AUDITORY IMPERCEPTION, ILLUSTRATED BY DESCRIPTION OF THREE CLINICAL CASES.

BY

S. BARTON HALL AND MURIEL BARTON HALL,
LIVERPOOL.

THE subject of auditory imperception has been fully discussed within recent years by Worster-Drought and Allen¹, who published the result of their findings in a characteristic case, and, reviewing the subject, gave some account of 50 others which they had collected from the literature.

Although congenital auditory imperception is a rare disorder, so many points are raised by the study of this condition, not only of clinical but of biological interest, that it was thought that further investigation was needed.

The three clinical cases here described have come under our notice during the past twelve months. Although they vary considerably in their clinical features, they are all examples of speech defect in children of normal intelligence and have certain features in common, investigation of which may contribute to our understanding of the nature and pathogenesis of the condition.

CLINICAL CASES.

CASE I.—J. S., age 5½ years, the younger of two sisters, was referred to us on September 8, 1930 on account of her inability to make herself understood in speech.

Investigation of the past history showed that she was healthy at birth and that she developed normally except in the matter of speech. Up to the age of three years she would not be separated from her mother for a moment. So strong was this maternal attachment that she would not remain with, or be nursed by, her father. When three years of age she 'made friends with' her maternal grandmother and since then has gradually overcome her shyness with strangers.

Up to the same age she made no attempt to talk, although she could make sounds, and understand what was said to her. She indicated her wants by gesture. At three she suddenly began to talk and to use sentences, but not in the form of distinct speech. She spoke rapidly and could not make herself understood to strangers.

In May 1930 she was sent to a good day-school, where it was hoped that by associating with a number of other children she would learn to speak normally. After a term and a half no improvement in speech was observed. She was found to have no ear for music but a good sense of rhythm.

So far as behaviour was concerned she was said to be a model child both at home and at school.

Physical History.—She was a fine baby, and her health had been excellent since birth.

Family History.—No history of speech difficulty was obtained from the mother's side of the family. One of the father's sisters, however, did not speak until she was three years of age when she learnt to speak in what was described as a lisping manner, a disorder which she was said to have eventually outgrown. The patient's sister, aged nine, was

also examined by us and was found to be left-handed, to show a tendency to stammer, and, when examined for her general intelligence, to show a considerable degree of mental retardation.

Condition on Examination.—She was a well-developed child, but rather babyish for her age, showing a tendency to weep and to cling to her mother. She had, however, a strong sense of self-display, and a little flattery induced her to recite a poem, some four verses in length, which started with the words 'Muller day me titpen.' Although this recitation was accompanied by a wealth of gesture, it was wholly unintelligible to the ordinary listener, and even the mother when asked to write down the words from the child's recital was unable to do so.

Physical examination revealed no abnormality.

Speech.—The speech was rapid, and incomprehensible to those unaccustomed to hearing her. It was grammatically correct and showed the normal intonations, but analysis of the sounds produced showed that, whereas the vowel sounds were correctly pronounced, there was a considerable variation in the pronunciation of the consonants.

B, D, H, L, M, N, T and W, were usually well pronounced, unless they came at the end of a word, when they were apt to be omitted altogether, as in 'too' for 'good.'

D, was sometimes replaced by T.

C, F, G, K, P, Q, S, X and Z, were replaced by T, or more rarely by D.

R, V, Y, and Th, were usually replaced by L, but occasionally by T.

J, and occasionally H, were pronounced as Ch, as in 'chut' for 'jug.'

Her form of speech was well demonstrated by her repetition of the 6-7 and 12-13 syllable sentences in the Stanford Revision of the Binet-Simon Scale², which was as follows:—

I hat a little dod.

I have a little dog.

Le dot hunt arter le tat.

The dog runs after the cat.

In tummer le tun it ot.

In summer the sun is hot.

Le boy't name it Chon. He it a lety to boy.

The boy's name is John. He is a very good boy.

Wen le tlain pattet lou will chear le wittle tow.

When the train passes you will hear the whistle blow.

We are toin to at a too ti in le tountly.

We are going to have a good time in the country.

There was no defect in the motor mechanism of speech. Each sound could be correctly pronounced. There was no defect in hearing, and no difficulty in comprehending the spoken word even when the patient could not see the examiner's lips.

There did, however, appear to be a lack of power in discriminating shades of difference between sounds, as shown by the fact that when she could not see the speaker's lips she could repeat 'ack,' but when asked to say 'pack,' said 'cap.'

General Intelligence.—Her general intelligence was examined by the Stanford Revision of the Binet-Simon Scale of tests, and although her speech did at first give the impression that any method of examination involving verbal answers to questions would be impossible to carry out, as soon as the errors in her speech were understood, and she was persuaded to speak slowly, there was no real obstacle to the examination.

Her mental age, as tested by the Stanford Revision, was six years, and her intelligence quotient 104, which indicated that her general intelligence was normal for a child of that age.

Diagnosis and Treatment.—A diagnosis of lalling was made, but lalling of so severe a degree, not only in that a large number of consonants were involved, but in that they were

so irregularly misplaced, as to amount to an idioglossia.

As soon as a complete investigation of her particular speech difficulty had been completed treatment was begun. The child, although only five years of age, was anxious to learn to speak properly and, on this account, was most co-operative. The mother, too, showed a willingness to carry out any instructions given to her.

Each consonant sound which was pronounced incorrectly in her own language was taken in turn and, starting with the sound K, simple monosyllabic sentences were prepared which included this sound and were taught to the child.

During the week which followed the interview the mother was asked to encourage the child to repeat these sentences several times a day and to use correctly all words which began with that particular sound, e.g. during the first week, words like 'cap,' 'coat,' 'cup,' etc. It was found that she began voluntarily to pronounce correctly such words as 'cocoa' and 'quart.'

This process is being repeated with all the faulty consonants.

She has been under observation for a period of three months, and her ability to pronounce words and to make herself understood to strangers shows a great improvement.

This marked progress has been noted by the mother who spontaneously volunteered the further observation that, *pri passu* with the speech improvement, she has noticed corresponding progress in the child's reactions to strangers, friendliness gradually replacing her former shyness.

CASE II.—D. B., age 6½ years, is the fourth in a family of six children. She was referred to us on June 12, 1930 on account of her inability to speak.

She was normal at birth and is said to have taken notice, cried and laughed normally up to the age of nine months. When she was three months old her mother had an attack of scarlet fever and on this account the child was weaned. This event led to what eventually proved to be a significant observation on the part of the mother in that the baby almost immediately learnt to recognise the sound of the food-pan on the grate, thereby clearly illustrating that hearing had developed normally up to that time. So, too, in the matter of speech she employed the normal baby sounds, learning to say the word 'mamma' at the age of nine months.

When nine months old the child had a mild attack of whooping-cough. There was no vomiting, but characteristic spasms of coughing occurred. Recovery was speedy, and by ten months of age she could walk unaided.

Nothing unusual was noticed until the child was twelve months old, when it was observed that she had made no further attempt at speech. From this time on she developed normally in every other way, became clean in her habits, and learnt to wash and dress herself. Her behaviour was always excellent, and she was very helpful with the younger children. She played happily with normal children of her own age. It had been noticed by her mother that she was acutely observant, and had a highly developed sense of direction. She made her wants known by means of gesture. She could hear loud sounds such as fireworks, thunder, whistles, bells and animal noises. She could hear people speaking but did not understand what they said. She attempted imitation of animal sounds and could say 'mamma' and 'no.' She was said to show no tendency to the formation of a language of her own. She could hear the gramophone and had taken an interest in it, but had shown no appreciation of music in the form of melody.

Physical History.—Since the attack of whooping-cough at nine months of age her physical health has been excellent.

Family History.—Both of the child's great grand-parents on the mother's side were said to have been deaf and dumb from birth. They had six sons, all normal in this respect, and through two generations of large families, the patient's mother being the eldest of ten children, there was no trace of speech disorder. There is no history of speech disorder on the father's side of the family, and the child's five sisters and brothers are all normal in this respect.

Condition on Examination.—She was a pretty little girl of good physical development, but shy in manner. She clung to her mother and buried her face in her hands. The usual methods of attracting a child's attention failed completely, but the offer of a penny immediately resulted in intelligent co-operation.

She had with her a 'Comic,' and displayed considerable interest in it, indicating by pointing and gesture that she understood the events there depicted. Her amazing powers of observation were well illustrated by the fact that although she entered the room hiding her face in her hands, a few minutes later, while pointing to a picture of a dog in the 'Comic,' she suddenly turned round and indicated its resemblance to a group of dogs in a small coloured calendar on the wall behind her. Other incidents showed her to have a highly developed orientation sense.

Speech.—When the examiner is out of the child's sight, she turns immediately to the sound of a whistle or to the spoken word, but does not understand what is said to her, nor will she attempt to repeat words. She cannot understand what is said to her when either the examiner or her mother addresses a remark to her standing where she can see their faces. The mother communicated with the child entirely by gesture.

During the interview she showed little tendency to speak. On several occasions she said 'naw,' which sound was accompanied by a shaking of her head and was taken to mean 'no.' Several times she produced the sound 'fa fa,' which was followed on each occasion by a series of unrecognisable sounds terminating in a shaking of the head. No other sounds were made in our presence. Shown a series of objects she indicated their use by gesture. She could neither read nor write, but was capable of constructive drawing which equalled if it did not exceed in some degree that of a normal child of six years.

She could copy anything which was set for her and, although she could not write her name, copied it exactly when asked to do so.

On account of her shyness, systematic examination of the intelligence was deferred to a later visit.

Diagnosis and Treatment.—The case was diagnosed as one of auditory imperception, but with the balance of evidence not in favour of a congenital origin.

In view of the fact that the child had shown no tendency to spontaneous lip-reading, also because, as one of a large family in a poor home, individual tuition could not be arranged, we recommended that she should be sent daily to a deaf and dumb school to learn lip-reading, but that apart from this she should associate as much as possible with normal children.

Subsequent History.—Four months later, in October 1930, we saw the child again. During that period she had added three new words to her vocabulary, 'dadda,' 'Billy,' and 'yes.' She had made good progress in lip-reading of which she now fully realised the importance as a means of attaining her ends.

A marked improvement was noticed in her reaction to strangers. Although slightly diffident at first, she soon overcame her initial shyness, and on this account examination of her intelligence was undertaken. The result by a series of performance tests showed her to have a median mental age of eight years, and an intelligence quotient of 114, which was well above the average of normal intelligence for a child of her years. During the performance she showed outstanding ability both in her method of attack and her power of concentration.

On December 4, 1930 we received a letter from the mother telling us that the child could lip-read very well and was trying very hard to talk.

CASE III.—J. W. was eight and a half years of age when we first saw him on December 20, 1929. His mother was 33 when he was born, this being her first and only pregnancy. He made a somewhat dramatic entry into the world. His mother's health had been excellent throughout the pregnancy, and on the day on which his birth was expected, there was a 'show' at 12 noon followed by one severe pain which sent his mother to the

nursing home. Arrived there, however, she felt perfectly well so did not retire to bed. At 5.15 p.m. that same afternoon while alone in her room, fully dressed, she realised suddenly that her baby was about to be born, but could not attract the attention of the nursing staff. At 5.25 p.m. the baby was born on the hearthrug, the patient in the knee-elbow position. Ten minutes later the nurses came upstairs to attend to her. A perineal tear, requiring two stitches, was found.

The baby weighed 7 lbs. at birth and had every appearance of a full-time child. He seemed to have suffered no ill effects from the precipitate birth. He sucked vigorously but ineffectively, as his mother was said to have no milk. On artificial food he gained steadily for the first month of his life. There followed, however, a period of ill-health during which he ceased to gain in weight. He became thin and wasted and lay on a cushion for many weeks, too weak to move his limbs. When he was 23 weeks old he weighed only 9½ lbs.

It had been noticed from birth that he had a distinctive cry, a monotonous cry consisting of two notes, the sound resembling 'la la,' which did not vary with differing emotions.

When he was six months old his general health began to improve, he gained steadily in weight, and by the time he was 14 months old was able to walk, but tumbled about a great deal and did not really become steady on his feet until he was five years of age. Even at the age of eight years he is said to be clumsy when running.

He cut his teeth normally from the age of eight months, and apart from a short period of bed-wetting at four years of age, developed clean habits at the usual age.

So normal was he in many ways in development that the parents did not discover that the boy was abnormal in any way until he was two and a half years old. They thought that he was more disobedient than other babies, and that he was very slow in learning to talk, but in other ways he seemed to be quite normal. He took notice of objects early, but was always much more interested in things than in people. Up to three years of age he had made no attempt to speak, but about this time he began to imitate animal sounds. The parents first came to realise that he was abnormal in some way when he showed a marked interest in trams, but was unable to learn or be taught the word tram, his nearest approach to the word being 'gag.'

At four years of age he said 'humph, tch, tch, tch,' in imitation of an engine and about this time began to speak much more freely, using a language of his own which consisted of grunting, inarticulate sounds, and occasional recognisable words, all associated with a considerable degree of mimicry and gesture.

Between five and a half and six years of age he began to read and write. When he was seven, he began to pick up words from other children, such as 'skip,' 'come on,' and to call the children by name correctly. About this time, too, the mother began to teach the child to speak by a combined method of lip-reading, writing and gesture. Since then his vocabulary has gradually developed. The use of lip-reading as a means of understanding what was said to him was proved to the father by chance. He had gone into the boy's room, which was in darkness, to speak to him, but the boy signalled to his father to stand on the landing where the light shone on his face. He has since noticed that the boy cannot understand what is said to him in the dark.

He can read print and has at times read voluntarily, but he prefers pictures. He can read long-hand and his father often uses this as a means of communicating with the boy. He can recite 'Ba ba black sheep' perfectly and moderately intelligibly, and also the Lord's Prayer. He writes both printed hand and long-hand. He can write to dictation but only when he can see his mother's lips. He is best at copying. A tendency to reverse letters in spelling words has been noticed. He draws fairly well, especially mechanical objects which he will always choose to draw. He cannot really sing although he thinks that he does. He will sit down voluntarily at the piano and thump. Although he has some idea of rhythm, as in marching, he has no idea of tune. He cannot tell the time,

but can measure it on the clock face. He uses the large hand only, e.g. he calls 5.30 6.00.

He plays games with other boys but does not really enjoy them. He is better at cricket than football, of which he is rather nervous. He soon grows tired of games and his mother has noticed that he does not show the same confidence and ability in running as that displayed by other children of his own age. He has shown a considerable amount of mechanical ability. Not only is he much interested in all mechanical things, but he is adept at Meccano, choosing his tools well and manipulating the fine adjustments with ease. Recently he showed skill in repairing the electric wiring of a toy motor car. He has taken little interest in the wireless, sometimes noticing it but more often he is entirely unconscious of it. The words 'Hullo everybody' might be the signal for his attention, but when the item turned out to be a talk or a song he would show his disgust by mimicing them in the words 'Yaw, yaw, yaw,' and would turn his attention to what were, to him, more diverting topics. He has learnt to count up to five perfectly, and after that imperfectly as regards pronunciation but otherwise correctly up to twenty. In writing double numbers he may transpose the figures. He has learnt to recite tables with perfect rhythm but the sounds which he produces are unintelligible and he has no conception of their meaning.

Physical History.—Apart from the weakness and failure to gain in weight experienced during the early months of his life, and an attack of whooping-cough at seven years, his physical health has been good.

Family History.—Investigation of the family history on both sides reveals nothing of significance. The boy's mother is, by profession, a lecturer in elocution and would appear from her own account to have a somewhat delicately balanced speech mechanism. Three days after the birth of the child she had a phase of speech trouble, lasting for two hours, during which she had a clear perception of objects but was quite unable to express herself in words. She had had no similar attack previously nor has she been so affected since. She has noticed, however, that when she is tired her words tend to come slowly.

Condition on Examination.—Our first impression of the boy as we saw him in December, 1929 was so unfavourable that a diagnosis of mental deficiency suggested itself. The childish fear of being separated from his parents, the almost idiotic facial expression, combined with the fact that he appeared to be able to express himself only by means of grunting, unintelligible sounds and uncontrolled facial movements and gestures, was calculated to give the casual observer the impression that he suffered from a considerable degree of mental retardation. The parents informed us that a diagnosis of mental deficiency had already been made, and that the patient was awaiting certification.

On closer observation, however, it was noticed that he watched his father's face intently, that his reaction time was normal, that he had a well-developed sense of humour, that he was acutely observant and that many of his movements, facial expressions and gestures portrayed a considerable degree of intelligence.

On examination he was found to be a well-built child showing marked motor activity in which arms, legs, head, face and eyes were all involved. His power of attention was limited. He was attracted by the sight of any passing object and would break into a laugh of a 'running' character on the slightest provocation. In the space of a moment his whole attitude would change, he would be tearful, cling to his mother and demand to be taken home. A marked feature revealed by the examination was the way in which the frequent change of facial expression during the constant movement of his eyes, from an object shown to him to his mother's face and back to the examiner's face, indicated the boy's feelings.

Physical examination revealed no abnormality other than the speech defect and its associated phenomena. The senses of taste and smell were normally developed. The impairment in ability to run, which had been noticed, appeared to be due to slight motor weakness.

Speech.—When the examiner is out of the child's sight and addresses a remark to him, the child does not respond by turning round. He is not conscious of having been spoken to. When, from the same position, the examiner blows a whistle, the child turns immediately.

When the examiner addresses a remark to the child in his sight he screws his face up as though he were trying to understand what was said, then turns to his mother in the hope that she will repeat the remark. He can understand by lip-reading almost everything that his mother says to him, but very little of what the examiner says.

If written or printed instructions are given to him he will carry them out if the words used are part of his vocabulary.

SEE The L R y BOY

FIG. 1.

He is very talkative. His spontaneous speech consists mostly of single words, many of them correctly pronounced. He used the following words in our presence :—' flying,' ' on,' ' bell,' ' cough,' ' Liverpool.' The following words were also used but incorrectly pronounced—' wound' (round), ' for' (fall), ' cloe' (slow), ' dop' (stop).

He also used short sentences; e.g., ' dig dow' (sit down); ' fly row' (fly round); ' boy love'; ' won't come out'; ' six o'clock' (six o'clock); ' bog puffer' (big puffer); ' dat bog whistle gain' (that big whistle again). One of his favourite phrases is ' what name Daddy?' when he is interested in an object but does not know by what name to call it. When shown the ophthalmoscope he said, ' gun, lamp gun,' and then read ' off' on the lamp.

The voice is deep and toneless, with no variation between one syllable and another. There is marked tendency to clipping of the ends of his words.

When shown a series of objects he was able to name them. He called a penny, ' penny'; a key, ' key'; a pen-knife, ' naaf'; a pencil, ' penkel'; a watch, ' clock.'

CAFE
1234567891012

FIG. 2.

When asked to write to dictation from the examiner in any position he could not do so, nor from his mother when she was out of his sight. When asked to write ' SEE THE LITTLE BOY' dictated by his mother in his sight he wrote as reproduced in fig. 1.

When asked to write something he turned to his father and said, ' Cafe, Daddy, lamp cafe,' scratched his head and said ' lemmethink,' and drew an electric sign, mentioning the lamps each time he drew them in (see fig. 2).

When asked to write his figures he produced those shown in figs. 2 and 3.

He could read from his father's handwriting and read ' Boy and Daddy will go home to-morrow' as, ' Ber and Daddy wl co home to-morrow'; ' Liverpool, Bovril' as ' Liverpool, Bomvil.' From the intelligence test material he read ' POST OFFICE' and ' LITTLE BO-PEEP' without being asked to do so.

He had difficulty in repeating anything that was said to him unless the words were spoken to him by his mother. He could copy, with ease, simple drawings, figures or letters set for him. When asked to draw something he drew an engine, saying 'bog puffer, puffer back.' It will be observed in the drawing that the engine is, actually, going backwards (see fig. 4).

At our first interview his behaviour was such that it was impossible to carry out a systematic examination of his intelligence. His performance of one or two simple tests,

FIG. 3.

however, gave us the impression that his intelligence was of a much higher standard than his behaviour would seem to indicate.

Diagnosis and Treatment.—Having interviewed the parents, and examined the boy on three successive days, we made a diagnosis of congenital auditory imperception.

An explanation of the boy's particular defect was given to the mother together with advice as to the best method of educating him, and of treating his speech disorder. We suggested that he should attend a good day-school and associate as much as possible with normal children of his own age. The importance of educating him by means of the senses

FIG. 4.

other than auditory, particularly that of vision, was emphasised; at the same time, and more particularly because he had in her an expert tutor, the need for cultivating speech by the auditory route was stressed. Conversation in his own language was to be strictly forbidden.

Subsequent History.—Six months later, in July 1930, we had the opportunity of observing him further. His mother informed us that during that period he had grown an inch in height. He was speaking more freely, using a larger vocabulary of articulated words, reading more quickly and moving more expressively. He could make a purchase at a

shop if he was certain of the name of the article required, otherwise he would ask for it to be written down. He was happy at school. At times he was able to carry on quite a good conversation but at others he was unable to do so. He had begun to take an interest in wireless music when he had the head-phones on, or with his ear close to the loud speaker, and could distinguish the various types of music such as organ, piano or the human voice.

Sometimes he would imitate the words, but with no appreciation of their meaning. He always picked up and repeated 'Hallo twins.'

Examination of the boy showed him to be considerably improved in every way. He was more friendly than on the previous visits, and was willing to be separated from his mother. No tendency to emotional instability was noted during the interview. He was quieter and more mannerly in his general behaviour. There was a marked improvement in his ability to attend.

There was a noticeable improvement in his speech in that he was able to make the examiner understand what he was saying. He still resorted to gesture, but there were fewer meaningless sounds. He used more words, pronounced them more clearly and put his words together into quite long sentences; e.g. 'Thank you vair much for air-plane'; 'Please Mum may boy have plastice (plasticine).' Sentences such as 'Mamma gone out,' and 'I've got five,' were said perfectly. He did, however, still show a tendency to use his own language when he was excited, e.g., 'I have dock' for 'I have none.'

So marked an improvement did he show in both general behaviour and power of attention that we undertook an examination of his intelligence by means of performance material.

He remained alone with one of us for a period of half an hour while this was carried out. He handled the material with confidence and interest. His attack upon each problem set him was bold, and his attention was well maintained. His mental age was found to be eight and a half years. His chronological age at the time of the examination was nine years almost to the day. This showed him to have an intelligence quotient of 94 and to be within the limits of normal intelligence for a boy of his age.

The following is a quotation from a letter written to us by his mother a few months later. 'This last month he has been running wild with boys of his own age, and is running better. Lately he has been repeating words, even phrases of three words, spoken very clearly into his ear, when he could not see my lips.'

DISCUSSION.

Diagnosis in the three clinical cases.—Case 1 (that of J. S.) resembles very closely the cases of idioglossia described by Colman³ in 1895. He found that the average number of consonants which the patient failed to pronounce was eight. In our own case thirteen and frequently two others were replaced, making a total of fifteen, which is a very severe degree of replacement.

Colman considered that the defect was entirely one of the mechanism of articulation, but we are in agreement with Guthrie who thought that in cases of idioglossia the defect was not in the motor but in the auditory apparatus, in that the child was incapable of discriminating shades of difference between sounds. This was indicated in our own case, for although each individual sound could be clearly pronounced, attempts to produce words containing more than one sound frequently resulted in a transposition, as for example 'god' for 'dog,' 'cap' for 'pack.' The correct pronunciation appeared to have little or no significance for her.

For this reason we felt justified in including the case under the heading of auditory imperception, the imperception being of such a character as not to interfere with the child's comprehension of the spoken word, although it is possible that it accounted for the delay in learning to speak.

The defect may be one of the 'auditory word-memory centre.'

Case 2 (D. B.) differed in some respects from a typical case of what Worster-Drought and Allen refer to as congenital auditory imperception. In the first place, if the mother's history is to be relied upon, and all the evidence goes to indicate that the mother's observations are reliable in this case, the child was normal until nine months of age. The cry, hearing and early speech were all normal. This would suggest that the disturbance was not congenital, but acquired during or shortly after an attack of whooping-cough. Secondly, the child made very little attempt to speak voluntarily or to imitate the human voice, although she imitated animal and other sounds. In view, however, of the fact that hearing was normal, that spoken language was heard but not understood, that crude sounds and musical sounds were perceived, we felt justified in including the case under the heading of auditory imperception.

Case 3 (J. W.) appeared to us to be a typical case of congenital auditory imperception. Not only was the lesion present from birth, but every stage of the child's development corresponds exactly with the detailed descriptions of the disorder given by Worster-Drought and Allen, from the peculiar monotonous cry in infancy to the tendency to transposition in scholastic efforts shown at the present time.

From general consideration of this clinical material the following points of interest arise.

We have been fortunate in our opportunity of studying auditory imperception in children at the comparatively early ages of $5\frac{3}{4}$, $6\frac{1}{2}$ and $8\frac{1}{2}$. Lack of appreciation of musical sound in the form of melody was characteristic of all three cases. Transposition of letters and figures both in speech and writing was of marked occurrence in two cases, but owing to its presence in normal children we are not inclined to emphasise this feature.

It would appear that in the auditory imperception of these three cases the difference is one of degree. Whereas in case I there was appreciation for the significance of language and for the meaning though not for the correct pronunciation of words, in cases II and III there was gross lack of understanding of the meaning of words. Further, there would appear to be a relation between such degree and the degree of idioglossia developed in these cases. It would seem as if, in the milder types of auditory imperception, such as in our case I, the need for verbal communication is felt, and develops with moderate freedom. Where, on the other hand, the conception of language is markedly lacking, most notably in our case II, little attempt at verbal communication is made, even in the form of an idioglossia.

The intelligence factor.—Worster-Drought and Allen have said that "opinions as to the mental condition of patients suffering from congenital

word-deafness have varied considerably; for a time they were thought to be always mentally deficient; but at present the general tendency is to regard them as at least of potentially normal mentality." It has been said by Burr⁴, who has reported several cases of this kind, that the mental deficiency was the result of the speech defect, not the cause of it, and that although these children are 'imbeciles from deprivation' in a poor environment, they are potentially normal and would become as intelligent as other children if treated in the proper manner. While agreeing with Burr, and with Worster-Drought and Allen, that some of these patients, although they give every appearance of mental deficiency, are actually normal in intelligence, it appears to us, however, that just as the innate intelligence in normal individuals varies considerably, so would there appear to be a possibility of considerable variation in the innate intelligence of the children suffering from this type of speech disorder.

To classify them all together as of normal mentality, their mental and moral behaviour dependent entirely upon their environment, would appear to be illogical. Is it not more likely that their reaction to their environment is also largely dependent upon their degree of intelligence? This point is brought out by a comparison of the environmental factors in our second and third cases. The second patient, D. B., was one of a large family of young children living in a very poor home. In spite of her inability to speak or to comprehend the spoken word, her behaviour had always been of an exemplary character, and she had adapted perfectly to her environment. Examination of her intelligence showed her to be well above the average in this respect.

The third, J. W., was an only child of parents in comfortable circumstances, who had experienced every advantage that environment could offer including a mother who was, herself, a teacher of elocution, but in spite of this he was restless, inattentive, unstable emotionally.

His general intelligence, while within normal limits for a boy of his age, was considerably below the level of that of the previous case.

During the past few months we have paid particular attention to those mentally retarded children with associated speech defect who have come under our observation. We have found in some that the speech defect has been closely allied to, if not identical with, an idioglossia, but we have felt that information relating to these cases does not come within the scope of the present paper where children of normal intelligence, only, are being dealt with.

A study of the literature concerning this latter type of case shows that, up to the present, the estimation of the mental development has been based entirely upon general conduct and behaviour, the interests, emotions, and ability to learn.

With the methods which we have at our disposal at the present day it would appear to be of inestimable value to be able to assess the intelligence of children such as these, firstly from the point of view of diagnosis, more particularly in cases of idioglossia, a condition which has been thought to be more commonly associated with mental retardation and defect; secondly, from the

point of view of prognosis, for it would appear that in those cases in which the standard of intelligence is average, or above average, the outlook with regard to education and employment is much more hopeful ; and, thirdly, with regard to treatment, a much more ambitious scheme being entertained for those of a higher level of intelligence.

The methods of assessing general intelligence in children over three years of age, three being the age at which parents commonly seek advice when the child has made no attempt to speak, are mainly verbal in character, both in the giving of them and in the answering, and are therefore not applicable to these cases except where there is comprehension of the spoken word.

There are, however, some excellent series of tests for performance ability some of which have been so designed that they are applicable to non-hearing children, and as these have been selected and standardised very carefully by various workers, notably by Frances Gaw⁵, they are of considerable assistance in this type of case. The results of examination by these methods have already been reported in our account of the cases.

It would seem that the examination of the intelligence by recognised scientific methods, in every case of idioglossia and congenital auditory imperception, would supply valuable information, which would not only be of help in arriving at a satisfactory diagnosis, giving a prognosis and arranging a plan of treatment, but might also aid in the elucidation of the pathogenesis in such cases.

Psychological reaction and behaviour.—Although our cases varied to some extent in this respect, the first two patients being contented well-behaved children, while the third was much more liable to emotional instability, we were interested to note in all three a history of timidity and shyness. It was present in all three at our first interview with them. This was so unusual in our experience of child patients as to warrant attention and to be considered as more than mere coincidence.

In case I, the mother had noticed that up to three years of age the child would not speak, nor would she 'go to' anyone except her mother, and, further, that the recent improvement in her ability to speak has been associated with the gradual loss of her former shyness in the presence of strangers.

Pathogenesis.—As has been pointed out by Worster-Drought and Allen, there are, in all probability, two primary factors to be taken into account in any attempt at elucidation of the cause of such lesions, viz., trauma and biological variation.

In the first of our cases there was no history of birth injury, and there was complete absence of injury or illness during infancy which might have contributed to her condition.

In our second case there appeared to be a close association between an attack of whooping-cough at nine months of age and the onset of the disorder. There was no suggestion of any possibility of birth injury.

In our third case there was a history of precipitate birth, but the child

exhibits no physical or mental abnormalities which could be ascribed to an injury at this time.

Here we have, then, a case of idioglossia with no obtainable history of trauma, a case of auditory imperception which is considered, at any rate by the mother, to have developed during or shortly after an attack of whooping-cough, and a case of congenital auditory imperception associated with what was undoubtedly a precipitate first labour.

We feel that, upon this evidence, the possibility of trauma as an etiological factor cannot altogether be ruled out.

Turning to the theory of biological variation, in our first case there was a familial history in that although the father has shown no speech defect one of his sisters appeared to have had some speech difficulty in childhood. The patient's own sister has a definite hesitation in her speech and is mentally retarded.

In our second case, although no history of speech difficulty could be obtained in her own generation of the family, or in two previous generations, her great grand-parents on the mother's side were said to have been deaf and dumb from birth.

In our third case, no history could be obtained of speech disorder on either the father's or the mother's side except the mother's own history of her experience of a short period of aphasia shortly after the patient's birth.

In all three a familial factor was present, although there was no regularity in its method of transmission, for in one case it would appear to have been transmitted through a normal male to a female, in a second through three generations of normal descendants to a female, and in the third through an affected female to a male.

In the second case, where transmission would appear to have been through three generations, it is impossible to know whether the great grand-parents were deaf-mutes, or whether one or both of them were suffering from some form of auditory imperception.

In the third case, too, it is impossible to know whether the mother's short attack of speechlessness, which from her description appeared to resemble an aphasia, was of neurological significance.

The history obtained in our three cases suggests that the familial factor is a powerful one, and a familial factor is shown in the case recently described by A. G. Morison*, yet on account of the irregularity of transmission we feel that undue stress must not be laid upon this pathogenetic possibility.

The problem of pathogenesis is obviously one which is extremely difficult of solution, and which will not be arrived at without detailed observation of a large number of similar cases.

SUMMARY.

1. Three clinical cases are described, the first a case of idioglossia, the second a case of auditory imperception of unknown origin, and the third a

case of congenital auditory imperception.

2. The past history, clinical investigation and after-history of the three are described, together with the details of the speech difficulty in each.

3. The diagnostic features of each are discussed, and the cases are compared with relation to the points of interest which they present, attention being paid to the age of the patients, the absence of musical appreciation, and the tendency to transposition of letters and figures. They are also compared as to the degree of auditory imperception which they individually present. The relation between such degree and the development of idioglossia is discussed.

4. The methods of estimating intelligence in these cases are discussed, and the significance of such estimation with regard to diagnosis, prognosis and treatment is emphasised. From the point of view of social adaptation, the importance of the intelligence factor, in addition to that of the speech defect itself, is referred to.

5. Associated emotional instability in such cases is described.

6. The etiological factors concerned in each are discussed, and the significance of each is assessed with relation to the recognised theories of pathogenesis.

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⁶ MORISON, A. G., *Jour. Neurol. and Psychopathol.*, 1930, xi, 28.