With a subject as complex and multi-faceted as language pathology, it is unlikely that any single approach could be devised which would provide a coherent and comprehensive account. This is always so when a range of professions contribute to the study of the subject, and especially so when these professions reach across the boundary between arts and sciences (as in the case of language pathology, where the contributing disciplines include medical science, linguistics, psychology, and education). In such circumstances, different models of enquiry evolve, each of which illuminates our understanding of the subject from a different point of view.

1. The notion of model

'The purpose of scientific thought is to postulate a conceptual model of nature from which the observable behaviour of nature may be predicted accurately' (Walker 1963, p.5). A model is an attempt to visualise a complex set of abstract or physical relationships, so that they become more intelligible. Models are inevitably simplifications of reality, in which certain features are emphasised at the expense of others. By formulating a model in a certain way, hypotheses can be generated about the nature of the reality the model purports to represent, and these can be subjected to experimental test. A fruitful model will provide us with many such hypotheses, as well as a range of fresh insights into the nature of a field. At the same time, models tend to make their users think in a certain way, so that it becomes difficult to step back and see that there are other ways of conceptualising the field, and that other models may also be a source of insight. Often, models from different research traditions are used simultaneously in relation to different aspects of the field.

Several models have come to be used in language pathology, largely arising out of the subject's multidisciplinary background. Some have been developed to impose order on the field as a whole; others relate to the study of an individual disorder or group of disorders. These models can be grouped according to various principles. One principle reflects the contributing disciplines: medical science, on the one hand, and

behavioural science, on the other. Another relies on the distinction which in linguistics was formulated in terms of diachronic and synchronic dimensions of language study (Saussure 1959): language pathologies are thereby investigated from a developmental or non-developmental point of view.

2. The medical model

The earliest models providing accounts of abnormal linguistic behaviour were derived from philosophy and theology (O'Neill 1980); in medieval times, for example, speech was seen as a psychic rather than a physical reflex, and aberrations were as a result often viewed in relation to notions of spiritual or mental well-being. A scientific model was not forthcoming until the 19th-century, when the work of European neurologists introduced a medical mode of enquiry into the subject. The essential features of the medical model are an emphasis on cause and effect: the signs and symptoms of disease are explained by postulating a causative agent (a disease or trauma), and intervention is focussed on identifying that agent (diagnosis) and eliminating it, thus providing a cure. In the case of language pathology, it quickly became plain that quite a large number of abnormal spoken language symptoms could be explained with reference to a physical (or organic) cause. Such causes included deafness, brain damage (both in children and adults), orofacial abnormalities, and pathologies of the vocal tract. In some cases, detailed studies of an anatomical, physiological, or neurological kind indicated the possibility of fundamental classifications of abnormal linguistic behaviour, notably the early division of aphasia into Broca's and Wernicke's types.

The medical model is now an essential primary step in the investigation of any postulated language pathology. It is standard practice to determine whether there is any physical factor present in an individual, before proceeding to examine other factors. Thus, typically a hearing test will be carried out, and often there will be investigations by ear, nose, and throat, neurological, pediatric, orthodontic, or other specialists. The strengths of the medical model are plain, and are those we have come to associate with orthodox medical practice in other areas of life. At the same time, the limitations of this model, with respect to language pathology, have also become

increasingly apparent. In particular, as the range of conditions widened, it became clear that several pathologies of language did not seem to have any organic cause capable of being elucidated in medical terms. Examples included most kinds of stuttering, certain voice problems, various categories of reading difficulty, and the many types of child language delay. Indeed, informal estimates indicated that perhaps in as many as 60% of all cases the linguistic symptoms could not be assigned a straightforward medical cause. Often, there was nothing physically wrong with the person (as far as tests could tell), or the nature of the physical abnormality did not seem correlatable with the range of linguistic symptoms manifested. Alternative models were therefore devised.

3. The behavioural model

A further difficulty with the medical model was its limited ability to provide guidelines for treatment or teaching. Whereas a physical problem could be remediated using physical techniques (medicines, surgery), only a few linguistic handicaps could benefit in this way (e.g. hearing aids, vocal fold surgery). In most cases, there was no way of relating a medical diagnosis to a specific linguistic treatment regime. Moreover, there seemed to be no neat correlation between type and severity of a condition and the range of linguistic symptoms encountered. For example, a group of identically deaf children of a given age could display a wide range of language abilities. In order to devise appropriate teaching programmes for these people, as well as for those who had no medical symptoms at all, a behavioural model of investigation was introduced.

There are as many potential behavioural models, in fact, as there are relevant behavioural sciences. In language pathology, the two approaches usually encountered stem from psychology and linguistics. The psychological approach has traditionally operated with a wide range of test procedures, investigating such factors as memory, attention, personality, intelligence, and perception, and characterised by the use of experimental and statistical techniques. The linguistic approach has focussed on the description of language behaviour as captured in samples of speech or writing. An analysis is made of an aspect of the language used, and the results are displayed in

the form of tables, charts, or other descriptive devices which enable patterns of abnormality to be seen and paths of intervention proposed. The diagnoses which emerge from this approach use the terms of psychological or linguistic analysis: language pathologies are defined with reference to disturbances in underlying cognitive skills, such as memory or attention, or at the linguistic levels of phonetics, phonology, graphology, grammar, semantics, or pragmatics.

Attempts made to correlate the findings of the behavioural and medical models have so far achieved only limited success. For example, there are many important individual differences, described in linguistic terms, between patients who have lesions in Broca's area. On the other hand, there are clear cases where the explanation for a condition requires reference both to medical and behavioural models. Examples here would include those voice disorders where only a combination of physical and psychological factors seem able to explain the development of a laryngeal pathology (Greene 1989). However, when one examines such cases as the latter, the need for a further explanatory model becomes apparent.

4. The developmental model

Developmental factors are by no means ignored in medicine (such as in pediatrics, and in the universal notion of the 'course' of a disease), psychology (notably in developmental psychology) and linguistics (notably in child language acquisition). In a developmental model, however, physical or behavioural changes over time become the primary focus of attention. This is so far a poorly investigated approach to language pathology. The concept of development is occasionally recognised, such as in the diagnosis of language 'delay', and in the recognition that some pathologies are 'resistant to therapy'. Hints at the normal developmental course of a pathology are also found in aphasiology, where experienced clinicians are prepared to give an indication of the time it normally takes for the restoration of certain functions. But for the most part, detailed information is lacking about the way language handicaps spontaneously develop, and about the rate at which they resolve (or fail to resolve) during therapy. Many longitudinal case studies of individual pathologies are required before the field can build up a bank of

prognostic data comparable to that now routinely available in medical science.

It is essential to aim for a developmental perspective, because this model provides valuable information for all main areas of clinical study. Time is part of the task of assessment, in that any evaluation needs to consider just how much progress has been made in a given period of time. Time is part of the task of intervention, in that the value of any remedial programme needs to be judged in terms of how long it takes to be implemented, and whether enough time is available in order to implement it. And time is part of the task of diagnosis, in that ultimately one would expect different types of pathology to be defined partly in terms of the time-scale involved (in much the same way as part of the definition of a disease is the time it takes to run its course).

5. The interactive model

A further approach, which also has received little study to date, focusses on the social interaction between the linguistically handicapped person and others. Language pathologies are unlike most other forms of handicap in that they do not become apparent until communication is attempted - and communication is a two-way process. A popular way of modelling language handicap, within the general framework of the medical approach, is a model derived from information theory which identifies stages in a 'chain' of communication. A message is conceived as being sent through a sequence of neurological, physiological, and anatomical stages of expression and being received through an analogous sequence of anatomical, physiological, and neurological stages. In terms of this model, deafness would be an 'input' pathology, stuttering would be an 'output' pathology, and aphasia would be a 'central' pathology. This model is a useful way of identifying the main physical locus involved in a condition, but it only goes a small way towards an explanation of the handicap as a whole, for it takes no account of the various kinds of social interaction which relate speaker and listener (or reader and writer) while they are engaged in the task of communication.

As with the developmental model, the importance of interaction emerges in relation to each of the main clinical tasks. In relation to diagnosis, a difficulty in coping with normal interaction is central to the definition of pragmatic speech disorders, such

as failure to follow the normal rules of conversation, or failure to speak at all (mutism). In terms of assessment, it is a commonplace that the results of tests and other procedures depend very largely on the nature of the interaction between tester and testee. And in terms of teaching, it is only common sense that success here will depend on the ability of the therapist to match language stimuli to the level of attainment reached by the patient - something which is not always easy to achieve. Certain aspects of language, moreover, seem to be more affected by interaction than others. In phonology and vocabulary, for example, the role of imitation is important; but in grammar, more attention needs to be paid to the way patients demonstrate an emerging awareness of linguistic rules, independent of the input.

6. Integration

Each of these approaches provides insight into the nature of language pathology. Occasionally they come into conflict - such as when the medical and the behavioural approaches lead to incompatible recommendations about intervention (as in the treatment of a voice pathology, where surgery and voice rest might be alternative ways of proceeding). But for the most part, these models happily coexist, within the field, each providing a fruitful source of research hypotheses. Most case studies now routinely incorporate information of a medical, behavioural, developmental, and social kind (though emphases vary), and the importance of integrating these different perspectives is stressed in the training of language pathologists. Within each heading, moreover, there are further possibilities, depending on the theoretical approaches used. Within the behavioural approach, for example, there are several ways of dealing with grammatical disability, using any of the grammatical theories available in linguistics. Within the developmental approach, there are several ways of modelling the order of emergence of phonological abilities. The pages of any research journal illustrate the range of models which now exist, in the domain of language pathology. If there is a problem, at present, it is not a shortage of models, but a shortage of model-users, and a shortage of time for the modellers to take further the approaches they have devised.

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