !). She has come on well in the special (M.D.) school and is very happy there.' (A tribute to the value of constant individual attention, which, of course, was impossible in the normal school.)

Speech.—Very soft. Almost whispered. No substitutions. (Therefore was probably normally acquired.)

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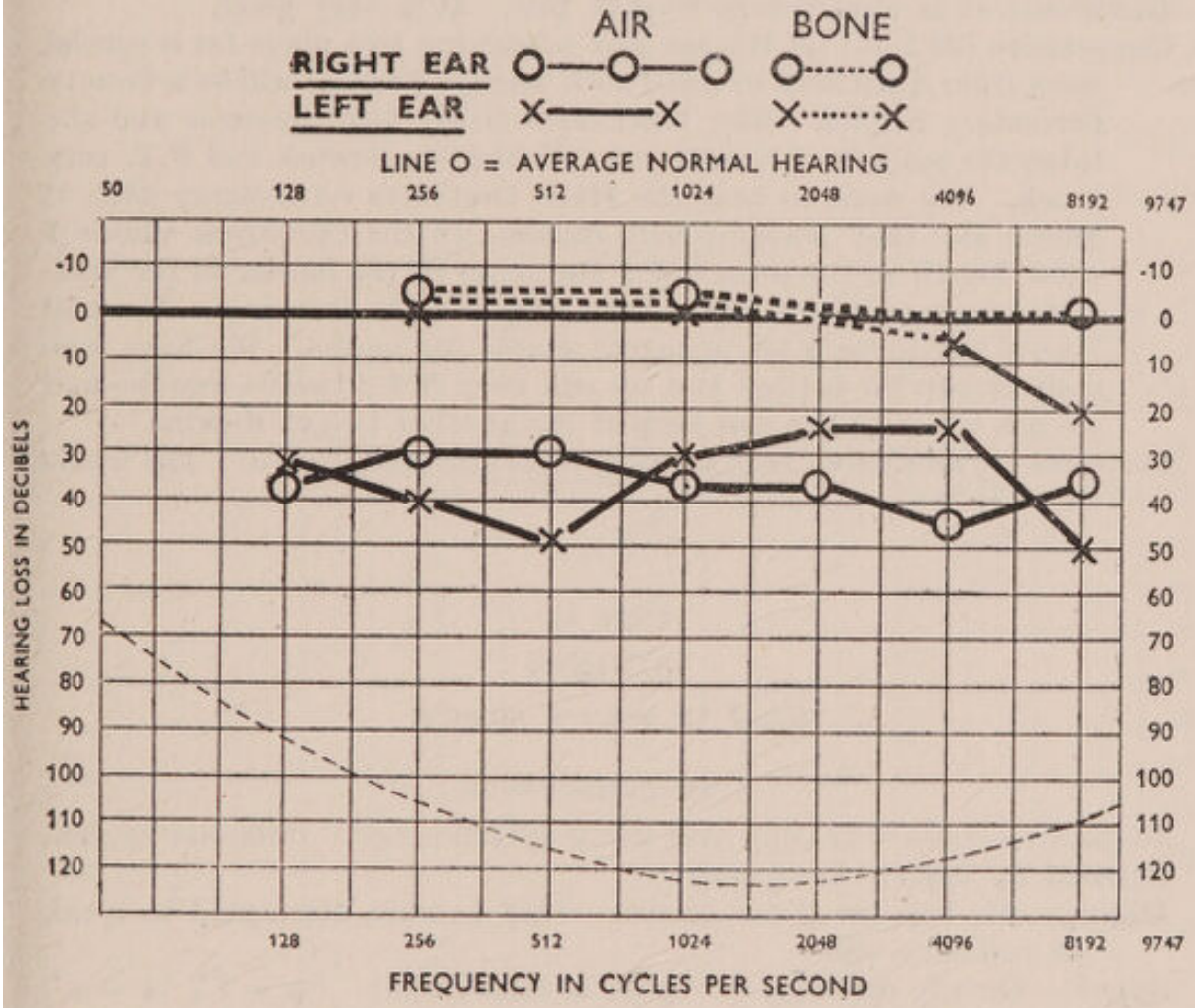
Case 11

JOAN

(*aged* 11 *years* 10 *months*)

Diagnosis.—Severe loss of hearing over whole range.
Referred by school medical officer.
History.—Old chronic double otorrhoea. Now dry. Deafness noticed about 5 years ago. No family history of deafness.



JOAN

Loss over Whole Range

FIG. 21

Speech.—Normal. Quiet.
Voice Tests :

	3 Metres	1 Metre
25 words :		
Back turned	2	14
Facing	13	19
5 sentences :		
Back turned	0	0
Facing	4	3 (tiring)

Attention.—Excellent but effort enormous. Was in a Central School but has now (April, 1945) won scholarship to a High School.

Scholastic Attainments :

Reading, age 15 years.
Dictation, very good.
Composition, very good.
Drawing, fair.

Teacher's Report.—' She is a happy little girl and does not show any signs of strain. She says she is able to understand what is said by the mistresses provided they are in front of her.'

Educational Treatment.—Lip-reading lessons.

Dictation.—It is unnecessary to give this. It is very good.

Composition (28.3.45).—' We are just rehearsing two plays for a special week from April 23rd to April 28th when our school will be a County Secondary School. Miss Watkinson is my form mistress and she takes the subject of Needlework. I like Needlework and P.T. very much. We went to hear the Halle Orchestra on Monday 26th of March and they played lovely music. In the Christmas exams I came fourth in the form but I am going to try harder in the mid-summer exams to get higher to the top. I like learning maths and I have got quite a lot of merrit marks for maths. We have won a silver cup for netball and we can keep it for twelve months and we are going to try and keep it for another twleve months.'

Comment.—The writing is beautifully neat and well spaced. The whole effect is most pleasing.

Case 12

GORDON

(*aged* 10 *years* 8 *months*)

First Examination

Diagnosis.—Loss of hearing over whole speech range. Defective speech.

Referred by speech therapist.

History.—No history of ear disease. Said to have attempted to speak ' at ordinary age '.

Speech.—Grossly defective. Vowels normal (local). ' θ = f ', ' z = s ', ' ʃ = s ', ' tʃ = s or t ', ' dz = d or z ', ' ks = k ', ' z, s, t, d ', omitted centrally and terminally. Tries very hard.

Voice Tests :

	3 Metres	1 Metre
25 words :		
Back turned . . .	4	14
Facing	7	18
5 sentences :		
Back turned . . .	1	3
Facing	3	3

Attention.—Good, but flagging towards end of test. The effort is obviously enormous.

Scholastic Attainments :

Reading, age 8·7.
Dictation, poor.

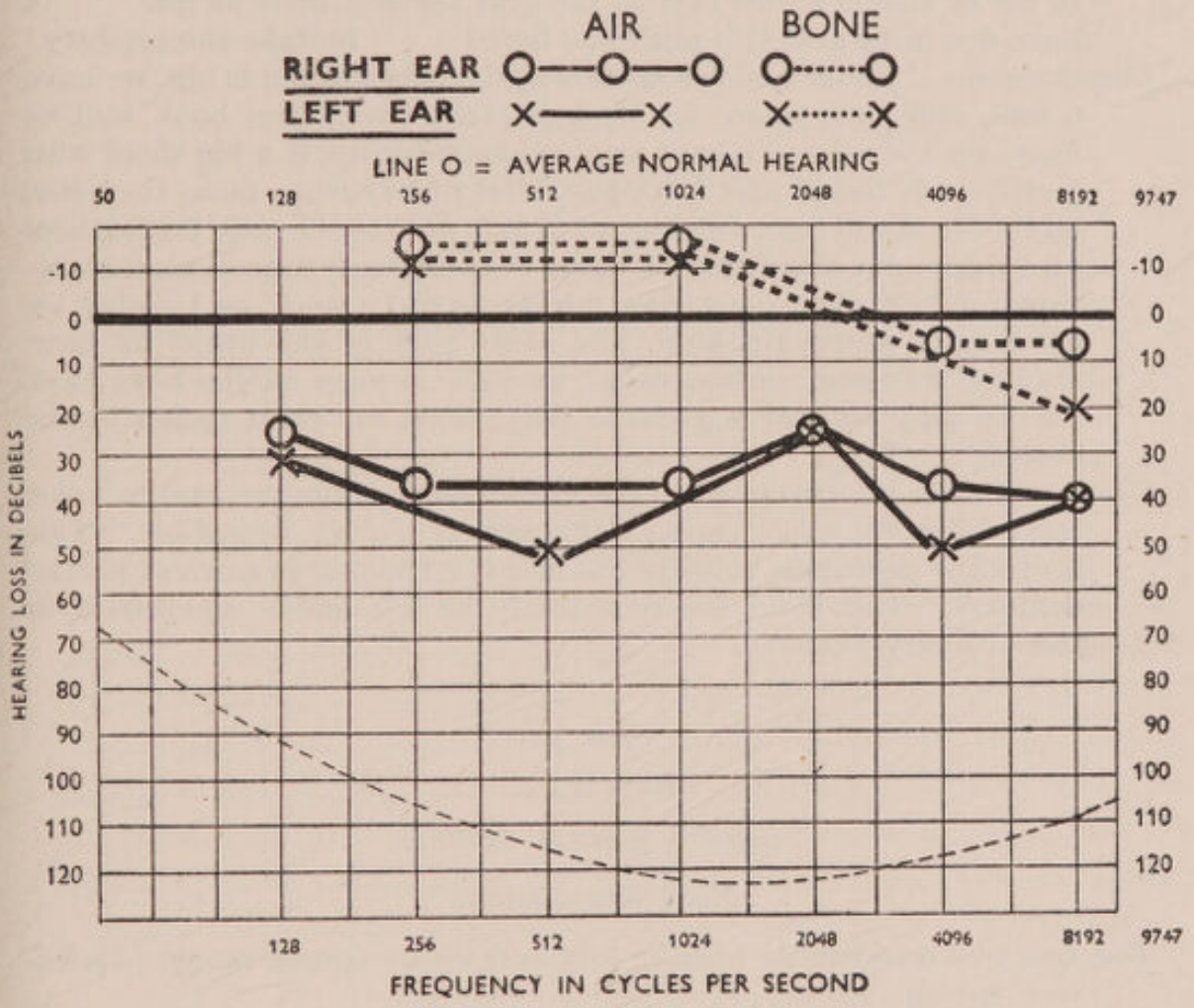
Composition, poor.

Drawing, good.

Teacher's Report.—None volunteered.

Educational Treatment.—Speech therapy. Lip-reading. Supervision.

Dictation.—' It is on a cat but not a bog. I saw hes rwn by in the wet. She came to seek or setel a bead nast in the gress. The grewel little catit. I hath sake forty gials this pusel. None fiel. ipptake thie industry. exblam.'



GORDON

FIG. 22

Composition.—' I go to A. Rd. school I like sum wrighting and I like storys. We play games in the play ground. I march in the hall. We sing in the hall. I sit by the window. I do longbevnes. I like Dictation and coposition. my clas is full doy and no geals in it. Mess potter is my techesne and I go in other class to I go in.'

Second Examination (aged 11 years 9 months)
After 12 months' Speech Therapy

The audiogram curves are unchanged. Speech now normal.

Voice Tests :

	3 Metres	1 Metre
25 words :		
Back turned . . .	14	20
Facing	18	25
5 sentences :		
Back turned . . .	2	5
Facing	5	5

Dictation.—' it si an a cat but not a dog. I saw her run by wet she came to see or steabe a dird nest in the gras the crul little kicton I have doc forty grils this pusll non fiafed imitake thier induty '

Composition.—' The school is a good one, the play ground is big, we have a hall, and class room, all kind of stray book, sum book writing book, on a wesday we have panting and singing, it a big shool with a grils part, babys part boys part a lot of boy come more then 100, all the shool will have 500 boy, at 6, 7, 5, gose to the prak for footbool on tueday, our shool master name is cross, he is a good man sometime but not when boys come late or do dirty work, on tuesday we have maps about Egnland, and other part of the world we have reading, dwaring, witing, sums, we milk in cups all the boys have pals to play with or a game to play, there are eight techer in the shool.'

Comment.—The improvement in the child's capacity to respond to voice tests following expert speech therapy is almost incredible. This shows the enormous value of ear and eye training in cases of partial deafness. This child can now safely be left under supervision in the ordinary school.

Case 13

NEVILLE

(*aged* 8 *years* 9 *months*)

First Examination

Diagnosis.—Considerable hearing loss over entire speech range. Defective speech.

Referred from speech clinic.

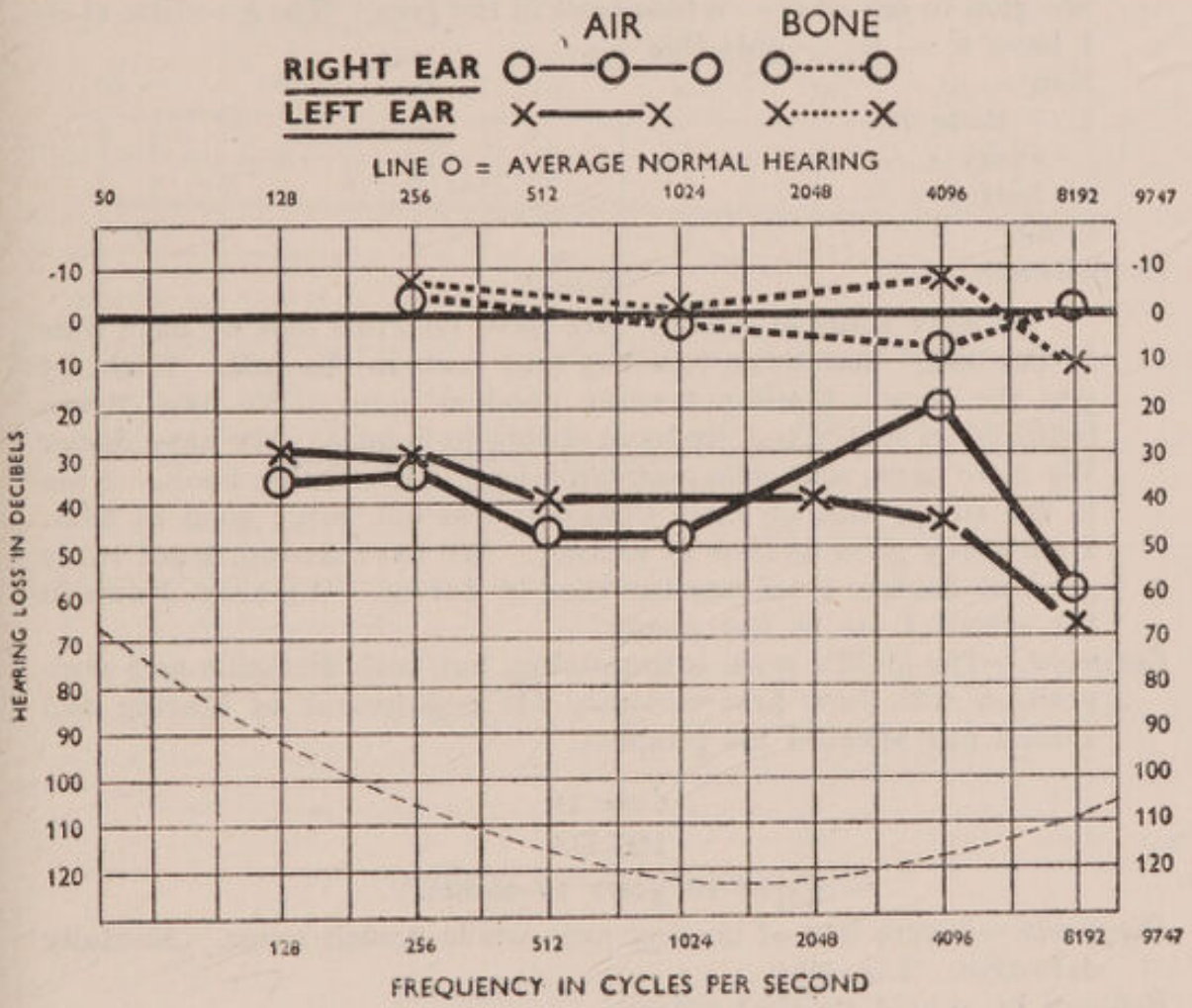
History.—Double otorrhoea of long standing. Deafness first noticed when child was learning to speak. Grandmother spontaneously reports ' Heard loud syllables but not lower ones.' Father is also ' slightly deaf '.

Speech.—Almost whispered. Very toneless. Omits weak syllables. ' s ' very imperfect initially and omitted centrally and terminally. ' ɵ = f ' occasionally.

Voice Tests :

	3 Metres	1 Metre
25 words :		
Back turned . . .	0	7
Facing	0	19
5 sentences :		
Back turned . . .	0	0
Facing	0	5

Attention.—Good.
Scholastic Attainments :
Reading, age 5·4.
Dictation, poor.
Composition, poor.
Drawing, good.
Teacher's Report.—None volunteered.
Educational Treatment.—Continue speech therapy and supervision.



NEVILLE

FIG. 23

Later.—May require transference to school for Deaf.
Dictation.—' it is on a cat not a bag i cor hor ranag bi in the wat kma to sak ral or a bo in the gesg.'
Composition.—' We had a little roorr for a roorr fo and we had a lok and a Pan to wit '

Second Examination, 18 *months later*

Audiogram shows no significant change.
Speech following speech therapy, now normal.

Voice Tests :

	3 Metres	1 Metre
25 words :		
Back turned . . .	12	13
Facing	14	20
5 sentences :		
Back turned . . .	0	1
Facing	1	4

Scholastic Attainments : (record of reading not sent by teacher).

Dictation.—' it is on a cat But not a dag. I saw the run by in the weat. She gam to see all si — a bias naxt in the gees. The g — litte ci — I have a — fe — gals this —
Non —
I — there in —
— every s —
— batfull s —
solud.'

Composition.

'*School*

We have sums in school. We have Dicktoss and we have dille in the hall. and there is a bag (ck) cook in the hall. Wich del you the time. I am not verey good at sums. We have wretn (writing) in school and we have sialing in School. We have disber We have pens, and rells and sums book and writing book. I am in the sifing. and we have Comester I'm not verey good at that. I am verey good at that in writing. We have daring, I am verey good at daring, I am one the bees in daring. We have demes in the school I am in the geems.'

Comment.—The child's work is improving, but both dictation and composition still show how seriously his impairment of hearing and speech has affected his progress.

Case 14

HILDA

(*aged* 12 *years* 10 *months*)

Diagnosis.—Severe loss of hearing over whole speech range. Mentally defective. I.Q. 60·5.

Referred by school medical officer.

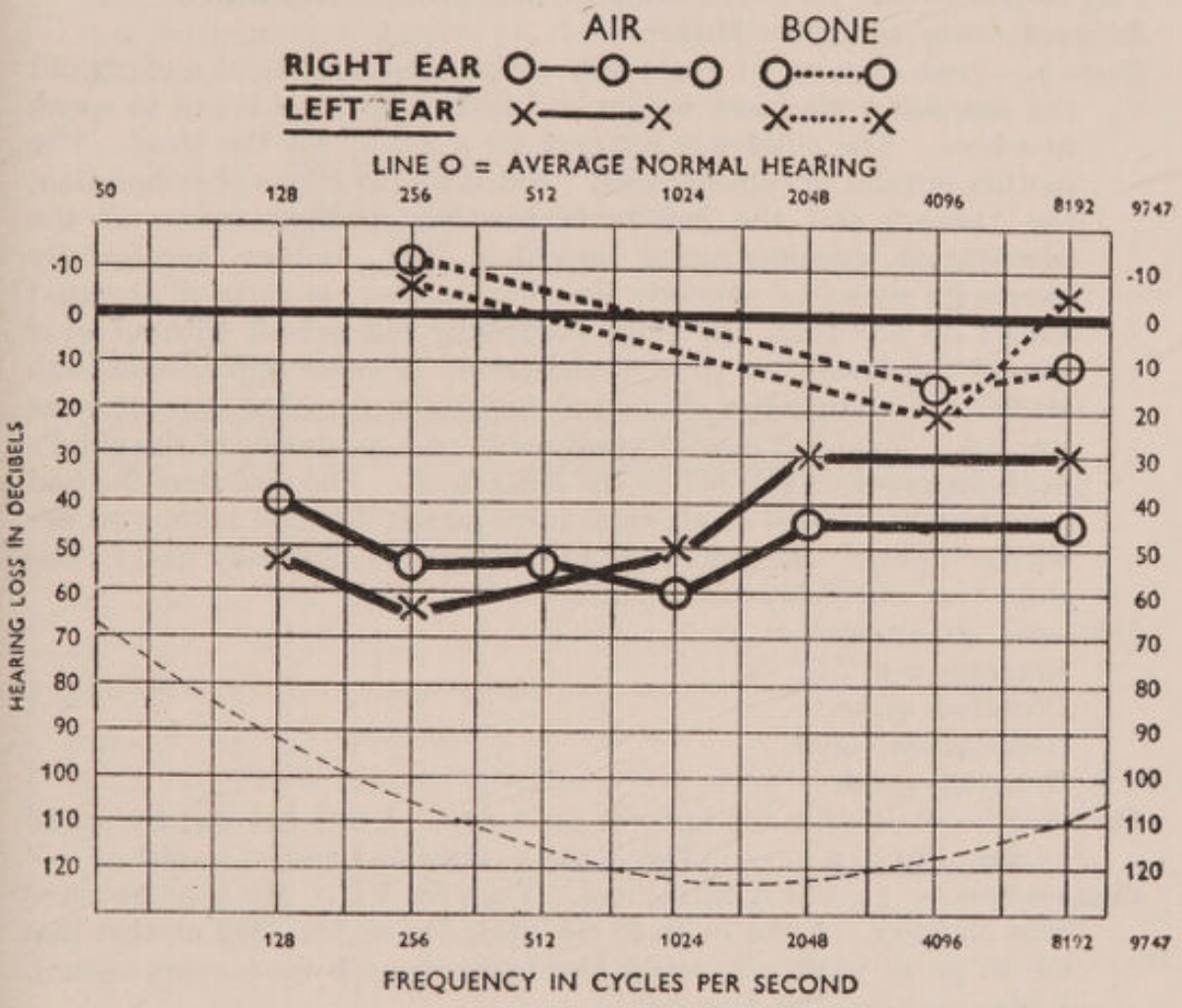
History.—Deafness noticed 6 months ago. (Family unobservant and neglectful.) Twin brother said to be mentally normal. No family history of deafness. No history of ear trouble. Tonsils enormous. Nutrition only fair.

Speech.—' Plummy ' (tonsils). Rudimentary vocabulary. Very toneless and quiet. Volunteers nothing. Omits whole syllables, also ' t, d and s ' centrally and terminally. ' ɵ = f '.

Voice Tests :

	3 Metres	1 Metre
25 words :		
Back turned . . .	1	15
Facing	6	16
5 sentences :		
Back turned . . .	0	0
Facing	1	1

Attention.—Fairly good.
Scholastic Attainments :
Reading, age 5·7.
Dictation, poor.
Composition, poor.
Drawing, poor.



HILDA

Considerable Hearing Loss

FIG. 24

Teacher's Report.—None volunteered.
Educational Treatment.—After consultation with the school medical officer concerned the parents were offered removal to School for Deaf. Parents refused. In view of low I.Q. case not considered suitable for legal pressure.
Dictation.—' It is ond a cat but nut a bag, I — — ran By In the —. Seh camto — — best a — — in the —, the — litty kia. I — hav — — — — non fal.'
Composition.—' We Do sumns in the class rons We Do abin up and tac-away in the classroms, and sewing. red in the Book and sumns Book and romst Book patins.'
Comment.—The child is undoubtedly mentally retarded as well as deaf.

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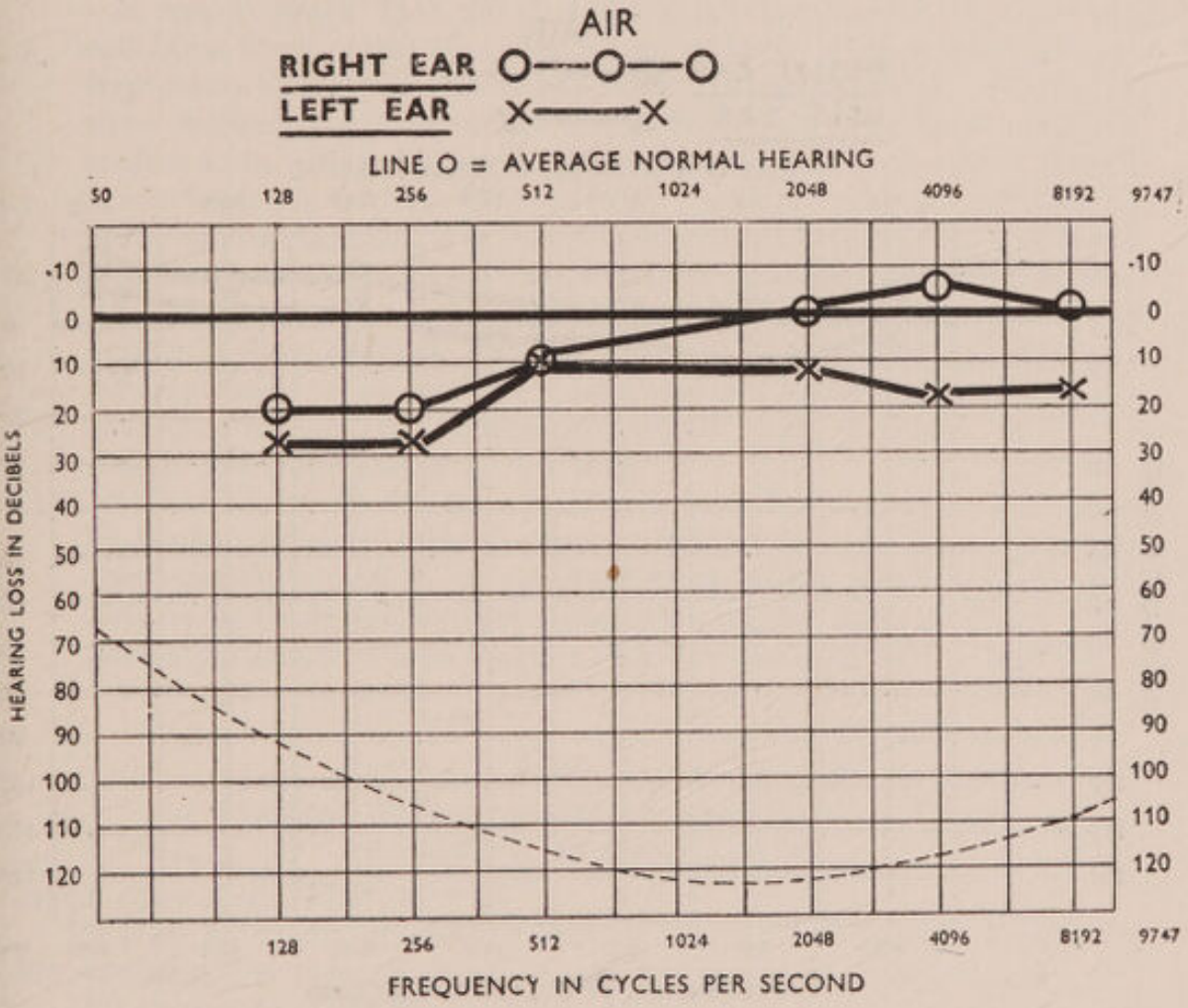
dictate the passage below (specially constructed to include the suspected sounds) and return the result to me. The child, meanwhile, was referred for speech therapy. Owing to a series of domestic crises it was over a year before the mother could attend with him again. When I next saw him the speech was perfect and the audiogram showed no impairment of hearing. The apparent loss of hearing was, therefore, purely functional. This case provides an interesting example of the necessity for re-examination of doubtful cases at regular intervals.



PETER

Speech Defect

FIG. 25

Dictated.—' Thirty-three fine stags lived in that forest. The five huntsmen rose before daybreak in order to join in the chase. The stars were still shining in the sky. They made no noise as they walked in single file through the leafy glen.'

Dictation result.—' thetty-three fine stags lived in thar forist. Thee five huntsman rosd befor daybake in order to joyn in the cha. The star were stll sining in sky. They made no noise has they walk in singl file throo the lefey gane.'

Comment.—Note the omissions of ' s, ʃ, ɵ ', and ' r ' sounds, and of weak syllables.

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Educational Treatment.—Re-education by experienced teacher. No need for speech therapy.

Dictation.—' It is on a cat but not on a dog. I saw her run by in the wet. She came to seeck or steel a birds nest in the grass. The crul little kitten. I have asked foruty girls this purrel now fald. Imatat thire industary.'

Composition.—' If you wish to engory school it all depeners on whtere you like th bilding your in, and if you like the work. I like the school I am in verey much but there are one or two disaponitments you see, I would have liked cookrey and swimming. I hope we sall have them when the nwe school is bilt. Just to give you an impreshen of the school I am in, this is what it is like. We are in three houses, the infants are in A, the juniers are in B, and the senires in C. The subjechs I like best are mths art nidulwork and I am begining to like Einglish and reading. The school is in a verey nice distict, but it is a long way to come. I have a nice frend and that is one of the nane things to make you happy I had no friend when I frist came to this school but I have four one now. I am beging to like Einglish because I like the mistress who takes me. All the misstress are verey nice here and if I had a little girl I would send her here. I am shore she would enjoy her-self. A lot of people are very proud to be here.'

Comment.—This case is of educational but not clinical interest. In cases of doubt, however, it is always advisable to make an audiogram. Professor Schonnel, in his standard book on the subject, *Backwardness in the Basic Subjects*, [1] deals fully with this type of defect. The case is included in this chapter only for the sake of comparison.

Case 18

AN EXAMPLE OF EXCELLENT CO-OPERATION BETWEEN THE SCHOOL AND THE CLINIC

Letter from Head Mistress :

' I wish to report Florence's loss of hearing. It seems to me that her deafness has become much worse during the last few months.

We always see that she is sitting at the very front of the class, and she declares she hears all we say. Actually, she does a good deal of lip-reading, but does not hear if her head is turned away.

Her behaviour in school is very good. She is quiet and obedient, and tries. She is attentive, at the beginning of a lesson particularly, but owing to her increasing inability to hear, her power of concentration is insufficient to last for the whole lesson if it is an oral one.

She is neat in her work, seems very anxious to please, and appears to be of normal intelligence. In fact, she has given me the impression of having improved in intelligence this last year. But she sometimes makes such bad mistakes in her answers when she is unaccustomed to the speaker, that it is obvious she has not heard. At the July Term Examination she was 37th out of 44.'

Comment.—A more helpful account of a pupil's school behaviour can hardly be imagined.

Case 19

AN EXAMPLE OF POOR CO-OPERATION BETWEEN SCHOOL AND CLINIC

JEAN

(*aged 7 years 3 months*)

Diagnosis.—Deaf-mute. Audiogram impossible to obtain.

Referred by school attendance officer.

History.—7th of 7 children. Elder sister (21 years) also a deaf-mute. Great-grandparents both deaf-mutes. Jean's deafness was realized when she was 2 years old. The child had been on the register of an Infant school for 2 years, but had never been reported to us. Her medical record showed that she had been absent from the routine inspection and that the medical officer had not been informed of her disability. She had some rudimentary speech, flat, toneless and completely unintelligible. She was an exceedingly pretty child, and obviously very bright and intelligent. She took a lively interest in the picture books and toys, and communicated her delight to her mother in quick expressive gestures, to which her mother replied in similar fashion. The mother said she had been ' most anxious ' for the child to have special teaching ; that her eldest girl had been sent when she was 5 years old and here Jean was 7, and we had done nothing ! It had never occurred to her to ask the teacher to report the case to us, to write herself, or to call in at the nearest school clinic. The case reached us eventually only because of her very irregular attendance at school.

Case 20

AN EXAMPLE SHOWING THE DIFFICULTIES OF DIAGNOSIS

JAMES

(*aged 5 years 6 months*)

History.—The child was sent from school with a note from the head mistress saying, ' He is restless and troublesome and does not speak. He has been 12 months in school.'

He came to see me with his mother (a pretty young woman, but silly) and a younger brother aged 3 years. The brother spoke and behaved normally for his age and was comparatively friendly. James shouted in a loud toneless voice only two words, ' No ' and ' Yah ', but he used these several times during the 15-minute interview. He would not allow me to examine him, but buried his face in his mother's lap and shouted ' No ! ' to every advance. His mother remarked pleasantly that ' he was always like that with strangers ', but made no attempt to improve his manners. Finally, when I took no further notice of him, he began running round the room opening cupboard doors, switching lights on and off, banging my bell, kicking over the paper-basket, &c., exceedingly noisy and restless. I offered him a penny, which he pretended not to see, but when he was going he turned with lightning quickness and snatched it up.

His mother said, ' He could say lots of things at home ', but

when pressed for examples could not give a single one. He used gesture rather suggestively in communicating with his younger brother, but it was quite impossible to decide whether he was deaf or very retarded, or merely spoilt. The noise and disorder having by this time become so intolerable that the whole clinic was disturbed, I was obliged to terminate the interview.

During the following week I went to enormous trouble fitting in a visit to his school. The child was away. His own teacher was absent and the head mistress was ill. I interviewed the 'locum' who had taught him for three months, but she was very young, harassed and inexperienced and could give no reliable information whatever. She told me that he never played with other children; then, in the next breath, said he was always teasing his companions, and inciting them to rough games, rolling in the playground mud and making a general nuisance of himself. She said he had no idea how to copy, but immediately afterwards remarked that he was rather good at drawing. (No specimen of any sort was available, because the children always chalked on boards.) I inquired what he did all day, but was told he did nothing. He hadn't really been much of a nuisance until lately, but for the past few weeks he had been 'terribly troublesome'. 'How?' She couldn't exactly say. Did he join in the physical activities? Oh yes, but lately he had taken to making 'animal noises'. Had she ever heard him speak? No, she didn't *think* so! She was sorry she couldn't give me any more definite information. He had attended quite regularly but she hadn't really noticed him much. This last statement made me think the boy probably was deaf after all. The speechless mental defective of five is usually far too troublesome to be ignored.

The following term I sent for him again. This time his deafness was obvious. But six precious months of special teaching had been lost.

Cases 21 *and* 22

CASES ILLUSTRATING THE NECESSITY FOR FULL INVESTIGATION IN ALL CASES OF SUSPECTED DEAFNESS

WILFRED

(*aged* 13 *years* 2 *months*)

History.—This boy was referred as 'deaf' by the school medical officer. His audiogram shows considerable loss of hearing (38 per cent) over the whole speech range. His own speech was inartistic but showed no phonetic substitutions or omissions. (Vision normal with spectacles.)

Voice Tests:

	3 Metres	1 Metre
25 words:		
Back turned	4	9
Facing	6	17
5 sentences:		
Back turned	0	1
Facing	0	4

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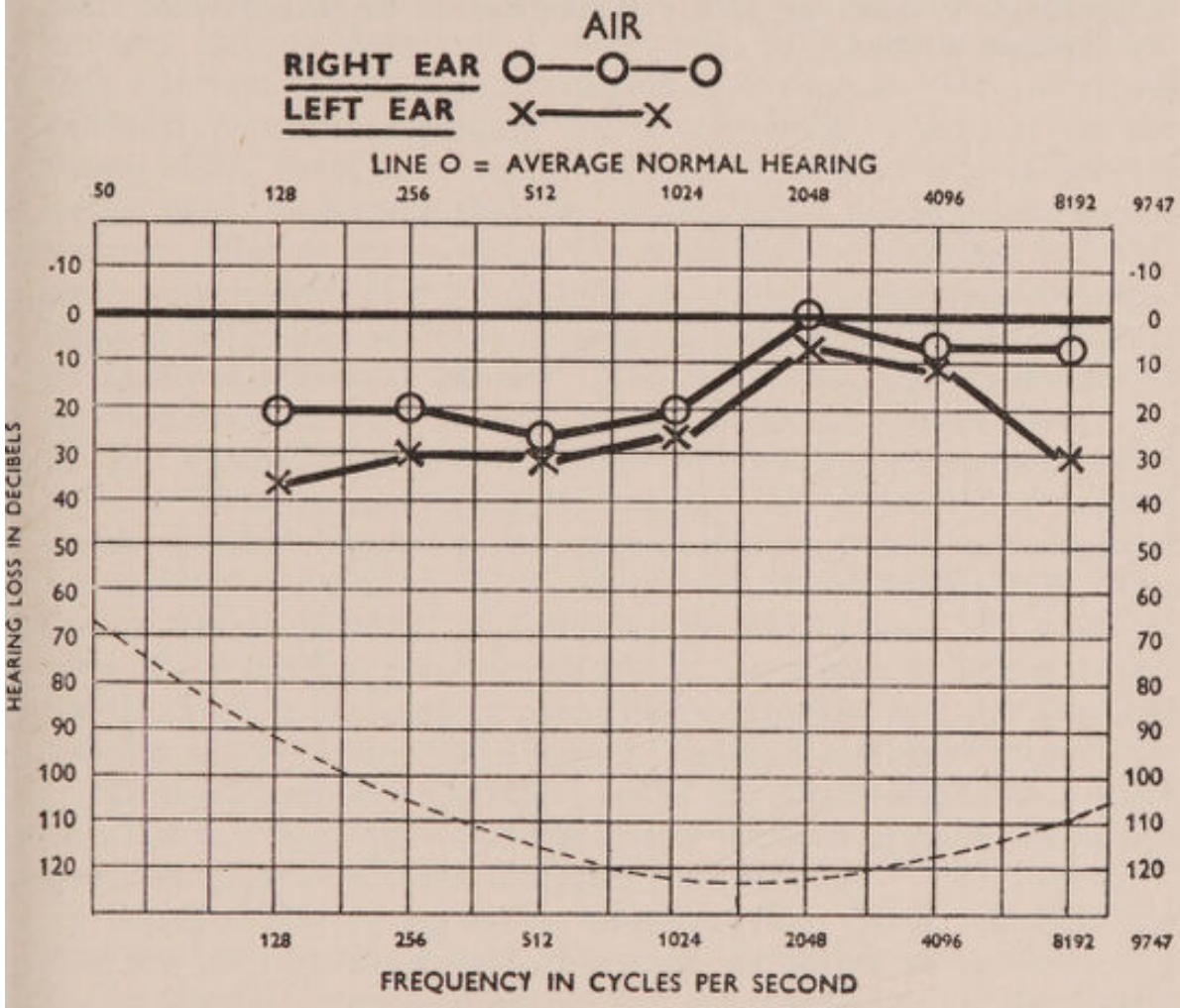
His head master reported, ' It was on account of the persistence of his lack of listening, and the repeated assurances of his teacher that his hearing was extremely bad, that I felt I had to get away from my first opinion of laziness and lack of effort.'

' Wilfred and Alan both attend the Handicraft centre. Wilfred gets along well. Alan does not.'



ALAN

FIG. 28

Comment.—The intelligent, careful boy, in spite of his considerable audiometric loss, gave the impression of hearing better in school than his duller, less attentive companion. The instrumental and voice tests, however, at once demonstrated the difference between Wilfred's organic disability and Alan's functional lack of response.

While this investigation into the attainments of children with impaired hearing was in progress, I was also collecting evidence regarding the development of speech sounds in the child under 5 years. In the course of analysing this material a definite pattern of speech acquisition became evident, and the similarity of these

normal infantilisms to the 'defects' of speech previously noted as being commonly associated with high-tone deafness, with blindness, and with intellectual retardation, could no longer be ignored. The results of this subsidiary investigation are given in the next chapter.

REFERENCE

1. PROFESSOR F. SCHONNEL, PH.D.: *Backwardness in the Basic Subjects.* 1942. (Oliver & Boyd.)

CHAPTER VII

THE ACQUISITION OF SPEECH

IN the course of the research into defects of articulation in school-children already described, I discovered, with some astonishment, that although the child psychologists have already built up a considerable literature regarding the development of *language* in the young child, there were apparently no records of any large-scale observations concerning the normal acquisition of the actual speech sounds. Most of this work on the acquisition of language has been done by non-medical psychologists recording the linguistic development of one child, or of a small group of children, usually the offspring of highly intellectual parents. The latest English observers (to mention only a few) include M. M. Lewis [1], Susan Isaacs [2], C. W. Valentine [3] and G. Seth [4] (writing in collaboration with D. Guthrie, a laryngologist); while the whole field of mental development in relation to language development has recently been admirably surveyed by A. F. Watts [5]. Leopold Stein [6], who now works in London, approaches the subject from the point of view of the medical psychologist who is also a speech therapist, and for this reason his work is particularly valuable, but his principal concern has been the child showing persistent speech abnormalities.

The reason for this apparent neglect of a vitally important aspect of child development was immediately obvious when I began my own investigations. The difficulties are fourfold.

Firstly. The young child vocalizes from birth. During the first few months this vocalization is in the nature of an instinctive bodily activity, and is probably not yet associated in the child's developing consciousness with the sounds he hears. This theory is supported by the undeniable fact that young deaf babies vocalize as freely as normal children, although the mothers sometimes spontaneously report that the child's cry had always been noticeably 'hoarse' or toneless. Round about the time at which the normal child begins to use vocal sound as a means of communication, the deaf child gradually ceases to vocalize at all, but substitutes signs to indicate his rapidly expanding needs and desires. The normal child, however, passes imperceptibly from the vocal activity of the early months to the stage of tuneful babbling characteristic of the 1-year-old (one stage growing naturally out of another), and finally to the beginning of articulate speech in the toddler. There is no doubt whatever that the normal child's babbling is the result of his gradually developing auditory discrimination, but, in the process of learning to discipline his organs of articulation to produce

sounds approximating those of his environment, he makes use of a number of speech units for which there is no recognized phonetic symbol, so that accurate charting is impossible and the recorder is obliged to use the symbol which most nearly represents the child's usage. It is essential, therefore, that the observer should be an experienced phonetician.

Secondly. It is unscientific to draw conclusions from recordings of mere fragments of a child's speech, but it is often difficult in the limited time at one's disposal to induce the child to demonstrate the full range of his phonetic usage. This lack of response is not always due to shyness, but to a sort of playful obstinacy. For instance, one bright little 2½-year-old whom I coaxed for ten minutes in vain, would only stand and gaze at me with a mischievous twinkle in his eye, but he was obviously enjoying the situation, and as he was being taken, much against his will, from my room, he presented me with this excellent specimen, 'I wan' teh 'tay 'n 'kool' ('I want to stay in school'). The observer must, therefore, be skilled in the examination of young children.

Thirdly. It is unwise to generalize from the speech of one child, or of a small group of children. It is therefore necessary that the recorder should have facilities for observing large numbers of young children, with widely differing mental, social and geographical backgrounds.

Fourthly. In order that speech sounds may be normally acquired it is necessary that the child's mechanism for speech and hearing should be perfect. It is therefore desirable that the observer should be a medical officer experienced in detecting even slight deviations from the normal anatomical, physiological and psychological standards.

In the course of some 3½ years I was able to collect complete records of the speech of 650 children (328 girls and 322 boys) under the age of 5 years. Of these, 620 were children attending nursery schools and clinics, while the remaining 30 were mostly children of friends and relations, whom I was privileged to observe over prolonged periods. In addition to these there were dozens of other children encountered in nurseries, trains, shops, even in bus queues, who provided me with fragmentary samples of their speech. For instance, a little girl in a bus presented me with this perfect sample. Pointing out of the window at another bus which was moving, she sang, rather than said, 'Loo' Mummy! I' daw'n nah!' ('Look Mummy! It's going now'). The records were charted according to age (in quarter-year periods) and sex.

From the detailed analysis of the mass of material thus collected a definite pattern gradually emerged. Following the infant's realization that the speech and gestures of his adult attendants possess meaning, a realization which normally occurs about 8–9 months old ('Clap handies!', 'Say bye-bye', prompts the mother, and the

baby delightedly obeys) the child begins to make responsive noises and actions whenever he is spoken to, and to play at making vocal sounds when he is alone. These sounds are usually of the repetitive variety—' Bab-bab-bab, mum-mum-mum, dad-dad-dad '—sounds which are promptly appropriated by the parent as proper names. Soon this game is carried a step further by the baby's recognition and subsequent echoing of the cadences of adult speech, so that the child's babbling assumes the normal vocal inflections or ' tunes '. Listening outside the nursery door to this tuneful babbling it is often impossible to believe that the child is not using articulate speech. Most of the consonants are already present, but the sequence of utterance is so undisciplined that the result is unintelligible. At this stage the child's comprehension of speech rapidly outstrips his performance and is often remarkably good, ' Shut the door, please ', ' Look, here's Daddy coming,' and ' Never mind, come here, I'll kiss it better,' says the mother, and the child immediately makes the correct physical and emotional response. The child now realizes that speech is the most convenient form of communication. The use of real words follows. Often this real word is comprehensible only to the mother. It is imperfectly articulated and therefore difficult to interpret, but, since he uses it consistently for any given object or activity, his mother rapidly learns to understand him. Just as the experienced ear makes up the missing frequencies from a telephone conversation although only 70 per cent of the speech sounds are actually transmitted, so the mother, listening with the ear of knowledge and of love, will assure one that the child's speech is ' perfectly plain ', and that ' he can say anything ', although the recorder is struggling to interpret a glorious jumble of phonetic substitutions, elisions and omissions.

For some time not only the tunes of speech, but the loudness and shrillness of the voice itself are greatly exaggerated. I have observed this many times in children of every social grade and level of intelligence. They tend to shout loudly, using a very wide range of notes, as if a nice discrimination of pitch and intensity comes only with more experienced listening and imitation. The first ' words ' or sound groups often consist only of vowels and a tune, and are frequently accompanied by an explanatory gesture; thus the child says ' i-i ' (' dicky ') and points at the sparrow in the garden; or, handing the last brick, ' a-aw ! ' (' æ-ɔ: ', ' that's all '); or the word consists of a labial consonant, a vowel and a tune; thus ' baw ' (' bɔ: ', ' ball ') ' mow ' (' mau ', ' mouth ') ' woh-a ? ' (' wɔ æ ? ', ' what's that ? ').

The first time I realized the true significance of this ' vowel and tune ' combination as the beginning of articulate speech was one morning in my clinic when I heard a baby of 18 months shouting loudly in an empty room. He appeared to be calling the sounds

'tɔ—ɔ', (as in 'tom', but prolonged to 'to-om') with a steeply falling inflection, and the vowel was closed with a faint little sound not unlike the 'ch' of the Scots word 'loch'. In answer to my inquiry the mother exclaimed, 'But it's as plain as plain! He's calling 'Shop' to let the nurse know we've come'—He had not yet acquired the difficult sound 'sh' nor fully realized the terminal 'p', but the correct tune was there, over-exaggerated but unmistakable, and, what was to me the most illuminating discovery of all, the 'timing' was perfect. I realized with the force of a revelation that here was the proof I had sought, in vain, for several years. There could not longer be any doubt in my mind regarding the true auditory pattern of normal articulated speech, and I knew that what I had previously considered as *defective* speech sounds were all, in reality, persistent immaturities due to structural abnormalities or functional retardations.

A child may learn to imitate a word shape by watching his mother's lips, but only dawning acoustic discrimination can teach him the rising and falling inflections, and all that delicate precision of timing and stress which go to make the speech tunes. These, the earliest manifestations of meaningful speech hearing, are the first to disappear in acquired deafness, as I had observed many times in hospital in children suffering from the after-effects of cerebrospinal meningitis, but without understanding the significance of this rapid loss. If his speech has already been fully acquired, i.e., by $4\frac{1}{2}$–$5\frac{1}{2}$ years, the actual phonetic sounds remain because the muscles of the mouth and tongue still perform their accustomed movements, but the cadences of speech are apparently more difficult for the child's memory to recall without the continual stimulus and corrective of hearing.

At this stage the tune of a simple word has often to convey the sense of an entire sentence. Thus 'ball' (usually pronounced 'baw') may mean, 'I demand my ball', 'Throw me the ball', 'I've lost my ball', 'Where is my ball?' and a score of other things, according to the inflection with which the word is spoken.

The vowel sounds used re-echo the accent of the environment in which the child lives, but certain deviations from the environmental normal are constantly observed. The long vowels 'u:', (as in 'pool'), 'ɔ:', ('paw'), 'a:', ('palm'), 'ə:', ('pearl'), 'i:', ('peel'); and the short vowels 'u' and 'ʌ' (as in 'hut' and in 'put'), 'ɔ', ('hot'), 'æ', ('hat'), 'e', ('set'), 'i', ('sit'), appear some time before the diphthongs; but frequently the sound 'e' ('set'), and less frequently the sounds 'u' and 'ʌ' ('hut' and 'put'), and rarely 'ɔ', ('hot'), and 'i', ('sit'), are lowered to the sound 'æ', ('hat'), so that 'egg' = 'agg', 'head' = 'had'; and less frequently 'foot' = 'fat', 'duck' = 'dak', 'cot' = 'cat', even 'bib' = 'bab', although more usually the 'i'

(' bib '), becomes ' e ' (' beb '). The diphthongs are difficult to write in ordinary script but they are the vowel sounds in the words ' mail ' (ei), ' mile ' (ai), ' boy ' (ɔi), ' sole ' (ou), and ' cow ' (au). They consist of two vowel sounds closely applied together, the first of which (in English usage) is usually given more resonance than the second, to which the tongue glides only lightly and briefly. The diphthongs appear to cause the child considerable confusion at first, so that the latter, less prominent half is often omitted ; thus ' lady ' (ei) = ' leddy ' (e), ' now ' (au) =" nah ' (a:), ' noise ' (ɔi) = 'nawse ' (ɔ:) although occasionally only the latter half is used—thus ' lady ' (ei) = ' leedy ' (i), ' cow ' (au) = ' coo ' (u:). Later when the presence of two sounds has been appreciated the diphthongs themselves are sometimes interchanged ; thus ' coal ' (ou) = ' cowl ' (au), ' day ' (ei) = ' die ' (ai), and less frequently, ' my ' (ai) = ' may ' (ei). I have recorded these apparent Cockneyisms over and over again in the speech of children who have never heard a true Cockney vowel in their lives. One begins to realize that vulgar pronunciation is often immature speech. The whole problem of local accent in relation to listening and intelligence might profitably be investigated.

While the vowels are being acquired consonants are rapidly tacking themselves on to them, first at the beginning of the word (since the initial consonant is normally spoken with more weight than the terminal one and therefore is more rapidly appreciated by the child's inexperienced ear) and much later at the end and in the middle of the word. The first consonants to be acquired are usually the nasal sounds ' m ' and ' n ' (' ng ' is much later in appearing), and the labials ' b ' and ' p ', followed by the ' front stops ' ' t ' and ' d '. Less often the ' back stops ' ' k ' and ' g ' are used first, but whichever pair the child first acquires he normally uses only that pair for both front and back stops for an appreciable time ; thus when the front stops are selected ' top ' = ' top ', and ' doll ' = ' doll ', but ' doggie ' = ' doddy ', ' cup ' = ' tup ', ' cat ' = ' tat ' ; or where the back stops are used ' cup ' = ' cup ', but ' two ' = ' koo ', ' dirty doggy ' = ' gerky goggy ', ' toy tank ' = ' koy kank '.

The group represented in ordinary script by the letters ' r ', ' l ', ' w ', and ' y ' (j) are usually late in appearing, and are frequently interchanged, so that a ' rabbit ' may be a ' wabbit ' or a ' labbit ' or a ' yabbit ' ; a ' lion ' may be a ' rion ' or a ' yion ', and so on ; but whichever sound the child selects the substitution is usually consistent for a period of some weeks or months. The last single consonant sounds to be acquired and finally differentiated are ' h ' (which is a mere breathed sound), and those forming the group represented in ordinary script by the letters, ' z ', ' zh ' (ʒ) (as in ' pleasure '), ' v ' and ' th ' (ð) (voiced, as in ' mother '), and their unvoiced equivalents ' s ', ' sh ' (ʃ), ' f ' and ' th ' (ɵ) (as in ' thing '). These sounds appear to cause the child considerable difficulty, so

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following consonant forms: 'θ = f', 'r = w', 'ʃ = s', 'tʃ = t', 'dʒ = d', s was normal. All double consonants were reduced to a single sound. The vowels were 'lowered' and the diphthongs confused. They were bitterly unhappy at school and made no attempt to mix with the other children, and thus had managed to avoid learning to correct their own speech from association with normal speakers.

In these cases I always advise that the children are sent for a few hours daily to a good nursery school; and the superintendents are instructed to place the children in different groups. This is important since without this advice the teacher's natural impulse is to think of twins as being physically as well as emotionally incomplete when they are apart. The best remedy for all these children who show persistent infantilisms whether they are neglected, isolated, or over-indulged, is daily attendance at a nursery school. It should be always remembered that intellectual neglect may occur in hospitals and in residential nurseries where the child's physical needs receive devoted attention. Nurses in charge of young children, therefore, should never be allowed to forget their responsibilities towards the child's mental growth. With the best intentions in the world far too much attention has been paid in the past to tidiness and quietness in the children's wards and far too little to freedom and understanding. The children have been efficiently 'maided', not affectionately mothered.

The question of formal speech therapy in the absence of gross anatomical defect, such as cleft palate, does not usually arise before 5 years. The child who by $2\frac{1}{2}$ years old has not made any attempt to develop normal speech along the lines indicated above, should be suspected of deafness or mental retardation, and the appropriate expert consulted. But there can be no more question of teaching the child to speak before he has made his own spontaneous efforts, than there can be of teaching him to walk before he has made an attempt to stand and to crawl. The child should be presented with good models which he may imitate, and then should be encouraged in every possible way to practise vocal communication by being played with, spoken to, and, just as importantly, listened to. He will need the support of unfailing sympathy and help, but not the discouragement of constant correction. Children often show annoyance if they are not understood, but this impatience is itself an incentive to effort. They will be filled with helpless fury if they are mocked or imitated, and may take refuge in frustrated silence. For this reason the community life of a large family, or of a good nursery school, where the child is provided with suitable toys, creative material, new experiences, and, above all, intelligent guidance, is of the utmost benefit to the child's linguistic, and therefore his general intellectual development.

Nursery schools for the young deaf child are already in existence. Similar provision for the young retarded child is urgently needed. As educational research laboratories alone their existence would be justified. The benefit to the child and to his harassed family would be enormous.

The pattern of development thus unfolds itself. Out of his experience the child evolves first the elements of articulate speech, then a vocabulary, then a language. This language is, at first, only sufficient to express his simplest concrete thought, but as his intellectual capacity increases and his experience grows, he acquires the power of reasoning and of abstract thought. The final stage of linguistic development, which is not attained even by all adults, is the enjoyment of academic and 'literary' language. Just as the musician's ear can distinguish, in a chord played on a stringed instrument, not only the fundamental notes, but all the complex harmonics which are associated with them, so the mature student of language can appreciate in every spoken or printed phrase not only the fundamentals of meaning, but the overtones of implication. One has only to consider for a moment the complex mental imagery evoked by the simplest passage of Shakespeare, for instance,

> Out, out, brief candle,
> Life's but a walking shadow, a poor player,
> That struts and frets his hour upon the stage,
> And then is heard no more . . .

to realize the vast distance the child has to travel from those first stages of phonetic acquisition to this, the ultimate attainment of linguistic appreciation. The importance of speech development in the young child cannot, therefore, be over-emphasized.

When infantile habits of speech persist after 5 or 6 years old the assistance of an experienced speech therapist becomes essential, or the child will stabilize his defects so that they become increasingly difficult to correct. Moreover, his scholastic progress, especially in the linguistic subjects, will be seriously retarded. The child who does not readily respond to this expert teaching should be examined by an experienced school medical officer with a view to determining whether his intelligence and his hearing for pure-tones are normal.

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CHAPTER VIII

THE PRESENT POSITION

IN 1938 the Board of Education [1] issued their *Report of the Committee of Inquiry into Problems Related to Children with Defective Hearing.* This Report laid down definite standards for the guidance of Local Education Authorities concerning the classification and educational treatment of children with defective hearing. The suggested grading was as follows :

Grade I.—Children with defective hearing who can, nevertheless, without special arrangements *of any kind*, obtain proper benefit from the education provided in an ordinary school—elementary, secondary, or technical.

Grade II.—Children whose hearing is defective to such a degree that they require for their education special arrangements or facilities, but not the educational methods used for deaf children without naturally acquired speech or language. These facilities range from a favourable position in the ordinary school classroom to attendance at a special class or school.

Grade IIA.—Those children within Grade II who can make satisfactory progress in ordinary classes in ordinary schools provided they are given some help, whether by way of favourable position in class, by individual hearing aids, or by tuition in lip-reading.

Grade IIB.—Those children within Grade II who, even with the help of favourable position in the class, individual hearing aids or tuition in lip-reading, fail to make satisfactory progress in ordinary classes in ordinary schools.

Grade III.—Children whose hearing is so defective and whose speech and language are so little developed that they require education by methods used for deaf children without naturally acquired speech or language. This grade includes the totally deaf.

The report further specified :

Grade I children are those who have a hearing loss up to 15 decibels on the gramophone audiometer or 35 decibels on the pure-tone audiometer, but who can hear and understand conversation at 20 feet and over in ordinary classroom conditions.

Grade II can hear conversation between 20 feet and 2 feet. They have a hearing loss of 15–40 decibels (gramophone audiometer) and 35–60 decibels (pure-tone audiometer).

Grade III can hear only conversation which is less than 2 feet away, if at all. The hearing loss is over 40 decibels (gramophone audiometer) or 60 decibels (pure-tone audiometer).

The report, however, particularly emphasizes—' The paramount consideration is whether the education which is provided for the grade to which he is assigned is the best one for him.' It points out, therefore, that assignment to any particular grade can only be provisional. I would go much further than this and say that the whole assumption concerning the relation between hearing loss in decibels and educational grading is unjustifiable. It is absolutely essential that every case is judged individually on its own merits, since so many factors other than decibel loss have to be taken into consideration. The broader classification (given above), which entirely omits the mention of decibels, is the only legitimate one.

After the fullest investigation of all the known figures of hearing loss among school children, here and in America, the Board of Education recommended that the following estimates should be used in providing educational facilities for these children :

Grade I : 50–80 per 1,000.
Grade IIA : 0·5–2·0 per 1,000.
Grade IIB : 0·5 per 1,000.
Grade III : 0·7–1·0 per 1,000.

In actual practice these estimates agree closely with Dr. Burn's Salford investigations. They also agree with my own observations regarding the number of children suffering from more severe degrees of hearing loss referred from the routine medical inspection to my own clinic. During the war, owing to administrative difficulties, the gramophone surveys in Manchester had to be discontinued. When I started my own pure-tone audiometer investigations I was obliged to rely entirely on the cases referred from clinics and schools. The number referred rapidly increased as the work became known, and it is now possible to state with assurance that the cases in Grades IIB and III are readily recognized by medical officers, nurses and teachers, and therefore quickly find their way to our register ; although it is often very difficult to induce attendance at the clinic, and still more difficult to obtain the parent's co-operation when the question of removal to a special school arises. The cases in Grade IIA are sometimes discovered only by accident, while those in Grade I are frequently missed altogether, unless the child happens to be seriously mentally retarded also, in which case his hearing loss becomes more obvious. The more severe cases have not, therefore, suffered any lack of *recognition*, as a result of the discontinuation of periodic group surveys, although insistence upon their early *educational treatment* is sometimes difficult, but the less severe cases have suffered in every way. Even the most devoted medical officers and teachers may be deceived into mistaking the physical nature of the child's disability, so that his ' laziness ' or inattention in school is considered to be due to an intellectual, emotional or social retardation. My

years of experience in School Medicine have taught me this one vitally important lesson which I feel I cannot emphasize too strongly ; in the diagnosis of retardation, every possible physical etiological factor should be eliminated before the condition is finally attributed to any purely psychological or emotional cause.

The new Education Act (Handicapped Pupils and Medical Services Regulations, 1945) defines eleven categories of handicapped children. Two of these comprise *Deaf Pupils*, ' that is to say, pupils who have no hearing, or whose hearing is so defective that they require education by methods used for deaf pupils without naturally acquired speech or language ', and *Partially Deaf Pupils*, ' that is to say, pupils whose hearing is so defective that they require for their education special arrangements or facilities but not all the educational methods used for deaf pupils '. (It will be noted that the former ' grades ' are not now mentioned.) The Regulations also indicate that deaf children ' shall be educated in a special school ', while partially deaf children ' *may* be educated in ordinary school if the special educational treatment afforded by such school . . . is satisfactory in his case and his presence is not detrimental to the interests of the other pupils '. For the partially deaf child ' the methods of special educational treatment shall include, in addition to special attention by the teacher . . . a favourable position in the classroom, the provision of individual hearing aids if necessary, and tuition in lip-reading '. 'The number of pupils on the register of any class shall not exceed . . . for a class of deaf, or partially deaf pupils, or pupils suffering from speech defect, *ten* registered pupils '. With regard to ascertainment of handicapping defects, the Regulations expressly state—' the Authority shall cause an examination of the pupil to be made by a medical officer possessing adequate qualifications or experience in the particular type of disability from which the pupil may be suffering '. Full provision for the deaf and partially deaf child within the special school framework is thus envisaged. The child who is not sufficiently deaf to need full special school education still remains a serious anxiety.

The educational problem, with regard to all children with impaired hearing, resolves itself into two parts, *diagnosis and treatment.* Once more it is necessary to repeat that all the medical aspects of the problem have been deliberately omitted from this study, but it must be understood that it is essential that expert aural examinations are carried out and full medical and surgical treatment provided. It is useless to determine the degree of deafness and to make the most elaborate provisions for special teaching without at the same time attempting to discover the pathology of the condition and, if possible, its prevention, alleviation and cure. The accurate *diagnosis* of deafness is already possible, but few Education Authorities have yet provided regular group audiometer surveys for their schools and

fewer still possess a pure-tone audiometer, or have trained staff to use it. Individual otologists possess their own instruments, and in London there are three hospital clinics which provide audiometric facilities, but in some places it is still difficult or impossible for the school medical officer to obtain an audiogram even when a differential diagnosis between intellectual and auditory defect is essential.

In places where pure-tone audiometers are in use they are not always employed to the best advantage since the staff is untrained in the technique of making accurate audiograms, and although this chart-making may appear simple, in reality it is highly skilled work. This skill cannot be acquired from merely reading a book of directions. The recorder must possess a good intelligence, infinite patience, and, above all, experience in the management and examination of young and retarded children. Routine voice tests of the hearing of school children are nowhere applied so far as I can discover. Their application during the ordinary routine school medical inspection would be difficult in any case, but in the special clinic it is a comparatively simple matter to apply them if the examiner will train his voice to deliver these words and sentences with some degree of standardization. A special output meter which registers decibel levels much as the speedometer of a car registers miles per hour, has been designed, but it is difficult to obtain at present.

If, in some areas, the *diagnosis* of educational deafness is still inadequate, in many others the *educational treatment* can only be described as haphazard. Too many educationalists still consider the problem only in terms of the deaf-mute. Cases of partial deafness are left to fend for themselves in the ordinary schools, which usually means that they learn little or nothing but how to write beautifully, and to draw and paint with almost passionate neatness and care. Their speech is often so defective that the acquisition of reading and spelling by ordinary methods is impossible, and the class teacher has neither the time nor the training to deal with the problem. The extent and preventability of this deprivation can be readily appreciated by the rapid improvement these children make when they are provided with special tuition in lip-reading and in speech therapy. The social and psychological effects are even more pronounced.

The child who is dubbed restless, inattentive and wilful is usually the one in most need of physical as well as psychological investigation. The whole problem of ' laziness ' in children needs consideration. It is the nature of the growing mind to be deeply curious and interested. When one first observes the children in nursery schools it is their unflagging enthusiasm and concentration for ' play ' (which is their ' work ') that is so astonishing. One cannot help wondering where our educational system has gone astray, since we have failed to harness and direct all this energy and determination. So often one finds at the medical inspection that the ' lazy ' child is in reality

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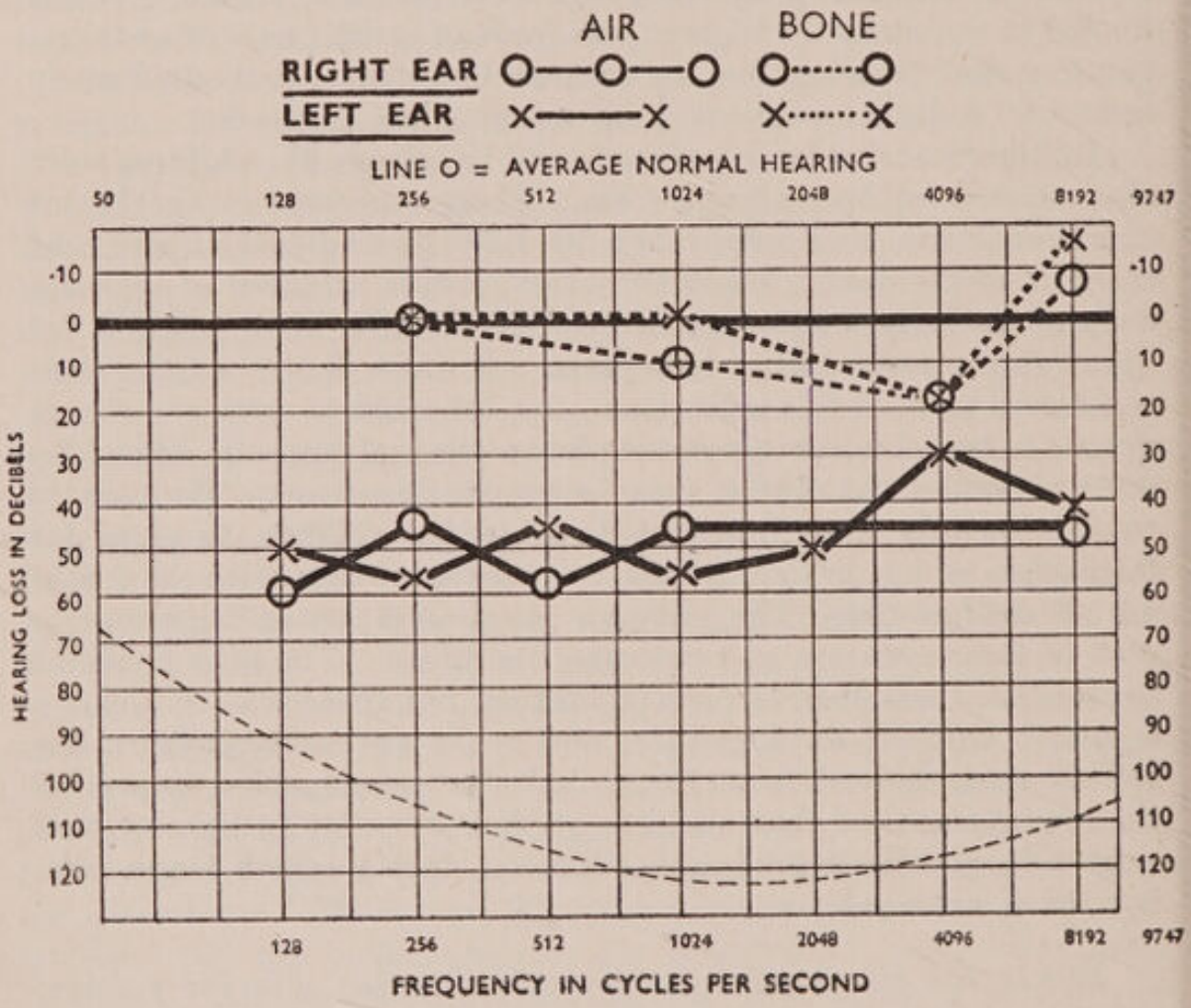
school children is justified. In March 1946 approximately 200 fully qualified speech therapists were practising in England, about 100 of whom were attached to school clinics. Two-thirds of the country's Local Education Authorities still make no provision for speech therapy. The Ministry of Education could help in this matter by providing grants for the study of speech therapy as for other branches of specialist teaching. At the present the profession is open only to those students whose parents can afford to send them to train in London or in Glasgow. This position, although it has tended to maintain the highest standards of artistic as well as therapeutic speech training, has, to my own knowledge, prevented many eminently suitable students from entering the profession.

In Manchester a large proportion of the Grade IIA children were also referred for lip-reading classes. These were held bi-weekly out of school hours, and were taken by fully trained and experienced teachers of the deaf. There were two centres, situated at opposite ends of the city. Approximately fifty children were referred for lip-reading classes during two years. A much larger number was considered to need this instruction, but the children were sometimes unable to travel to the appointed place alone and domestic difficulties often prevented the mother from accompanying them. The parents were frequently most unwilling to allow the children to enrol for instruction which, in their minds, was associated only with the teaching of deaf mutes. The children themselves grudged giving up part of their evenings and Saturday mornings. The attendance at these classes was therefore disappointing, but those who did attend regularly enjoyed them greatly, and spoke enthusiastically of the benefit they derived from them. At the annual clinic inspection the improvement of these children in their response to the standard voice tests was most noticeable. Classes during school hours have now been arranged.

It was not found possible to provide hearing aids for younger children since they cannot learn to adjust them with sufficient care and precision, but several older children of good intelligence were provided with hearing aids, with disappointing results. One case will serve as illustration :

> She was a clever girl of $15\frac{2}{12}$ years with a low-tone deafness involving a 36 per cent loss over the middle frequencies. She had received special instruction and was a good lip-reader for connected speech. At 1 metre her hearing for sentences and isolated words with her back turned was nil. Facing me she repeated 4 sentences out of 5 correctly, and 9 words out of 25. With a hearing aid she repeated (back turned) 20 out of 25 and (facing) 25 out of 25. A set of batteries was provided and she returned delightedly to school. During the first week she used the aid for every oral lesson, the following week she used it less. After a month she ceased to use

it at all. I asked her the reason. At first she was unwilling to tell me, interpreting the question as a mild rebuke, but when I assured her I was asking for the sake of my own information she confessed she could not bear the noise made by the other girls in school. It was different in my quiet clinic, she said. In school they dropped rulers, and banged the lids of their desks. Even the noise of thirty pages being turned was intolerable. She found it much less distracting to lip-read the teacher from the middle of the front row and not to have to put up with the other noises.



VERA

Low-tone Deafness

FIG. 29

This remains to me, at present, an insoluble problem. Not the least interesting feature of the girl's story was that the extraneous noise—which normal people must hear just as loudly in proportion to speech—was so mentally disturbing. Has the normal person learnt from experience how to suppress the mental stimuli of these extraneous noises ? Or has the deaf patient become so accustomed to his silent world, and to concentrating on faint but meaningful sounds accompanied by complicated but consistent visual patterns

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basis to the training departments of the schools for the deaf before the normal school-leaving age, since the present administrative code makes no provision for vocational training within the ordinary school curriculum. Whether special provision will eventually be made for these pupils in the County Colleges remains to be seen.

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CHAPTER IX

SUGGESTED IMPROVEMENTS

THE first essential for improved methods of education for the child with impaired hearing is accurate *diagnosis*. As the 1938 Report suggested, gramophone audiometer surveys at regular intervals at present provide the most convenient method of 'screening' the school population, but it must always be remembered that intelligent older children who are experienced listeners may readily recognize *numbers* from their vowel sounds alone, and therefore some elaboration of the present 'speaking audiometer' test is advisable for children over eleven years old. This elaboration might include standardized words and sentences or even nonsense syllables after the model of the Fry-Kerridge and the Ewing tests. All children failing to reach a definite level of performance in the screening test should first be re-tested, and if still found defective should be referred for the full pure-tone and voice tests. The clinic personnel conducting these tests must not only be fully trained in their use, but must understand their responsibility in carrying out faithfully even the most minor details of the technique. It is upon attention to these apparently trifling details that the success of diagnosis ultimately depends. The screening tests should not, therefore, be entrusted to any junior nurse or clerk who happens to be free. The duty should be bestowed as a privilege upon a few selected members of the medical auxiliary staff, working under the supervision of the medical officer in charge. Only in this way can reliable results be assured.

In conjunction with the gramophone survey a list of all children showing speech abnormalities of any sort should be obtained from the class teachers and forwarded to the medical officer so that these children may be referred for further investigation whether they fill in the audiometer form correctly or not. It must always be remembered that children with speech abnormalities may also record spoken numbers correctly even if their hearing for the upper parts of the speech range is defective, because in ordinary life they have learnt to recognize them in a distorted form. The pure-tone test is, at present, the only reliable method of differential diagnosis between defective speech due to deafness and defective speech due to intellectual retardation. Without an audiogram the most experienced medical officers, teachers and speech therapists may be deceived.

The pure-tone testing should be conducted only by those school medical officers and teachers who have been specially trained in this work. The lay technician, no matter how experienced in the use

of the audiometer, is not usually skilled in the management of young and retarded children. Voice tests should always be included, for the reasons already given, and these tests alone will require special training in delivery. In all cases, whoever makes the charts, the clinic should be in the charge of a school medical officer working in close co-operation with the consulting otologist. In order that records may be consistent it is advisable that one experienced senior school medical officer should be specially allocated to the supervision and welfare of handicapped children. Where two medical officers divide this work between them one should be placed in charge of the department and the other considered to be acting as his deputy. Their individual case records should be clearly initialled. Final decision should always rest with the senior officer. In this way there will be no risk of divided responsibility, which at once provides opportunities for administrative delay and confusion. For the sake of the children's future it is essential that when full clinical records have been obtained the child's headmaster should be informed in writing of the extent of his disability, and a standard form of scholastic attainment should be submitted, to be completed and returned to the medical officer. I have discovered from experience that no amount of individual description of the child's attainments is so valuable as the evidence supplied by actual samples of his work. The form (41D) at present used by school medical officers for the preliminary assessment of intellectual retardation, which is based on Cyril Burt's *Mental and Scholastic Test*, is admirable for very young children, but does not provide sufficient test-material for children with a mental age over 8 years. A form similar to that used in this investigation would be as valuable as any, but I have also learnt from experience that certain modifications are desirable. For instance, more precise instructions should be given concerning the distance and pace at which the piece of dictation should be delivered, and whether any repetition of a word or phrase is permissible. The time allowed for composition should be defined and a request that the time taken over the drawing of a man should be noted on the back of the sheet by the child's teacher. A definite space on the form should be left for the teacher's remarks. Where this information is left optional it is not always given. I soon found that where I was personally acquainted with the headmaster I always received a long letter full of the most valuable information concerning the child's character and school behaviour, but where we were unacquainted, although the forms were returned with admirable promptitude, very few teachers volunteered any comments. This indicates the necessity for closer personal contact between the teachers and the medical officer in charge. When this detailed record of the child's scholastic attainments and school behaviour is related to his clinical notes the diagnostic material is complete and

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each other by signs, and the children with the larger vocabulary rapidly acquire the greater fluency in signing and finger-spelling. They become bi-lingual, as it were. There is no doubt that the handicapped child who spends his leisure time among normal children tends to think and behave more like ordinary people than the child who spends his entire life among afflicted companions.

Then the parents are haunted by the fear that their child, debarred from the companionship of his normal fellows, will later marry a deaf partner and thus perpetuate his tragic disability. This objection is not mentioned in the 1938 Report, but, in my experience, it is one of the most common reasons given for refusing to sign the necessary forms of consent. Many parents are so unwilling to admit the possibility of their child's deafness being hereditary, even when every other probable etiological factor has been eliminated, that they will not only deny the existence of any family history of deafness, and will advance the most fantastic explanations (even black magic !) to account for the child's inability to speak, but they will often steadfastly refuse to believe that the child's hearing is in any way impaired. In many cases they actually prefer to consider the child mentally retarded, and they will obstinately and pathetically assert that they know he will ' grow out of it ' if only he is ' given a chance ' and left at home.

After much consideration of the problem of the residential special school I sincerely question if any administrator, no matter how well intentioned, should be granted the power of *forcibly* separating a young child from his parent for long periods of time except in cases of proved neglect. The failure of any large urban district to provide adequate day-school accommodation for its handicapped children can hardly be construed as parental neglect. The position of the young child in the rural community is different, but these cases are not, after all, very numerous in proportion to the child population, and the parents might be helped to find employment in a city if they so desired, or suitable boarding-out arrangements, preferably with relations, might be made. It is unnecessary to add that to whatever school the child is eventually allocated, his regular attendance should be strictly enforced.

The education and training of Grade IIA cases needs further consideration. These children, although hard-of-hearing, can manage to keep up with their schoolmates now, but they may present a most serious problem later in life if they happen to be suffering from progressive deafness. Analysis of the clinic cases which I have considered suitable to classify as Grade IIA prompts me to suggest that some form of special education, within the framework of the elementary school, is desirable for these children, as it is for children with the higher degrees of myopia. In any case from the point of view of research alone the experiment would be well worth

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but the provision is far from adequate and the training of the teachers and helpers for nursery special schools has not yet been fully organized. It is essential that experts in Nursery methods as well as educationalists experienced in the teaching of blind, deaf, crippled and retarded children should be consulted. In my own opinion, which is based on considerable experience of nursery schools, the teachers should first be trained in normal Nursery methods before they are allowed to specialize in work among young handicapped children.

The whole question of the training of the teacher of handicapped children is in urgent need of review. The present normal Training College curriculum is almost exclusively directed towards the child's academic education, and far too little concerned with his physical and social welfare. School hygiene is the only subject in the syllabus which is seldom taught, even in part, by experts, that is by lecturers with practical experience in preventive and educational medicine. It is surely even more necessary that the special school teacher should have the benefit of expert tuition in the medical aspects of his work.

In order to appreciate the physical, intellectual and emotional problems of the handicapped child, I suggest that his teacher should first spend at least two years in an ordinary school. In this way he will establish in his own mind the normal standards of behaviour and scholastic attainment. After this I would grant him a six to twelve months' course of lectures, discussions, demonstrations and practice under the direction of experts in the medical as well as the educational and psychological aspects of special school work. A new training department preferably attached to a university might be instituted for this purpose, so that the students might enjoy the cultural and social benefits of university life. Many of the classes could be taken in common, while smaller groups could be formed for lectures in the various specialities. After the qualifying certificate has been obtained the graduate should be promoted, in salary and status, to the special schools service. This scheme need not cut across any at present in being, but could be run in association with existing examining bodies.

Student teachers and student health visitors who plan to work in the ordinary schools should also be given a series of lectures by experts, and they should be granted opportunities for observation in special schools and clinics. Only in this way can they be made fully aware of the problem of the handicapped child, and of the necessity for early recognition and reporting of physical and intellectual defect. Practising teachers should be given facilities for frequent refresher courses, so that they may be kept informed of the latest developments. Student speech therapists intending to practise in school clinics might also be given better facilities for instruction by experts in ordinary educational methods.

There are limitless fields of educational research in relation to linguistic development which are still unexplored. Further information is needed concerning the part played by kinaesthetic imagery as well as auditory and visual memory in the acquisition of reading, writing and speech. The relation between eye-span, ear-span and voice-span in oral reading has never been investigated. There is urgent need for more standard performance tests with which to estimate the intelligence quotients of linguistically retarded children.

Most of all, however, we need trained and experienced medical officers to undertake responsibility for this work among handicapped children. Only senior school medical officers who are specially interested in *education* as well as *medicine* should be selected for these duties, since it is essential that the medical officer should possess the knowledge and experience which enables him to meet the teacher and the administrator, as well as the visiting medical consultant, on common ground. The school medical officer who is not interested in educational problems as such, but who prefers to work in purely medical fields, will find ample scope in other branches of the work. The selected officer should be given definite status, freedom of action in his own sphere, and recognized facilities for observation and research. The present system, which usually obliges individual school medical officers who are interested in research to conduct it in their free time, and at their own expense, and often without official help or encouragement, is not conducive to the best results.

It has not been possible in this study to give more than an indication of the vast implications of this problem of the child's hearing for speech; but the field, as yet, is largely unexplored. To borrow one more simile from the acoustic physicists, the problem resembles a chord in music. It is not one simple sound, it is a highly complex pattern of overtones designed to harmonize with and reinforce a fundamental note. The fundamental note is easy to determine, but only the trained musician can appreciate the intricacies of its associated harmonics. The fundamentals of this problem of hearing for speech are already apparent. The complex pattern of its overtones awaits analysis.

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