MENTAL TESTING IN CLINICAL PRACTICE

BY

MOYRA WILLIAMS
M.A., D.Phil.
Principal Psychologist
Littlemore Hospital, Oxford

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FOREWORD

THIS short book is intended as a guide for all those interested in the measurement of mental activities in sickness. It has no claims to be original, nor does it aim to be fully comprehensive. There are many aspects of mental disorder which are not mentioned here—mainly because methods of assessing them quantitatively are not yet available. Delusions, for instance, hallucinations, and disorders of behaviour are hardly mentioned. The five aspects of mental activity which are discussed here are those which most usually require measurement. Each function is dealt with separately, and attempts have been made to discuss the variables affecting each one in both health and sickness. I believe it is only when these are fully appreciated, and when allowance is made for them on mental test results, that mental testing itself can be of value.

The tests discussed here form only a small selection of many hundreds available. Their choice is determined entirely by the author's bias, though some are mentioned because their names have become familiar in clinical practice, even though their reliability and usefulness seems to be in doubt. They are only described with the idea of allowing the reader to become familiar with the material and procedure involved, and so be able to judge for himself the usefulness of the method. This is not intended as a handbook from which mental tests can be applied and scored.

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INTRODUCTION

HISTORICAL BACKGROUND

Although the history of mental testing has been well documented by others, a few names and dates are still worth repeating here. Most people agree that it begins in 1882 when Francis Galton established the "Anthropological Laboratory" to measure individual differences in behaviour, even though the aspects measured by him were almost entirely concerned with the functions of the senses, rather than with mental activity as we think of it now. The next name usually mentioned is that of J. McKeen Cattell who was inspired by Galton's work to apply his principles to a wider field. It was he who appears to have used the words "Mental Test" for the first time in 1890. Still concentrating mainly on the sensory-motor functions, Cattell developed a series of tests from which he aimed to determine the intellectual ability of college students.

In 1892 Kraepelin prepared a series of tests to measure various mental activities in psychiatric patients, and it was with this work that psychological methods first found their way into the clinical field. Kraepelin included tests of arithmetic, memory, and word-association in his investigations; but it was mainly through the work of Binet and his co-workers, especially Henri and Simon, that mental testing really began to have a greater significance and cover a wider range of functions.

In 1895 Binet criticised all previous mental tests for concentrating too narrowly on the sensory side, and in 1905 he produced a scale of thirty tests (including many verbal items), in ascending order of difficulty, which he administered to fifty children aged 3–11. In 1908 this

scale was revised by Binet himself. The number of tests was increased, they were grouped together into age levels, and the term *Mental Age* was referred to for the first time. This scale was translated into English and further revised by Terman at Stanford in 1916, the English version being known as the Stanford–Binet. (A still later revision undertaken by Terman and Merrill is the form in which Binet's test is most often used in this country.) The concept of intelligence quotient (I.Q.), derived from dividing the mental age by the chronological age and multiplying the result by 100, was also introduced by Terman.

$$\text{I.Q.} = \frac{\text{M.A.}}{\text{C.A.}} \times 100$$

In 1904 Spearman introduced statistics into the field. Using the technique of factor-analysis, he began studying and trying to identify the functions used in the performance of different mental tests. He distinguished one main factor of general intelligence (*G*) plus several special factors (the *s*'s), each of which was specific to one function. The technique of factor analysis itself cannot be discussed here, but the widespread effect it has had on mental testing in general will be evident in the following chapters.

In 1914 Woodworth widened the sphere of mental testing to cover aspects of behaviour other than those reflecting intelligence and sensory-motor activity. He tried to measure and express in quantitative terms those elusive aspects of the individual known as Personality. Woodworth's Personal Data Sheet, a self-rating questionnaire or inventory, has served as the prototype for many later tests of this nature.

The latest step forward in the history of mental testing was the development of the projective techniques. Already in 1911, Jung had drawn attention to the fact that much insight could be gained into a person's mental conflicts from his responses to Kraepelin's Word Association Test—a situation in which the subject has to say the first thing that comes into his head after each word mentioned by the examiner. It is to Rorschach, however, that we really owe the systematised use of "unstructured material" in assessing the personality as a whole. Rorschach's test, in which the subject has to say what he can see in a series of ten ink-blots, is still one of the most widely used psychometric tools today.

During the last forty years, there has been a large increase in both the number of tests used and the fields of investigation to which they have been applied, but no further major innovations in techniques have been forthcoming.

THE NATURE OF MENTAL TESTS

The name "Mental Tests" has a forbidding ring. It suggests the probing of a person's innermost secrets or the stretching of his abilities to breaking point. But a mental test is not really so much an analysis of a patient as an examination of the psychologist's hypotheses about him. The examiner on first meeting his subject forms certain impressions. These may arise from his own observations or from the suggestions put to him by others. He suspects the patient may be able to cope with some situations but not with others. It is suggested that the patient may have certain unsatisfied mental and social needs, or that his thought processes may be affected by certain illnesses. From these hypotheses and from his experience of the behaviour of other people, the psychologist makes predictions about the way in which his subject will behave in a number of standard situations. These situations are the tests. They prove whether the hypotheses are right or wrong.

It will be clear from this that the value of mental testing lies in its ability to answer particular questions, not in its capacity to probe or strain. If the clinician who refers a patient for "testing" does not say what possibilities he wants tested, he should not be surprised if he does not receive a very helpful answer. But at the same time, the psychologist responsible for the testing would do well to bear in mind the questions he is being asked and attempt to answer these, before embarking on an essay about other aspects of his subject's inner mental life which he may find particularly fascinating.

THE AIM OF MENTAL TESTING

Mental testing is carried out for a large number of reasons. The selection of the right people for certain jobs or for certain systems of education has long been known to depend on their mental abilities, and mental tests are extensively used for these purposes. In the clinical setting, mental tests have two basic uses which can be summed up

as (1) diagnosis, and (2) research. The techniques used in the latter field will depend on the problems being studied. Many research projects require specialised equipment and techniques, and will not be considered further here.

In this book I shall consider only that aspect of mental testing which involves the objective estimation and quantification of behaviour.

STANDARDISATION OF MENTAL TESTS

As already stated, mental tests are used to check up on vague and possibly erroneous clinical impressions. How does one know whether the check is right? Before using any test, both the person using it and those interested in its results should know how it was standardised, in particular, its *norms*, its *reliability*, and its *validity*. The data about these will usually be supplied in the handbook describing the use and scoring procedure of the particular test.

Norms

Norms are the data telling the tester how the average person of the same age and education as his own subject behaves in this particular situation. This is what the tester wants to know, and he must be sure, therefore, that the test has been standardised on a large enough sample of the population as a whole for the comparison to be valid, and that the sample contained a fair representation of people of the same culture, education and age as his own subject. The handbook should not only give details of the population on which the test was originally used, but should also show the mean and the distribution of the scores obtained. If the distribution is very large, it suggests that there is a wide normal variation, and the reliability of the test is likely to be low. A very narrow distribution, on the other hand, suggests that the test is unlikely to discriminate well between subjects of different classes. The importance of these points will, I hope, become clearer later on, when we consider in more detail the effect of age and upbringing on the different mental functions.

Reliability

Reliability indicates the accuracy with which the test measures the variable under consideration. Supposing one wanted to assess the accuracy of a new thermometer in measuring temperature, one could

do it in two ways. One could place the thermometer in a medium of constant temperature on several different occasions and see to what extent the readings on the new thermometer agreed with one another (test/re-test correlation); or one could place it alongside an already calibrated thermometer in mediums of different temperature and see to what extent the readings on the new thermometer agree with readings on the calibrated one. But in the case of mental tests, the situation is rather different. Each time a mental test is applied to a person, his potential responses to it will be altered very significantly. The second time he is presented with the test he will know the material and what to expect; soon he will become either practised or "test sophisticated". Hence any re-test, if the measuring instrument used is accurate, is bound to produce a different reading from the first test. This fact is taken into account when test/re-test correlations are made, and the amount which has to be allowed for on different types of function is now roughly known.

The method of comparing readings on one measuring instrument with those of known calibration is only valid if the accuracy of the first instrument has been really well established. But here is another difficulty in the sphere of mental tests. How do we know the accuracy of the first test used? The answer is we really do not know, and as we do not, the mental tester is forced to resort to variations of the thermometer technique. Two variations are particularly common. In the first, he applies as many different tests of the same function as he can find and measures the extent to which they agree; in the second, he divides his new measure in half, and measures the agreement between the two halves—the split-half method. Since all mental functions may fluctuate widely from one day to another and under different conditions (internal and external), it follows that the variations in test scores which appear in these situations may not necessarily all reflect unreliability of the measuring instrument. They may reflect rather the extent to which variations are due to genuine fluctuations of ability. In practice, it is assumed that every mental test has a certain measure of unreliability or error, and score-differences are only regarded as significant if they exceed this error by a fair margin.

Validity

Does the test really measure what it sets out to measure? How accurate are its predictions? For example, if we measure the number of digits a person can repeat after a single hearing, are we justified in saying that he has or has not a good memory? In this particular instance, what one wants to know is the extent to which a person who does well on so-called memory tests, and especially on the repetition of digits after a single hearing, will do equally well in life situations where memory is involved. This is not always easy to ascertain. In the first place, follow-ups of actual performance often take many years. In the second place, what standards of "goodness" is one going to accept in a life situation? In the case of memory, how well does a person have to remember everyday events to have a good memory?

Because of these difficulties, psychologists are inclined to adopt the same procedure in the checking of validity as they do in the case of reliability. Instead of comparing test performance with life situations, they compare them with performance on other tests. To assess the validity of a new memory test, its results are checked against other tests, believed to measure the memory function—for example with the ability to learn pages of poetry, to recall items after a long delay, or to describe personal and world events. It is possible to see that this procedure may lead to trouble. If the first measuring instrument is based on a false premiss, the falsity is perpetuated by the next. In the case of memory, it is possible that the same function is *not* involved in all these different performances, so that high correlations would indicate the uselessness of any new procedure which correlated with them all (see Chapter 4). Fortunately, as information on test results is accumulating, it is becoming easier to check test validity against life situations.

Test Administration

Once a mental test has been standardised, and once the way in which it should be given has been clearly outlined in its manual, the administration of it is simple. Does this mean to say that every administrator who uses it will obtain the same results? Certainly not! The way in which a subject behaves in a test situation will depend not only on the test itself, but on an infinity of variables in the

general situation—on the subject's attitude to the test, on his attitude to the administrator, and on such simple and obvious factors as his physical comfort and his understanding of the instructions. It is in the control or manipulation of these factors that the skill of mental testing lies. A good administrator never starts the test until his subject is at ease and until he himself is sure that the function he is about to measure is at its optimum. "Establishing rapport", as this procedure is called, is an art rather than a science. Each individual develops his own technique for doing it, derived from his own personality. It cannot be learned from books or handed on from one person to another except through example. Usually no attempt is made to introduce the test proper into a session until such rapport has been established, but if, as happens in some cases, it is clear that a good rapport is unlikely to materialise, the tester is often justified in going ahead with his investigation and making allowances for the poor co-operation when interpreting the results.

Some differences of opinion exist between administrators about the wording of test instructions. Most mental tests lay down in their handbooks or manuals the exact words an administrator must use when giving a particular test. "Say . . . see these crosses that are just alike. Here is one that is not like the others. Put your finger on the one that is *not* like the others." (Terman and Merrill IV. 6. 3). Any alteration of these words renders the whole test invalid.

The reason for this rigidity is that any cue inadvertently given by a well-intentioned examiner may make the task easier for his subject and would therefore alter the score a subject obtains. If instead of saying "put your finger on the one that is *not* like the others", the examiner said "put your finger on the black one", the subject's problem is already solved for him.

As against this, it may be argued that the same words do not necessarily mean the same thing to different people, and it is the meaning of the instructions which should be the same for all people rather than the wording. If the subject shows difficulty in understanding one of the set instructional phrases (or if, on the other hand, it would mean talking down to him and so threatening his self-respect), it seems justifiable to alter the wording a little; but before doing so, examiners should be sure that the words they use as substitutes have the same cue-value as those they substitute for.

In the clinical situation, as much interest is usually attached to the

subject's general behaviour during the test as to the items on which he fails; as much insight can be gained from his own spontaneous comments as from the final test score. Notes (either mental or written) should be made of these throughout the interview. Does he show signs of more anxiety in one situation than in another? Does he tire easily? In what situations do you feel your rapport with him beginning to slip away, and what do *you* have to do in order to retrieve it?

Because of the importance of these factors, mental tests are seldom given in clinical practice to patients in groups, except for purposes of screening. Little, therefore, will be said about group testing in this book.

Evaluation

The goodness (or value) of a test is judged on four criteria:

(1) The amount of information it yields.
(2) The time it takes to give.
(3) The effect it has on the subject.
(4) The ease of scoring and interpretation.

In clinical practice, a fifth criterion has usually to be added to these—namely the amount and portability of equipment involved. A test which can only be given in a specially fitted laboratory, or which involves expensive and unwieldy material, cannot easily be used at the bedside of a disturbed patient in a general hospital, or carried around after an acute psychotic.

The better the test, the less disturbing it is to the subject, the less equipment it necessitates, the shorter the time involved in giving it, and the more information it yields. Any item of a test which does not prove to have predictive and discriminating value should be scrapped at once. If as much information can be learned (reliably) from the answer to a single question as from those to twenty questions, there is no need to ask more than the one. If the test does, in fact, contain twenty questions, the answers to each of these should reveal a different degree or quality of mental function.

When first developing a test, the constructor checks every item in it for (1) its difficulty value (based on the percentage of the total population passing it), and (2) its discriminative value (based on the degree to which it differentiates between those who do well on the whole test and those who do not). From this process, known as *item*

analysis, he will construct a scale of *equal interval units* on which to measure each trait or function he wishes to assess.

The methods of scoring used in mental testing vary greatly. Scores may be based on any directly observable phenomena, from the analysis of movements to the number of items passed or failed. They may be based on assessments of qualitative factors or on quantitative ones, but all scoring methods should have the following points in common:

(1) They should be objective and resistant to personal bias.
(2) They should be given in quantifiable terms.
(3) They should be simple and quick to work out.

CHAPTER 1

INTELLIGENCE

INTELLIGENCE was the first aspect of mental activity which psychologists attempted to measure quantitatively, and the ten-year start it has had over other types of mental test has never been overhauled.

Intelligence tests are not only the most widely known of all mental measuring instruments, but are probably the most accurate in terms of predictive value. Their early successes in this field were indeed so striking, that intelligence tests have come to be relied on heavily in some quarters for personnel selection and vocational guidance. Their inclusion in the eleven-plus examination is perhaps the best known of their practical applications in Great Britain.

The vast support for intelligence tests given by untechnical sources makes some psychologists quail. Do we really know what it is we are measuring? What do we mean by intelligence?

DEFINITIONS

In a symposium held in 1921, thirteen different psychologists put forward thirteen different definitions of intelligence (see Vernon, 1960). Although these divergencies of opinion have not been entirely overcome, some *rapprochement* has occurred within the last forty years. It is now possible to group all acceptable definitions into four classes: (1) biological, (2) psychological, (3) operational, (4) developmental.

1. Biological

Headed by Darwin, Spencer, Lloyd Morgan and Binet, those who fall into this group regard intelligence as a capacity—mainly inherited and innate—for profiting from experience.

2. Psychological

Terman and Spearman are the leaders of those who define intelligence in psychological terms. Intelligence is regarded as the capacity for abstract thinking, which in turn is defined as the ability to educe relations and co-relations, or to use judgement.

Both the above two concepts have in common an attitude to intelligence as something which a person has or has not in measureable quantities, and moreover something which he will retain in its original quantity (provided his cerebral functions remain intact) throughout his life. If a person's intelligence is measured in childhood, the abilities he will show in adult life can be predicted. His intelligence quotient, once assessed, will never vary. That this is not always the case will be pointed out later. It was largely as a result of doubts raised by the follow-up of intelligence tests themselves that the next group of definitions arose.

3. Operational

"Intelligence is what intelligence tests measure" is a concept frequently used. Although both it and the men who quote it usually intend something derogatory thereby, it is not so fundamentally different from the concepts of intelligence put forward by some psychologists themselves. Many people, headed by Spearman, Thurstone and Guilford, who have analysed intelligence test results by factor-analysis regard intelligence as little more than a common factor (or *G* for general) in all test performances. Accordingly, intelligence is defined as the "function", whatever it may be, which enables a person to do well on many different types of task.

4. Developmental

A comparatively recent attitude to intelligence has derived from studies of maturation. Hebb (1960), who regards intelligence as the sensory-motor patterns of behaviour developed by experience, makes a distinction between inherited (or genetic) potentiality (Intelligence A) and actual efficiency (Intelligence B). While the two are commonly so closely linked as to appear indistinguishable, Hebb argues that there are instances where, as a result of organic injury or social restriction, a person's efficiency may show marked deterioration.

Hebb's argument indicates how closely intelligence is linked to many other factors, a point further emphasised by Piaget (1950).

Piaget's studies of child behaviour indicate a transition in thinking from what he calls "animism" to "causality". They also suggest that intelligence is something fluctuating and changing rather than static and immovable, and, indeed, Piaget himself gets over the difficulties of defining the word intelligence by simply not using it. He substitutes for the general concept of intelligence the much more understandable and measurable functions of thinking, speaking, perceiving and memorising, etc.

Although Piaget's solution to the problem may be the soundest, the word *intelligence* has become so deeply ingrained in our language and has proved itself so useful in many ways that it seems almost certainly here to stay. Whatever our difficulties, therefore, we had better try to make the best of the situation—and it need not be such a very bad best. Even if we cannot define intelligence, we can still study the conditions affecting it and as a result of these studies it is possible that a clearer definition may one day be made.

CONDITIONS AND FACTORS AFFECTING INTELLIGENCE

In the last section, the difficulties of defining intelligence were briefly outlined, but it was suggested that even if we have to admit temporary defeat in this sphere, it does not follow that we cannot study the matter further. Although we may not be able to define intelligence, we can at least measure it and assess the variables affecting it. But is this not nonsense? How can we measure the effect of a variable on something if we do not know what we are measuring? If we want to measure the effect of heat on mercury, for instance, we must decide in advance whether we are going to measure weight or volume. If one person measures weight and another volume, their conclusions will be very different. One person will decide that heat does affect mercury, the other will find it does not.

In our studies of intelligence and the variables affecting it, this sort of difficulty has arisen. The person who regards intelligence as an innate potentiality will find no effect on intelligence of physical illness or education; the person who regards it as an ability to act, will. For the purpose of studying the variables affecting intelligence,

it is therefore safest to keep to the measurable effects or test results, and regard intelligence in purely operational terms. This means that it is necessary every time a statement is made about intelligence to mention the test which has been used to measure it.

1. Organic Factors

These can influence intelligence through at least three means—heredity, cerebral organisation, general physical condition.

(a) Heredity

It was his interest in the influence of heredity which first prompted Galton to attempt the measurement of mental functions. Since Galton's day a great deal of work has been done on the subject, and the influence of heredity on general intelligence has been studied in many ways. In the majority of "normal" people who are brought up by their own families, it is difficult to say how much of the intellectual ability they show is due to heredity and how much to upbringing. Intelligent parents bring up their offspring in a very different way to dull ones. They tend to provide good food and mental stimulation from an early age, encourage adventure and reinforce education. If the children of dull parents are also dull, it may be due in some part to the absence of such an environment and not to heredity.

Two lines of study, however, indicate that the correlation between children and parents is due to something more than upbringing. Lawrence (1931) measured the intelligence of illegitimate children whose parents were known, but who were brought up in an orphanage away from all parental influence. On the tests of general intelligence, there was a correlation of $r = +0{\cdot}25$ with the test scores of the parents.

The second line of investigation has concentrated on the study of identical twins. Vernon (1960) quotes a correlation of $r = +0{\cdot}9$ between the ratings of twins reared separately, whereas in the case of cousins reared in the same environment, the average correlation shows $r = +0{\cdot}27$. Little work has been done to see whether some skills or abilities are more inherited than others, and most of the tests used in these studies have been general ones based on the average ability shown in a number of different spheres.

(b) Cerebral organisation

Cerebral disturbances affect performance on intelligence tests in a number of different ways. The effects are dependent on three main factors: (1) type and nature of disorder, (2) cerebral area involved, (3) age of individual at time of disorder.

Many connections have been found between each of these variables and the mental disorders following them. As these will be discussed in some detail in later chapters, no more will be said about them here.

The connections between handedness, cerebral dominance and innate mental ability have received much attention. A considerable amount of evidence has been produced to indicate that in people who are born with a tendency to right cerebral dominance, there is also a tendency to left-handedness. Such people also tend to be bad at the organisation of spatial relationships, and to show some disorders of speech articulation (Zangwill, 1960). Exceptions to these associations are common, however, and there is no evidence yet to indicate whether these associations are due to congenital abnormalities of the left hemisphere or to some other factors.

(c) General physique

Is intellectual ability correlated with physical build? The belief that it is possible to tell "the intellectual type" from the "sporting" or "worldly" is, of course, widespread. The thin, ascetic, artistic individual who neglects his clothes and probably his food is recognised the world over, and would be expected to do better on tasks involving verbal skills than his round-faced colleagues. But there are points which cast doubt on the validity of such generalisations. In the first place, such an individual's appearance might be the result rather than the cause of his mental tendencies; and in the second, it might be found that on tests of manipulative skill or practical learning he did not do so well as others. A correlation between physique and aptitudes is in some doubt.

That a person's general state of well-being has a marked effect on his test performance is, of course, clear. Quite apart from the obvious fact that a sick person cannot concentrate sufficiently to do himself justice, it has been found that fatigue, or any form of physical discomfort can cause an appreciable drop in test performance.

Of more serious consequence to the psychometrist are the falls in performance which may occur without a subject being aware of the

deficiency in cases of inebriation, of slight cerebral anoxia or light narcosis. Not all forms of mental activity are affected to the same degree by these factors, nor do all conditions affect the same functions. In cerebral anoxia and inebriation insight is the first function to be lost, although memorising and concentration are also affected, but in other physical disturbances other specific functions may be attacked first.

Although by definition innate ability is not affected by such temporary disturbances, the accurate measurement of it is impossible if efficiency is impaired. Hence, before a person's basic ability can be assessed, it is necessary to ensure that his general physical condition is at its best.

While the above points may appear self-evident, the converse—that high intelligence is accompanied by good physical condition and low intelligence by bad—is not readily apparent. Yet Terman's follow-up of gifted children (1947) showed that these individuals had better than average physical health. Whether their resistance to disease was due to an inherited factor, or to their ability to keep out of trouble was not indicated.

2. Maturation

It is not only the processes of thinking which change with age; Piaget has shown that the abilities a person exhibits also alter with maturation. But mental growth does not occur lineally, nor do different abilities show a regular and steady progression (Bayley, 1933). One year's difference in mental age means something very different between the ages of 3 and 4 from its meaning between the years of 13 and 14. Moreover, different abilities reach their maximum development at different chronological ages. The ability to organise visuo-spatial data is at its zenith between 14 and 16 years; the ability to learn by rote memory may reach its peak slightly sooner. On the other hand, the ability to manipulate verbal and symbolic material may continue to improve with practice into middle age.

The rate of deterioration occurs little more regularly than does that of development. Certain aspects of performance (e.g. speed) fall off in early adulthood, whereas others may be retained for many years. The degree to which a skill is practised has an important effect on its retention.

In general, it is found that there is greater correlation between different abilities in children than in adults, and the concept of "general intelligence" (i.e. a concept of intelligence based on the correlation between tests of different abilities) is valid only in children.

3. Education

The argument is often put forward that many intelligence tests reflect and are influenced by education. However, recent evidence suggests that the converse is probably the more true. Within a given culture, those tests based on educational curricula are better indicators of general ability than those based on supposedly new problems. The reason for this is not hard to see. The brighter the child, the more he is able to profit from his education. But the probabilities of finding a "new" task which is equally "new" to all people facing it are almost nil. The intelligent child to whom it is really new will do less well than the dull one who has practised similar tasks before (Vernon, 1952).

Non-verbal tests are more affected by practice and cultural set than are verbal tests adequately translated into the vernacular (Anastasi, 1954). It has therefore been suggested (Vernon, 1952) that the only way to be certain of distinguishing the bright from the dull on any mental test is to give all people taking the test a certain amount of practice, so that the bright have the same advantage as the dull. It is for this reason that Vernon recommends "coaching for all" on the intelligence tests used in the eleven-plus examination if these are not based on topics ordinarily included in the school's curriculum. The effects of education and culture become more evident as age increases. While comparatively unimportant in the young, they have a marked effect on the test performance of adults.

Many attempts have been made to devise "culture-free" tests for the measurement and comparison of the intelligence in people brought up in widely different societies. On the whole all have failed, and it is generally agreed now that it is better to recognise and make allowances for the effect of culture than to ignore it. Three approaches to the inter-cultural comparison problem have been made:

(1) It is ignored. Completely different types of material are used in each culture, and each person is compared with the mean

of his cultural group only. No attempt is made to compare a subject in one culture with one from another.

(2) The effect of culture is measured and allowed for. A test is given to as many different groups as possible and the group differences are noted.

(3) Items and material are only incorporated in a test if it is found that they are commonly used in many different cultural groups.

4. Occupation

The fact that there is a strong correlation between good performance on some tests and certain occupations is hardly surprising. There are some jobs which can only be carried out by those with certain skills, while conversely those with special skills will tend to select occupations where these can be practised. But is this because of high "general intelligence", or because of a particular aptitude or endowment which becomes crystallised with practice?

Many studies have been made of the correlation between occupation and scores on tests of intelligence. It is generally agreed that whatever the test used, the highest averages are obtained by those in professional occupations and the lowest by those in labouring jobs, while the offspring of professional parents tend to do better on scholastic and intelligence tests than do those of the labourers. These findings suggest that the selection of occupation is dependent on some innate capacity, but whether this capacity is really intelligence or just a particular aptitude is less certain (Heim, 1954).

5. Cultural and Family Environment

The connection between cultural factors and intelligence, like the effect of education, is not easy to determine. The effect of culture on test performance is, of course, considerable, as has already been discussed, but the extent to which general ability is affected by environmental factors is almost impossible to assess.

The most revealing studies are perhaps those carried out on identical twins comparing the similarity of those reared together and those reared separately. Several such studies have been reported in this country and America (Newman, Freeman and Holzinger, 1937; Burt, 1955; Shuttleworth, 1935). Shuttleworth concludes that differences in intelligence can be regarded as 64 per cent due to heredity, 15 per cent to environmental differences between families and 3 per

cent to upbringing by the family. Even within the family, however, it is difficult to disentangle innate from acquired abilities. Children with the best test performances tend to come from small families—is this because intelligent parents foresee the necessity for limiting the number of children they have, or because within a small family each child receives more encouragement to develop his innate abilities?

6. Personality and Emotional Stability

Are certain types of people more intelligent than others? Are the neurotic more or less intelligent than the stable?

That any emotional or psychiatric disturbance will have an adverse effect on test performance and on a person's ability to apply his intellect is clear. In childhood, emotional disorders may be crippling, and may lead to educational backwardness of such a degree that it is often confused with feeble-mindedness. Even within the feeble-minded, however, emotional adjustment has a marked effect on abilities. Schmidt (1946) found a group of subnormal children to show an increase of ten I.Q. points in general tests, after special care aimed at increasing emotional stability and maturity.

In adults, disturbances of mood and those of personality affect test performance in many different ways. Since these disturbances often form a useful guide to diagnosis, they will be discussed in greater detail later.

CLINICAL USES OF INTELLIGENCE TESTING

What are the clinical objectives of assessing a person's intellectual level? How and when is it helpful? It can be useful in three fields: (1) as an aid to diagnosis, (2) as a check on therapeutic procedures, (3) as an aid to vocational resettlement.

1. Diagnosis

Some disorders (e.g. anxiety states) may be precipitated by a large discrepancy between intellectual ability and occupational demands. A man of limited ability who is promoted to foreman from the bench may break down under the added strain; conversely, one with a lively imagination may become so frustrated by a repetitive routine occupation that he weaves fanciful delusions to occupy his mind.

The demand for "assessment of intelligence" is often made to clarify a differential diagnosis between psychosis and some other disorder. Is the patient's inability to express himself, his apparent dullness, his lack of efficiency due to low innate ability, to a functional disorder, or to cerebral degeneration? The answer to these questions can often be given from analysis of a person's responses to intelligence tests. Many forms of thought disorder are shown up more clearly in test situations than in general conversation or behaviour—that is what tests are for—and the quality of the responses can often be a useful guide also.

2. The Assessment of Therapy

How effective has a certain form of therapy been? Has it had any adverse effects? What sort of therapeutic procedure is this patient most likely to profit from?

(a) The measurement of improvements resulting from therapy

It has been stressed already that any form of physical or psychiatric disorder is likely to impair mental efficiency; it follows that improvement in those conditions is often reflected (and can be measured by) improvement in test performance. Before-and-after treatment testing can therefore be used as a measure of improvement.

Two technical difficulties present themselves in this connection. One is the choice of tests to be made; the other is the allowance which has to be made for practice.

The choice of tests may be determined by certain hypotheses, by the treatments under consideration, or by the disabilities shown by the patient. Different forms of treatment affect different types of mental function, and whatever the test used, it should aim to cover as wide a range of abilities as possible, to ensure that no changes are missed.

The allowance which has to be made for practice is more difficult to determine. As has been stressed many times already, as soon as a person has done a mental test once, his potentiality is altered. He approaches the next test knowing what to do and remembering how he did before. Even if he has not looked up the answers to some of the questions in the meantime, this altered attitude will tend to improve his performance.

The considerable amount of work which has been done on test/re-

test correlations shows that tests measuring knowledge and manipulation of words (e.g. vocabulary tests) show least gain with practice, whereas those involving manipulations of objects scored on time taken show most.

Sometimes it is possible to overcome much of the practice effect by re-testing with a parallel form of the original test. In not all tests, however, is a parallel form available, and even where one is, parallelism is not always complete. Whether it is better to re-test with the original battery and make a certain allowance for practice, or re-test with a parallel set, cutting out practice but increasing error, is a matter of opinion.

(b) The measurement of disorders resulting from therapy

While different therapeutic procedures are known to affect some symptoms or illnesses more than others, it is also recognised that a number of them are not without their adverse effects on mental ability. E.C.T. has been shown to affect memorising ability for quite a long time after it has been terminated, even in well-preserved young people (Hetherington, 1956), and would not be recommended, except as a last resort, on a patient whose memory was already showing signs of organic impairment. Heavy doses of chlorpromazine (largactil) cause a slowing up of sensory-motor reaction. If there is any likelihood of a patient's general ability being impaired rather than improved, as a result of known side-effects, the point can often be clarified by means of standardised test procedures applied before treatment is begun.

(c) Therapeutic suitability

The measurement of intelligence cannot of itself give any indication of the therapeutic approach most likely to help a patient, but it can rule some out. If psycho-analysis is being considered, a patient should have at least a good average intellectual ability. A youth under consideration for special technical training should have aptitudes for the special skills involved. A low intelligence would rule out both these procedures. If patients are to be given psychotherapy in groups, it is advisable that each group should contain subjects of about the same intellectual level.

THE MEASUREMENT OF INTELLIGENCE

1. Scoring

Measures of intelligence are usually expressed in one of three ways: mental age (M.A.), intelligence quotient (I.Q.) or percentile of population. Mental age was a score devised by Binet in 1908. Using a large number and variety of tasks (from threading beads to copying pictures and repeating words), Binet picked out those tasks which were passed by the average child of each age, and regarded any child who passed such tasks as having a mental age of that equivalent.

The main object of using quantitative scales is to afford the possibility of comparisons; yet with M.A., comparison between individuals is not always easy. It is difficult to say whether a child with a M.A. of 6·2 is brighter than one with a M.A. of 5·2 unless both have the same chronological age, or unless the M.A.s are presented as proportional to the chronological ages. This latter is indeed given by the intelligence quotient.

First described in 1916 by Terman, the *intelligence quotient* is calculated as follows:

$$\text{I.Q.} = \frac{\text{M.A.}}{\text{C.A.}} \times 100.$$

The intelligence quotient not only allows for the comparison between people of different ages, but, unlike the M.A., was believed to remain constant throughout a child's life. Thus, if a child of 3 years has an I.Q. of 100, it was originally believed by Terman and by Binet that it would still be 100 when he was 15. Since, on Binet's and Terman's tests, improvement does not occur above the age of 15, the M.A. of adults, whatever their actual chronological ages may be, are always divided on these tests by 15 to find their I.Q.s

As will be pointed out when considering some of the intelligence tests later, the original concept of a constant and unvarying I.Q. throughout life has had to be modified considerably in recent years. We now know that people's abilities are continually changing, that practice as well as age causes alterations of abilities, and that predictions made from tests given in infancy are not always fulfilled by those given later. For this reason, some workers prefer to express a

person's performance as a percentile of the population, comparing each individual's ability with that of others of his age and culture (Raven, 1958). This is undoubtedly the safest procedure if an accurate description is required. The term I.Q., however, has come to be so widely known and accepted that the layman insists on using it, even when the technician wishes not to. Some tests have been devised to get the best of both worlds. Wechsler (1939), although he calculates abilities from the standard scores of his population, expresses the results in I.Q. in order that they may be more acceptable to the clinician.

2. Interpretation of Test Results

The reliability and validity of any test used for the measurement of intelligence will depend on at least some of the following variables:

(1) *The time elapsing between a test and the predictions made from it.*

(2) *The age of the subject when tested.*

As has already been mentioned, different functions mature at different rates and at different ages. The fact that a child is better at manipulative skills than at verbal ones when he is 4 or 5 does not necessarily mean to say that he will continue to be so. The modern intelligence tests make allowances for such variations in the general population, but cannot always make full allowances for the speed of maturation in the individual. Thus, the nearer the test is in time to the outcome it predicts, the more likely is the prediction to be fulfilled.

(3) *Practice and coaching.* These affect different skills in different degrees. They do not, curiously enough, seem to affect children more than adults, but they *do* affect motor skills and speed tests considerably more than verbal ones.

(4) *The cultural background of the subject.* All tests measuring intelligence reflect and are influenced by cultural and educational background. While this does not necessarily invalidate the scores, it is important to bear the fact in mind.

(5) *The predictions to be made.* High I.Q., as measured on general and especially verbal tests, correlates better with success in some occupations than in others. It correlates well with success in clerical work, but badly with success in such professions as radio-engineering. Success in business or in teaching demands at least average basic

general ability (I.Q. 110+) but even here, success depends more on special personal qualities than on a high I.Q. (Vernon, 1960).

(6) *The subject's health.* In the clinical setting, performance on tests may be impaired by a number of factors. A low score does not necessarily indicate low intellectual ability. Failure in itself has less significance than the *cause* of failure. A subject's work methods should always be studied for diagnostic indications.

TESTS FOR THE MEASUREMENT OF INTELLIGENCE

The following is a short account of the most popular tests used for the measurement of intelligence, together with comments on their uses and values.

1. Infants (birth to 18 months)

The measurement of intelligence at this age is based on observations of sensory-motor activity, which are rated along certain scales. When evaluating them, the following points should be borne in mind:

(1) No verbal directions are possible. The examiner has to "set the stage" and observe.

(2) The subject is not motivated to do his best, is easily fatigued and very distractible.

(3) Normative samples are very small and reliability is low.

(4) Correlation with I.Q.s as measured later is very low. In children younger than 12 months, prediction is no better than chance.

GESELL'S DEVELOPMENTAL SCHEDULE (1927) (see Gesell, 1949)

This scale was the first one ever to be devised for the measurement of infant behaviour. The scale rates behaviour in four spheres:

Motor behaviour—postural reactions, head balance, sitting, standing, creeping, walking, reaching, grasping and manipulation of objects.

Adaptive behaviour—eye–hand co-ordination, exploration and manipulation of objects. In later years, drawing and simple form-board tests.

Language behaviour—facial expression, gestures, vocalisation and comprehension.

Social behaviour—feeding, toilet behaviour, play, response to training, response to emotions in others and to self in mirror.

Disadvantages

(1) The scale is heavily weighted with motor tests.
(2) There has been no statistical analysis of reliability.
(3) Follow-up studies have shown poor predictive value for I.Q. as measured by later tests.

Advantages. The scale involves little material and is fairly simple to score.

Scales for the measurement of intelligence in infants have also been devised by Cattell (1947) and Kuhlmann (1922). These are based on a combination of the Gesell standards and the Binet test, and are subject to the same objections as the Gesell test. Since they also involve somewhat more elaborate material, they are generally less popular.

2. Pre-school Children (18–30 months)

Comments

(1) Performance may be hampered by shyness, distractability and negativism.
(2) Predictive value is better at this age than for infants, and increases with increasing age, as shown in the table below:

Age	*r* (*Binet I.Q.*)
2–3	0·5
4–5	0·6

(3) Predictive value varies with the different functions measured. Those showing high predictive value are:

perception of spatial relationships,
controlled attention,
memory,
logical reasoning.

Those showing low predictive value are:

motor co-ordination,
rote memory for information (which depends too much on upbringing),
all tasks involving complex verbal instructions.

MERRILL–PALMER SCALE (Stutsman, 1931)

This consists of thirty-eight tests administered as an age scale but scored as a point scale (one point for each item passed). Credits can be given for those items which cannot be administered, for any reason. Tests are mainly non-verbal and based on sensory-motor co-ordination. Speed is involved. Material was chosen for its appeal to children. It has been criticised for depending too much on time and motor activity.

MINNESOTA PRE-SCHOOL SCALE (see Goodenough *et al.*, 1940)

Largely derived from the Kuhlmann–Binet. It contains few motor items and no timed tests. Test items not very popular with children. Available in two parallel forms. Correlation with I.Q. tested later by Army Alpha shows $r = +0{\cdot}3$.

VALENTINE'S INTELLIGENCE TEST FOR YOUNG CHILDREN

(see Valentine, 1945)

This is the only test standardised in England. Suitable for children 2–8 years. Most tests are taken from Binet, Porteus, Merrill–Palmer or Gesell, but the scale includes some involving appreciation of relationships. Correlation with teacher's judgement = +0·6. No follow-ups reported.

3. Children (4–16 years)

(a) General scales

TERMAN–MERRILL (revised 1937)

This is still the test most widely used with children in Great Britain, and it has been used as a basis for evaluating many other scales both here and abroad.

Material. The test consists of a variety of different tasks, chosen empirically. Not all the tasks are given at all the ages. At the top end of the scale, verbal items predominate. For each year of age, there is a group of six to eight tests.

Procedure. The approximate level of performance is found by a short vocabulary test. Starting from this, the examiner works down the scale till a level is found at which all tests are passed (basal age). The examiner then works up the scale till all tests are failed.

Scoring. Credit of 2 months' mental age is given for all sub-tests passed above basal age. These are added to the basal age and give the mental age. To find the I.Q. of subjects over 15, the mental age is divided by 15.

Interpretation. The only information given from the score is the I.Q. Many people have attempted to find some way of scoring the "scatter" (the range of sub-tests passed and failed, above and below the basic age), in order to use it as a diagnostic indicator, but without much success.

Criticisms

(1) Tests concentrate too much on verbal performance.
(2) It is difficult from the test to gain insight into the subject's special aptitudes or abilities.
(3) The material is too childish for adults.
(4) It is inaccurate in this country from the age of 11 on, although various modifications have been made by British users.

Advantages

(1) Two parallel scales are provided which enables re-testing.
(2) It provides much opportunity for observing the subject's work methods, especially in children or subnormal adults.

WECHSLER INTELLIGENCE SCALE FOR CHILDREN (W.I.S.C.)
(see Wechsler, 1949)

This is an extension downwards of the Wechsler–Bellevue scale (see later), and consists of the same twelve sub-tests (two alternatives are offered in the W.I.S.C. for Digit Span and Digit Symbol, since these two did not show high correlations with the other tests in the battery). It is administered and scored in the same way as the adult scale.

Criticisms

(1) Although the sub-tests are similar to those provided in the adult scale, it does not follow that they measure the same functions—the same tests may measure different functions at different ages.
(2) No studies of validity or prediction are reported.
(3) Comparison with the Terman–Merrill shows that the W.I.S.C. gives lower scores in the higher intelligence grades, but higher scores in the lower ones.
(4) Sub-tests do not show high inter-correlations; hence, interpretations of "profile" are not very meaningful.

Advantages

(1) Like the adult scale, it gives I.Q. in terms of standard scores.
(2) As each sub-test concentrates on the measurement of one single mental function, the distribution of abilities and aptitudes can be seen at a glance, although the reliability of these may be doubted (see Criticism (4) above).

THURSTONE'S PRIMARY MENTAL ABILITIES (P.M.A.) 1943

(Thurstone and Thurstone, 1943)

The authors factor-analysed fifty-six tests, from which they isolated seven factors. The tests are published in three booklets, for children 11–17 years, 7–11 years, 5–7 years. The factors include verbal-meaning (*M*), space (*S*), reasoning (*R*), perception (*P*), number (*N*), word fluency (*W*). Each factor is measured by a separate test. At each level, the sub-test can be summed and scored in terms of I.Q. In the youngest age-groups, some factors cannot be differentiated clearly.

Criticism

(1) The standardisation is not satisfactory. The numbers used in the standardisation of the test are adequate, but socio-economic distribution was poorly controlled.
(2) Most of the tests involve speed.
(3) The interpretations go far beyond the evidence. To call the factors isolated "primary" mental abilities is too sweeping. Each factor may be sub-divisible into others. (The shortcomings of standardisation have been made good in the Differential Aptitude Tests (D.A.T.) standardised by the Psych. Corp. New York.)

(b) Performance tests for use with children

Comment. It is important to recall that performance or non-verbal tests do not all measure the same function. Some measure manipulation and some perception.

GOODENOUGH DRAW-A-MAN (Goodenough, 1926)

This is a popular test. In 1946 it was the third most frequently used test in the U.S.A. The child is asked to draw "the best man you can". Scoring is based on a 51 point scale, which takes into consideration such aspects of the drawing as the presence of parts of the body, clothing, relationship of parts to wholes, etc. In scoring,

it is necessary to follow the manual closely. Scores, in terms of M.A., are found to correlate most highly with reasoning, spatial aptitude and perceptual accuracy. The test is suitable for children 3–13 years.

Criticisms

(1) Proper scoring depends on wide experience. It can be criticised as "subjective".
(2) The score gives no indication of special aptitudes.

Advantages

(1) Involves little material.
(2) Is suitable for those with whom rapport is difficult to establish.

PORTEUS MAZES (Porteus, 1950)

This test is said to measure foresight and planning capacity, but standardisation is not very satisfactory. The test received a great fillip when it was found that leucotomy affected performance on this one more than on any of the other tests used to assess the effect of psycho-surgery on intellectual activity.

KOHS BLOCKS

The subject has to reproduce seventeen different patterns with coloured blocks. The original test was cumbersome and measured only one aspect of intelligence. Variations of it have been used in a number of batteries, especially the Wechsler scales.

RAVEN'S MATRICES (Raven, 1938)

A set of coloured matrices has been produced for use with children and old people. Various revisions have been marketed by the author in recent years (Raven, 1958). Test involves choosing from a number of alternatives the piece necessary to complete each pattern. Scoring is based on percentiles rather than on M.A. or I.Q.

Criticisms

(1) Mental age and I.Q. are difficult to determine from scores.
(2) It gives little insight into the subject's work methods.
(3) It covers only a limited aspect of intelligent behaviour.

Advantages

(1) Easy to administer, and suitable for a group test.
(2) Useful for screening purposes.

FORM-BOARD TESTS

Various form-board tests have been designed, primarily for use with young children. The Seguin or Goddard board is given three times, and the score is based on the average time taken for the three trials.

HEALEY PICTURE COMPLETION TEST

This test consists of pictures, from each of which a square has been cut out. The subject has to choose the appropriate piece from a box of alternatives.

PINTNER–PATTERSON SCALE (Pintner and Patterson, 1917)

This is a series of performance tests which have been combined together, primarily for testing the subjects of different cultural groups or those with language difficulties. Suitable for children 4–15 years, though not much good for superior children 12+. Standardisation poor. Scoring is based on three criteria: (1) time taken, (2) number of moves made, (3) final product.

(c) Special tests for handicapped children

(1) MENTAL DEFICIENCY

Osoretski's test for motor proficiency. Suitable for children 4–6 years. Comprises six tests for each age, covering posture, finger co-ordination, etc.

Vineland social maturity scale. Covers birth to 25 years. Comprises 117 items, scored from interview, such as self-help in dressing, eating, etc., occupations, communications, locomotion. Scored in terms of social age (S.A.) and social quotient (S.Q.).

(2) INTELLIGENCE TESTING OF THE DEAF (Hiskey, M. S., 1941)

Although many performance tests are used with deaf children, it must be remembered that all have been standardised on those who could hear. Only the *Nebraska Scale* (involving eleven sub-tests) has been standardised on the deaf.

(3) INTELLIGENCE TESTING OF THE BLIND (Bauman and Hayes, 1951)

The verbal items from the Binet and from the Wechsler–Bellevue (see later) have both been specially standardised on blind people.

(4) INTELLIGENCE TESTING OF THE ORTHOPAEDICALLY HANDICAPPED (Heilman, 1951)

This has only just begun. It is usual to use performance tests (e.g. Raven Matrices) cutting out the time element.

4. Intelligence Testing of Adults

WECHSLER–BELLEVUE SCALE (Wechsler, 1939)

This has three claims to fame:

(1) It was the first scale specifically standardised for adults, and allowing for normal decline of some abilities with age.

(2) It was devised in a clinical setting and is orientated towards clinical problems.

(3) It was the first test in which items were arranged and grouped for the assessment of the different aptitudes separately.

Material. The test is presented in two parallel forms. Each form contains eleven sub-tests—five verbal, five non-verbal and a vocabulary test. Within the sub-tests, the items are arranged in ascending order of difficulty.

Presentation. As originally devised, the test should be given in its entirety, but much work has been done on shortened forms (usually missing out one or more of the sub-tests). Values gained by averaging the scores obtained on the sub-tests which are given, and multiplying this average by the number of sub-tests in the battery, correlate well with the whole test. It is more usual in clinical practice now for the examiner to pick out one or two of the sub-tests and apply these, but it must be remembered that each test was designed to measure a different ability, and that I.Q.s calculated from one or two sub-tests are not likely to have the same significance as those calculated from the whole test.

Scoring. Raw scores are transmuted into standard scores, in which the mean = 10 and S.D. = 3. I.Q. is calculated according to age, allowing for greater decline in performance than in verbal spheres. As well as the I.Q., Wechsler gives indices for efficiency (E.Q. = I.Q. for age/I.Q. for 20-year-olds) and for deterioration (D.Q. = Standard Scores for "Hold" tests/Standard Scores for "Don't Hold" tests).

Standardisation. This has been criticised because the 1,751 subjects on which it was worked out came mainly from New York State.

Reliability. In calculating the fall-off with age, no allowance was made for educational backgrounds. Re-tests show that scores on this test tend to rise with repetition, especially on the timed tests.

Validity. As there is little way of checking validity against career in adults, in the same way as it can be checked against scholastic success in children, the only checks available are statistical ones—i.e. internal consistency. This has serious shortcomings.

Criticisms. The main criticisms that have been levelled at this scale are in relation to its standardisation, and the value of some of the items which are said not to discriminate well. Most of the criticisms have been met in the later revision of the scale.

WECHSLER ADULT INTELLIGENCE SCALE (W.A.I.S.) 1955

This scale contains a few modifications from the Wechsler–Bellevue, notably:

(1) Better standardisation in the older age-groups, and the provision of norms up to 75 years.
(2) Inclusion of the vocabulary test with the measure of verbal I.Q.
(3) Addition of several new items of improved discriminatory nature.

Criticism. When interpreting scores, the following points should be borne in mind:

(1) The concept of a general factor of intelligence is not very acceptable in adults. There is little evidence that success in different life-spheres or in occupations show any correlation with test scores.
(2) The different "indices" (see above) have been much criticised and are not regarded as giving reliable diagnostic criteria.
(3) "Profiles" calculated from the sub-test scores have not been found to be reliable as diagnostic indicators.

Advantages

(1) Although low scores must always be treated with suspicion, high scores can be useful in ruling out the possibility of low intelligence being a contributory factor in mental disturbance.
(2) The scale is useful as a research tool, and has been used in a number of studies devised to see if treatment (or illness) affects some functions more than others.
(3) The scale gives an excellent opportunity for the examiner to study the subject's work methods in different situations. These often afford a useful indication of diagnosis.

Some typical patterns of performance on the Wechsler tests may be described as follows:

MENTAL DEFICIENCY

The sub-test scores are all low, but acceptable responses are usually given to the easy items. The subject shows little realisation of errors and is perfectly satisfied with the responses given.

On the verbal tests, the subject shows some familiarity with the words and questions but is unable to manipulate them usefully. Responses often incorporate repetition of the stimulus word, e.g.:

Q. What do we mean by the word breakfast?
A. When you eat breakfast.
Q. Why do we pay taxes?
A. Because you have to pay taxes, it's the law.

ANXIETY STATES

Passes and failures tend to be uneven throughout the sub-tests—easy items being failed as often as the hard ones. Speech is logical and coherent; there is no misuse of words or switching of meaning. Personal references are often incorporated, but in a meaningful manner.

On the verbal tests, there is a tendency to be over-elaborate and self-critical. Failures are often scored due to inability to be concise, rather than from lack of ability, e.g.

Q. What is the thing to do if you find an envelope in the street that is sealed and addressed and has a new stamp?
A. I don't know. I expect I should put it in my pocket meaning to post it and forget about it. I might stop someone and ask them to post it for me.

Performance tests are carried out slowly, due to tension and hesitancy. Many signs of anxiety appear also in schizophrenics, but in this condition are accompanied by other indications of mental disturbance.

HYSTERICAL PERSONALITY

As in anxiety, there is a tendency to fail on easy items. Things at which it is "socially O.K." not to be good (e.g. digit repetition) are failed readily. Excuses are made for all other failures—"I'm not feeling well today"; "I wish you had asked me this yesterday." Personal references are brought in, in a contrived manner. There are no disorders of speech or grammar.

DISORDERS OF MOOD

Depression usually causes a slowing of all behaviour, but the quality of responses remains adequate. Depressive mood is often seen in the content of verbalisation, e.g. self-recrimination, self-criticism. Unlike the hysteric, who is sure he would have done better some other time, the depressive never feels he has been or will be better than now.

Elation of mood often results in very quick reactions to all stimuli, a tendency to make stupid mistakes which are not corrected, and failures due to inability to retain the right "set". Expansiveness is seen in the content of verbal responses, e.g.

Q. Why do we pay taxes?
A. To make bigger and better bombs, to blow up the whole world to reach the sky.

Verbalisation in mood disorders is always logical, though with elation "flight of ideas" is often seen, and there is a tendency to be loquacious.

SCHIZOPHRENIA

Chronic schizophrenics who do not show thought disorder, and those in remission show no characteristic signs, though there is a tendency to do better on tests of logical reasoning (Similarities, Arithmetic, Block Design) than on those involving the appreciation of social relationships (Comprehension, Picture Arrangement). In the acute illness, failures may be scored due to the subject being unable or unwilling to give an acceptable answer, even though he can indicate that he knows what the acceptable answer is, e.g.:

Q. What does the word *straw* mean?
A. Straw to a child, straw to a milk, milk to a child.
Q. In what way are coat and dress alike?
A. Regal, aren't they?

A characteristic of this condition is that the subject often begins to answer a question but stops before completion. As soon as the examiner begins to ask the next question, the subject answers the first.

5. Assessment of Performance in Old People

The mental testing of older people presents particular problems.

(a) Reason for testing

In many of the older subjects referred to psychologists, it can be taken for granted that a considerable amount of organic cerebral deterioration will have taken place. Not only will there be some cortical degeneration, but there may also be signs of cerebral arteriosclerosis. The frank and obvious results of "strokes" may also be present. The psychologist's help is sought in assessing (1) degree of residual ability, and (2) indications regarding management or treatment (i.e. fitness for return home).

(b) Approach

In order to establish rapport with older subjects, certain factors must be borne in mind.

(1) The administrator seldom stands in the same prestige relationship to his subject as is the case with younger people. The subject is inclined to regard the administrator as an impertinent young whipper-snapper, and to resent psychological testing in general.

(2) At the same time, the subject may be on the verge of realising, but trying not to admit even to himself, that his abilities are beginning to fail, that certain acts have become harder than they used to be, and that the extent of his powers is on the decrease. In such a situation, he will struggle very hard not to put himself in a position where he may fail.

(3) The majority of older subjects, having spent their lives battling against serious life situations, regard the sort of material used in psychological tests as childish and below their dignity. They consider it either a waste of time or an insult to be asked to do jig-saw puzzles.

In order to overcome these difficulties, it is essential to get the subject "on your side" before beginning any tests. Some minutes spent in general conversation during which the subject is invited to talk about his own past life, his attitude to present-day problems, and

what he feels about his own situation are never wasted. Such a conversation should be aimed at giving the subject the feeling that his position is being respected, and that the purpose of the tests is to help him prove his points, rather than show up his weaknesses.

With increasing age, it is well known that a person may show slowing up of both motor and perceptual functions, loss of adaptation, disturbances of memory, loss of inhibition, and increased dependence on sensory cues (Welford, 1958). Individual variations in the rate and onset of mental changes due to ageing may depend on heredity (Kallmann, 1953), education (Sward, 1945) and life-habits (Williams, 1960).

Although disturbances of memory form by far the commonest objective and subjective disorders of old age, they are not inevitable. Disturbances of mood, of behaviour and of judgement are frequently seen when memorising is comparatively unimpaired.

Tests for the measurement of performance in older people are very rare. Williams (1961) has devised a technique for assessing mental capacity, based on the number of cues or prompts a subject requires in order to succeed on such standard tasks as Object Assembly, Matrices, and Delayed Recall. A number of workers have studied the performance of older people on standardised mental tests, and their conclusions are as follows.

Changes in Mental Test Performance with Ageing

The number of standardised tests which have been applied to "normal" old people is very limited. Most of the work in this sphere has been carried out on older members of hospital populations.

Vocabulary. Although it is generally agreed that performance on vocabulary tests does not "fall off" with age as much as does performance on other tests (Jones and Kaplan, 1945), a good deal of variation has been reported in the performance of older people (Orme, 1957). The tendency for vocabulary to deteriorate appears to depend largely on life-habits (Williams, 1960). There is general agreement that it does not afford a reliable measure of "basic intellectual ability" in the older age-groups (Ackelsberg, 1944; Yates, 1956).

Wechsler–Bellevue Scale

Studies of the performance of subjects over 65 years show that with increasing age, the correlation between sub-tests decreases

(Berkowitz, 1953), and that the rate of decline varies from one individual to another (Doppelt and Wallace, 1955). On the latest revision of the Wechsler Scale, the W.A.I.S. (Wechsler, 1955), allowance is made for age based on a study of 659 subjects aged 60 and over. From the increase in weighted scores allowed for the raw scores on the sub-tests, it appears that, in general, Digit-Symbol deteriorates most quickly, followed by Arithmetic, Picture Completion and Picture Arrangement. Vocabulary, Digit Span and Object Assembly fall off most slowly. No individual profiles are given and the inter-test correlations are not mentioned, so that the significance of sub-test scores in the individual cannot be assessed.

Matrices

It is a general finding that performance on Raven's 1938 Matrices begins to fall off in early middle age. A new set of coloured matrices has been devised for use with children and older subjects (Raven, 1958) and has been standardised on volunteers from an Old People's Club. The performance of old people differs from that of children in being characterised by repetitiveness.

INTELLECTUAL DETERIORATION

The term intellectual deterioration describes any degree of fall-off in mental performance from a previous level, whatever its cause or nature. In fact, however, it is usually used to imply only defects due to irreversible brain damage, of a degree likely to cause permanent disability. The causes of such defects may be various and include age, cerebral vascular disease, traumatic injury, anoxia and intra-cranial tumours (see Burgemeister, 1960). The mental changes resulting from these disorders are not easy to distinguish from one another. Indeed, the different patterns of mental impairment resulting from cerebral disorganisation seem to reflect the area of the brain involved, rather than the cause of the involvement. This should not be taken to imply that cerebral lesions can be "localised" with any great accuracy by means of mental tests—or indeed that mental tests can be used unreservedly to diagnose the presence of a cerebral lesion. Organic deterioration may show itself in a number of behaviour abnormalities such as perseveration, faulty judgement, emotional lability, delusions or hallucinations, some of which are difficult to assess quantitatively, and none of which is directly measured on intelligence tests. None

the less, mild degrees of intellectual disorder accompanying the early stages of an illness or the final stages of recovery can sometimes be picked up on mental tests, when they would otherwise pass unnoticed.

It is often of practical importance to distinguish between those defects due to organic impairment, those due to the normal ageing process and those due to functional disorders (neuroses and psychoses). Although this is never easy on a quantitative basis, there are some aspects of behaviour which may distinguish the different conditions. These can be outlined briefly.

The effect of age

There is no inevitable overall loss of efficiency. Those who show mental changes due to the normal ageing process alone are often capable of compensating for the loss of one function by concentration on another. Thus, loss of speed is overcome by extra care and forethought (Welford, 1958) so that overall efficiency may not deteriorate. The mental testing of people in the older age-groups has already been discussed.

The effect of functional disorders

The chief characteristics are preoccupation and variability. The patient with a functional mental disorder tends to fail on a task because he is too taken up with his own worries to concentrate on it, rather than because of inability. On the occasions when his preoccupations are overcome, or when the task he is asked to perform fits in with them, he may perform adequately. In the sphere of memory he tends to do poorly on learning tasks, but shows adequate retention of isolated stimuli (see Chapter 4).

The effects of organic impairment

Certain tendencies of mental behaviour are particularly characteristic of brain damage. Defects of retention and learning are also common. Specific, though not easily recognised disorders of language and visuo-motor skills may also be apparent if looked for. Patients are abnormally dependent on "cues" from their environment, and appear to be abnormally stimulus-bound or cue-orientated.

To assess intellectual impairment it is, of course, necessary to know a person's previous level of functioning, and here a major difficulty presents itself at once. Not many of those who are referred

to psychologists for assessment of deterioration will have been subjected to quantified intelligence tests in childhood or youth, and although it is sometimes possible to deduce a "base-line" from the accounts of relatives or from work records, such methods are always unreliable. The past always tends to appear rosier in retrospect than it was in actuality, due mainly to the tendency to remember pleasant things better than unpleasant ones and succesess better than failures. Thus, a person's past abilities will always tend to be exaggerated and his present level of performance to be discredited by those who have known him for a long time.

1. Measurements Based on Sub-test Scatter

The method most often adopted by psychologists to assess deterioration is based on a comparison between those abilities which are known to deteriorate most readily after brain damage and those which are most resistant to it. This is usually known as the measurement of *test scatter* or *Hold–Don't Hold* comparison. Past ability or "basic intellectual level" is assessed by a subject's performance on a vocabulary test, and "level of efficiency" is assessed by a series of sub-tests measuring speed, adaptability, abstraction, memory, etc. Estimation of deterioration is based on the discrepancy between basic intellectual level and present efficiency.

Before attempting to describe or evaluate these tests, it is important to consider the factors which may influence a person's performance on the different measures employed.

Age

The effect of increasing age on different types of test has already been discussed.

Functional disorder

Functional disorders play havoc with all mental efficiency. Significant falls in the Don't Hold tests have been found in schizophrenics by nearly all observers and are seldom quantitatively different from those found in organics (Rapaport, 1945). In fact, the Don't Hold tests seem to be open to impairment from functional disturbances just as much as from organic ones, and are unable to differentiate between the two causes on a quantitative basis alone.

In general it would therefore appear that test scatter is not a reliable way of assessing deterioration of organic origin. None the

less it may be useful as a first indication and as a rough screening method. Although a discrepancy in the direction Hold > Don't Hold (i.e. one suggestive of dementia) may appear in a number of conditions and does not necessarily indicate brain damage, one in the direction of Hold < Don't Hold is so unlikely to be seen in organic cases (unless speech is impaired) that it can be regarded as ruling out significant brain damage in the vast majority of cases.

The best-known measures of dementia based on test scatter are:

THE BABCOCK SCALE (Babcock, 1930)

The test consists of two parts. The first part is the Stanford–Binet Vocabulary Test which is designed to measure basic or pre-morbid ability. The second part comprises thirty items designed to test effective ability in perception, motor control, memory, learning, etc. Norms for Part II of the test are given for each vocabulary level. The median index for the 264 controls originally investigated by Babcock was +0·1. An index below −2·0 was associated with mild incapacity or general inefficiency, while one of −4·0 or less was associated with severe intellectual deterioration.

The full Babcock test takes a long time to administer, and the large number of sub-tests involved is fatiguing for a patient who is below par anyway. In 1942 Brody published a short version of this test using only the vocabulary and five sub-tests (Opposites, Information, Digit–Symbol Substitution, Sentence Repetition and Designs from Memory) whose administration can be completed in twenty minutes and which has been shown (Brody, 1942) to differentiate well between clear-cut groups of organically deteriorated and non-organic psychotic patients.

HUNT–MINNESOTA (Hunt, 1943)

This test again uses the Terman–Merrill Vocabulary Test as a measure of basic ability. Efficiency is assessed by six tests of memory and learning, which are given in two groups. Interpolated between the groups of memory tests are further tests of basic ability used as "validity indicators".

The test has not been found to differentiate reliably between subjects with brain damage and those suffering from other mental disorders (Williams and Brody, 1950).

SHIPLEY–HERTFORD (The Institute of Living, 1942)

Performance on a multiple-choice vocabulary test is compared with

that on a twenty-item "abstraction" test in which the subject has to complete lines such as the following, replacing each dot by one letter or figure:

1 2 3 4 5 .
AB BC CD D.
oh ho rat tar mood ....
surgeon 1234567 snore 17635 rogue .....

Neither section of the test has been extensively standardised, and the test has not been proved diagnostically helpful.

Apart from the above tests, which were specifically designed for the quantitative measurement of brain damage, some of the tests devised for the measurement of intelligence have been said to show up intellectual deterioration.

WECHSLER–BELLEVUE (Wechsler, 1939)

In his original publication of the Wechsler–Bellevue scale, the author suggested that a deterioration quotient could be calculated from a comparison between the summed scores on some of the sub-tests with that on others. The deterioration quotient suggested (which was based on the general fall-off with age) was as follows:

Hold tests	*Don't Hold*	*Percentage of loss (Deterioration)*
Information	Digit span	
Vocabulary	Arithmetic	$\frac{\text{Sum Hold—Sum Don't Hold}}{\text{Sum Hold}}$
Picture completion	Block design	
Object assembly	Digit symbol	

Corrections, based on the average (normal) deterioration or loss found at different ages on the scale, are made before assessing the significance of the result.

Wechsler's original finding with regard to the fall-off of the Don't Hold tests with age has not been substantiated by all later workers. Berkowitz (1953) found that with increasing age the correlation between all sub-tests decreases, while Doppelt and Wallace (1955) have pointed out that the rate of decline varies from one individual to another.

Wechsler's deterioration quotient has been criticised on theoretical as well as on practical grounds. Mathematicians point out that the sub-tests do not measure isolated functions when subjected to factor analysis, and also that since correlation between all sub-tests on this scale is low, there is bound to be a large test scatter in normal

people. Practical workers have borne this out, and do not appear to find the scale useful in differentiating between diagnostic groups.

MATRICES

By comparing a subject's performance on the Mill Hill vocabulary scale with that on his Coloured Progressive Matrices Test (Raven, 1958), Raven suggests that it is possible to gain a measure of efficiency loss. In older people, however, a poor score on the matrices does not necessarily indicate loss of efficiency in other spheres (Williams, 1960), while in subjects with clear-cut senile dementia, the vocabulary scores usually fall off in parallel with performance on the matrices (Orme, 1957).

2. Recognition of Organic Signs

Dissatisfaction with measures of deterioration based on test comparisons has been voiced by many (Yates, 1954; Payne, 1957; Piercy, 1959). An alternative method of assessing deterioration is on the basis of the "organic signs" present in the qualitative performance of a subject. Those most often recognised are:

Stereotypy and perseveration

This is sometimes shown in verbal tests (where a subject may repeat one response in answer to a variety of different questions: e.g. "How old are you?"—"I was born in 1899." "How old does that make you?"—"99." "What is the date now?"—"Would it be the 9th?") but is most often demonstrated on tests where speed, adaptability and memory are under investigation. Raven's Progressive Matrices, Digit–Symbol substitution tests, and Designs from Memory tests are all particularly useful in eliciting stereotypy and perseveration.

Concreteness of behaviour

This tendency, first described and named by Goldstein, may be evident in both verbal and non-verbal performance. Its chief characteristic is "an attitude which is determined by and cannot proceed beyond some immediate experience, object or stimulus" (Mayer-Gross, Slater and Roth, 1960). Thus the subject responds to all stimuli as if they existed only in the setting in which they are presented. He cannot abstract *them* from their environment or their qualities from *them*. A knife cannot be grouped with any other

objects because it is different from them. A word cannot be defined properly as it fails to call up any other word. (Definitions therefore tend to consist of either repetitions or of sentences in which the word itself features: e.g. Bed—"Yes, it's a bed—well just a bed you sleep on." Breakfast—"When you have breakfast. You eat your breakfast —sometimes we have bacon-and-eggs.") Proverbs cannot be interpreted in terms of generalities but only in terms of the words they contain. (An interpretation of the proverb "still waters run deep" might be—"That's right, very deep—and very still".) The Rorschach cards are seen just for what they are, and although a subject may spend many minutes pointing to and enumerating every little mark, he is unable to see it as anything other than an ink-blot.

Catastrophic reaction

The catastrophic reaction (also described by Goldstein) consists of obvious perplexity, despair, physical signs of stress (sweating, weeping), inability to "get to the point" and often refusal to co-operate. The subject is aware of his shortcomings, and is continually at pains to point out that normally he would be able to perform the task without difficulty. He tends to make excuses for his failure by blaming it on physical shortcomings such as illness, fatigue, or visual failure.

Typical of the catastrophic reaction, and perhaps one of its most significant features is that it only appears when the subject is asked to perform beyond or at the limit of his powers. If a difficult problem is replaced by a simpler one, the organic patient will often recover his composure at once, in contrast to the patient suffering from an anxiety state, who usually shows the same signs in response to easy questions as he does to difficult ones.

Some of the tests on which the above signs appear have already been mentioned. In 1941 Goldstein and Scheerer described five tests which were specifically designed to elicit evidence of concrete behaviour in the organic patient. These tests, and the characteristics noted, were:

CUBE TEST

The subject has to copy a number of designs in coloured cubes. This test is similar to the Kohs Blocks and to the Block Design sub-test on the Wechsler Scales, and involves the same material.

The organic subject tends to build the blocks on top of one another or on top of the design to be copied, or will copy diagonals in the design by placing individual blocks in a slanting row.

COLOUR-SORTING TEST

Woollen skeins of different hues and shades are presented to the subject who is asked to:

(1) Pick out the one he likes best, and then pick out all those which could be "grouped" with it.
(2) The examiner picks out and presents to the subject three skeins, two of which are the same colour. The subject is asked which of the two are alike, and which is odd.
(3) The examiner arranges two rows of skeins. In one row all are the same colour, and in the other row all are the same shade (light or dark). The subject is asked to choose from the second row the skein which could be grouped with the first.
(4) The subject is asked to select all the skeins of one colour (e.g. red or green).

The organic subject tends to *match* instead of *sort*, and shows great dependence on the uniqueness of colour or shade.

OBJECT-SORTING TEST

The subject is presented with a large variety of common and toy objects (ranging from a screw-driver to a chocolate cigar) some of which occur in pairs (e.g. two lumps of sugar) and is asked to:

(1) Select one object and then choose all the others which can be grouped with it.
(2) Group all the articles which belong together.
(3) Group all the articles again, but according to a different principle from before. The objects can, in fact, be grouped according to a number of different principles, such as use, colour, form or material.

The organic subject has considerable difficulty in putting any of the objects together, except those which are identical—e.g. the two lumps of sugar.

COLOUR–FORM SORTING TEST (the Weigl–Goldstein–Scheerer test)

The material consists of twelve pieces of board, representing three different shapes and four different colours. There are four triangles, four squares, and four circles, one piece of each shape being red, one blue, one green and one yellow. The subject is asked to sort the pieces into groups so that all those in a group have some variable in common. After he has sorted the pieces successfully according to one

principle, he is asked to sort them again according to another (". . . so that the pieces in each group are still alike, but not in the same way as before").

The organic subject shows great difficulty in shifting from one principle to another. Very severe impairment is shown in a tendency to build the pieces into patterns rather than sort them into groups.

GOLDSTEIN–SCHEERER STICK TEST

The subject is presented with a number of sticks of different lengths and is asked to copy designs made by the examiner, either beside the models or from memory.

The organic subject tends to reverse or change the orientation of the model ( becomes ), to distort or alter the direction ( becomes ) and to "close" open models ( becomes ).

The main feature of all the Goldstein–Scheerer tests, and one which endeared itself very much to clinicians, was the fact that scoring was based on work methods rather than success or failure. Thus some insight could be gained into the way in which a subject was prepared to tackle his environment.

Evaluation. Goldstein's tests, in common with all assessments of deterioration based on the detection of organic signs, are open to a number of criticisms. The main ones are:

(1) Recognition of a sign is arbitrary. What one person may consider "organic" another will call normal. Diagnosis depends on clinical experience and individual judgement rather than objective measures.

(2) No tests are available for the quantitative measurement of "signs". It is therefore impossible to indicate the degree of impairment present.

(3) The signs elicited depend largely on the situations in which a subject is placed, i.e. on the tests he is given. To elicit all possible organic signs, a subject has to be given a large battery of tests, and fatigue may finally obscure the picture.

(4) Some of the signs (e.g. concreteness and stereotypy) are also seen in mental deficiency. Their presence only indicates organic impairment in subjects of good previous ability. One is therefore thrown back once again on the assessment of basic ability, and the tests designed to elicit organic signs are of little assistance in this sphere.

(5) The presence of organic signs does not necessarily indicate that a person will fail on a given task. He may succeed by using different work methods.

Other tests used for eliciting organic signs are the Rorschach (see Chapter 2, p. 61) and the Bender–Gestalt (see Chapter 2, p. 73). It was Bender who first drew attention to the difficulty found by organic patients in copying simple diagrams, particularly those composed of diagonals and spots; the latter often being replaced by loops or lines. The measurement of specific disturbances such as disorientation, amnesia, and aphasia will be dealt with in Chapters 3, 4 and 5.

3. Summary of Tests of Intellectual Deterioration

The measurement of intellectual impairment though often of great clinical interest, is almost invariably difficult.

All measures of deterioration depend on knowledge of a subject's pre-morbid ability, and this is difficult to deduce at the time of testing.

In the absence of knowledge of pre-morbid ability, psychologists usually rely on eliciting *signs* of diagnostic importance.

It is the object of psychological tests to put subjects in conditions where such signs may be elicited.

The presence of these signs gives no indication of the degree of impairment present; nor do they necessarily indicate total incompetence, any more than verification of a cerebral lesion indicates dementia.

In interpreting the results of performance on tests, it must not be forgotten that most organic signs are merely exaggerations of normal error-tendencies (see Speech, Memory and Orientation). The deteriorated patient does not perform differently from the normal subject, but tends to make the same errors as normal people on easier tasks.

Although it is seldom possible to assess a patient's deterioration in quantitative terms, his *present efficiency* can always be calculated.

The level of efficiency is probably of more practical importance than that of deterioration. When asked for assessments of intellectual deterioration, psychologists might be well advised to present clinicians with estimates of efficiency rather than with estimates of fall-off, for while the latter have dubious validity, one is on fairly safe ground with the former.

CHAPTER 2

PERSONALITY

SOME DEFINITIONS

Definitions of the personality fall broadly into two groups; the first lays stress on its behavioural aspects and regards it as "the sum of activities that can be discovered by actual observation" (Watson, 1930), while the second lays stress on dynamic concepts. According to the latter it is the "sum total of all the biological innate dispositions, impulses, tendencies, appetites and instincts of the individual and the acquired dispositions and tendencies" (Morton Prince; see Eysenck 1953).

Since there is really no means of proving one more right than the other, it is usual in practice to consider both aspects together, and a useful working definition considers personality as the organisation "underlying a person's character, temperament, intellect and physique, which determines his unique adjustment to the environment" (Eysenck, 1953) without specifying exactly what that organisation consists of.

Personality was commonly regarded as separate from both *character* (which denotes the conative aspects of behaviour or will), and *temperament* (which concerns the affective reactions), but whether such a distinction has great value is doubtful. Since 1950 greater stress has been laid on differentiating those aspects of the personality which can be defined in terms of measurement, rather than those which are arrived at through philosophical speculation. Thus, in place of character and temperament, we now have *traits* (the general and persistent characteristics of behaviour shown by a

person such as "neatness" or "aggressiveness"), *habits* (the overt, observable behaviour patterns), *attitudes* (the combination of ideas or internal images and reaction tendencies) and *drives*. The latter, although they cannot, so to speak, be seen or measured directly are inferred from the changes of behaviour which follow changes in internal condition. A hungry rat which will face a stronger electric shock to obtain food than a satiated one, is presumed to be driven by the need—hunger, although even hunger it must be admitted can only be assessed in terms of the amount of food the animal is known to have eaten.

FACTORS DETERMINING AND INFLUENCING PERSONALITY

Before we can accurately measure or assess any of the above variables, it is necessary to consider some of the factors which may influence them. Although it would have seemed logical to study the effect of these in well-adjusted or normal people before branching out into the study of the abnormal, this is not the course history has taken. Most of our information about the factors affecting personality comes from a study of the abnormalities or exaggerations they produce. We know more about the cause of disorders of personality than we do about the causes of its order.

The factors affecting personality, either in its development or its dissolution, can be divided into three groups: Physical, Intellectual and Social.

1. Physical Factors

Of all the factors believed to influence personality, physical ones are probably those which can be most easily observed and have been most scientifically studied. But, as is often the case, those variables which are most amenable to scientific assessment are not necessarily the most influential, and despite the vast amount of attention which has been paid to the physical correlates of personality, the extent to which they are responsible for more than the broadest aspects of individuality seems to be doubtful.

The variables falling into this category can be grouped roughly into (*a*) general physique, (*b*) biochemical balance, (*c*) cerebral organisation.

(a) General physique

Although some connection between physique and temperament has been accepted at least since the time of Hippocrates, it was Kretschmer (1925) who first suggested that body-build might be associated with the different psychiatric illnesses and their "normal" counterparts. The two extreme physical types differentiated by Kretschmer (to which he later added a third, the athletic), are the short–fat (pyknik) and the long–thin (asthenic or leptosomatic). Two personality types were found to correspond to them—cyclothymic and schyzothymic. Kretschmer's groups have been corroborated in the main by all subsequent observers.

Several of Kretschmer's successors have modified his description, and many have used a different terminology. Sheldon (1940 and 1942) suggested a causal explanation for the association. From the physical measurements of a large sample of university students, Sheldon distinguished three main groups which he termed Ectomorphs, Mesomorphs and Endomorphs. Since few subjects were found to represent pure examples of any of these types, each subject was given a rating from 1 to 7 on each of the parameters represented, so that the pure ectomorph would be 117, the pure mesomorph 171, and the pure endomorph 711. The majority of people, however, were found to have ratings on the Sheldon scale round about the centre of all values, 443, 434, or 344.

Sheldon also subjected each of his subjects to prolonged interviews and a questionnaire concerning their habits, likes and attitudes, and from their answers to these, as well as from their behaviour in test situations, Sheldon concluded that individuals with the different somatic types had actually different physical needs. It was the habits and behaviour patterns developed through attempts to satisfy these that Sheldon believed gave rise to the different pictures of the personality. For instance, the short–fat type *needed* food, sleep, warmth and comfort and so tended to develop patterns of behaviour leading to these goals. The muscular types needed exercise and bodily activity, whereas the tall–thin ones lived an active intellectual life where food for thought was more hungrily sought after than that for the body.

This hypothesis seems highly rational, but further evidence correlating physical needs, physical types and personality has not been forthcoming.

(b) Biochemical balance

The belief that many personality traits are regulated by biochemical agents has been popular since recorded history. It was Hippocrates again who classified human beings according to the *humors* he considered to dominate them, and although Hippocrates' own classification has been superseded, the characteristics he described are still referred to by the names he gave them. We still recognise the phlegmatic, the choleric, and the sanguine among our acquaintances, even if we do not now believe the characteristics of behaviour they show to be due to predominance of the humors which give them their names. To account for these broad differences in modern terminology, Eysenck (following the suggestion of Pavlov) has postulated some factor such as "plasticity" which can be measured by speed of conditioning and susceptibility to certain drugs, and which determines the traits a person exhibits. But to what, if it exists at all, is this plasticity due? How can it be assessed in physiological terms? At one time there seemed hope that the answer might be found to lie in the autonomic nervous system.

The classification of normal people into those in whom the sympathetic and those in whom the parasympathetic nervous systems predominate, (as judged by the sweat response, salivary output, respiration rate, blood pressure, etc.) was carried out by Wenger (1947), while Gellhorn (1943) pointed to the preponderance of parasympathetic activity in psychotic states. Alteration in serum cholesterol in schizophrenia is a fairly consistent finding, while a high choline-esterase serum content is not only present in the acute stages of early illness, but is said to be absent after relief of symptoms by E.C.T.

From none of these studies, however, is it possible to define clearly and precisely the underlying causal mechanism. It is well known that psychological states such as fear, anxiety and tension all have a marked effect on the autonomic nervous system, and that in those conditions, action-alerting substances are circulated around the body. Whether the abnormal constituents of the serum seen in psychotic states are really the cause or only the result of mental disorders is still a matter for argument.

More experimental approaches to the subject have been made possible by the discovery of the hallucinogenic drugs, such as

lysergic acid (LSD) and mescalin. The fact that these almost invariably produce delusions and disorders of perception (especially those relating to the perception of the self) in normal people have led to the suggestion that their action may be mimicked by some biochemical substances in the body during breakdown of the personality. Several observers have argued that these artificially induced "psychoses" resemble more closely states of intoxication than of psychosis, but this is not universally agreed. Hoch (1958) points to the clarity of consciousness throughout these states as indicating a true psychotic-like condition, and also stresses the fact that symptoms produced by the hallucinogenic drugs tend to be blocked by the same agents as those found effective against psychotic states—namely chlorpromazine and its associates. However, even he admits that the picture resulting from LSD and mescalin depends largely on the previous personality of the individual. Those with schizoid personalities are more prone to develop paranoid reactions than others, while subjects who have in the past suffered true psychotic breakdowns may develop symptoms with a smaller dose of LSD than more stable people.

Experimental studies of monkeys confirm that behaviour disorders may occur from doses of LSD even in animals, although alterations are seldom found in either memory or choice discrimination tasks (Evarts, 1958).

It has been suggested by Woolley (1958) that the effect of LSD may be similar to that of serotonin which it resembles in chemical constitution. He claims to have shown that serotonin, when applied to *in vitro* tissue cultures causes a tetanic contracture of the oligodendroglia. In the living brain, he says, these cells seem to keep up a regular pulsation whose function may be to "stir" oxygen and other substances through the cerebral structures. Woolley suggests that cessation of such pulsations due to the presence of LSD might cause temporary anoxia, and so create the mental disturbances noted. This suggestion does not seem to have been generally accepted, and even if it were, like all other attempts to explain the personality in purely biochemical terms, it would still leave much to be explained.

(c) Cerebral organisation

The striking changes of personality which may follow injuries to the brain and in particular to the frontal lobes, were first noted in

1935 by Brickner, one of whose patients ran a crow-bar through the front of his brain, but survived the injury for several years and apparently recovered full physical health. From having been a conscientious, reliable, sober worker, the patient revealed after recovery from his injury all the opposite characteristics. He was uninhibited, unreliable, euphoric, lacking in judgement, childish and lazy. Similar changes have since been noted in association with frontal lobe tumours by Rylander (1939) and after pre-frontal leucotomy by Partridge (1950), Petrie (1958) and Tow (1955).

An association has also been claimed between the personality and the temporal lobes. Long-standing lesions in the temporal lobes causing epilepsy are frequently accompanied by aggressiveness, irritability and unreliability.

These striking and much-quoted associations between cerebral derangement and personality have one thing in common. The lesions to which the mental changes are attributed are localised and limited. Generalised widespread disorders of the brain due to atrophy or cerebrovascular disease seldom cause alterations of the personality itself. They may bring about exaggerations of previous personality traits and the manifestations of previously inhibited behaviour, but the tendencies and attitudes present in the original personality can almost always be recognised. Does this mean to say that the basic personality pattern is determined by the activity of certain focal areas alone? Although there may have been a tendency to suggest this in the days when the effects of pre-frontal leucotomy were first being analysed, the connection between the activity of any one single cerebral area and personality organisation in the normal healthy person is still very obscure.

In the case of the frontal lobes, identical operations carried out on two different people may have very different consequences, while dissimilar operations on people with similar personalities may again produce completely divergent results. It is not only the cerebral area involved which influences the changes produced, but the type of person it is involved in. The age of an individual at the time injury or malfunction takes place may also have a significant effect on the changes of personality produced. Hebb and Penfield (1940) have suggested that the frontal lobes of the brain have particular importance in determining the development of personality, and have stressed that the earlier a lesion is suffered the more likely it is to

cause a severe and lasting disorder, but Oldfield and Williams (1961) have reported one patient whose frontal lobes were severely damaged by a fragment of glass during his first year of life, but who was subsequently accepted by the Army (category A1) and showed little more than gross mental deficiency when interviewed at the age of 19.

Summarising the information available from the pathological material on the part played by the frontal lobes in determining the personality, Greenblatt and Solomon (1958) follow Stanley Cobb (1952) in suggesting that leucotomy interferes with a "long-circuiting" of sensory impressions. They point to three particular and almost invariable sequels to frontal lobe damage—(1) a reduction in drive or energy, (2) the subject is less affected by past experience and more bound to immediate stimuli, (3) he is less able to elaborate experience or sustain experiences. "One way of looking at this," they conclude, "is that the mechanism of prolongation in time is impaired."

The part played in determining personality by the temporal lobes and their adjacent sub-cortical structures has mainly been studied in cases of psycho-motor epilepsy. The close association between electrical abnormalities from this part of the brain and personality disorders has been recognised for some years. Gibbs (1958) has shown that not only do patients suffering from the psychomotor type of seizure have foci more frequently in the anterior temporal region than in any other cerebral area, but also that in cases where personality disorders accompany fits, there is more often a focus in the temporal or anterior temporal area than anywhere else. It is pointed out, however, that even where a clear-cut focus is present, "emotional stress intensifies the symptoms and often determines their character" (Green *et al.*, 1958). Gibbs goes on to point out, moreover, that surgical removal of the area from which a fit arises may *not* improve the personality disorder, even though it often stops the fits. Green *et al.* give details of forty-three patients who underwent temporal lobectomy and noted most improvement in those who were least disturbed. They summarise the psychological changes under three headings—(1) Thinking, (2) Feeling, (3) Acting. In 80 per cent of the cases they noted considerable improvement in feeling (or affect); acting improved in conjunction with it, although alterations to thinking were negligible. They suggest that much of the improvement they

did find may have been due to "stabilisation because of increased security in the environment", rather than any actual alteration to cerebral function.

How much of the part played by the temporal lobes in determining personality is due to cortical and how much to sub-cortical (e.g. hippocampal) structures is another question. Nielson (1958) reviewing the cerebral areas most closely associated with psychotic disturbances in non-epileptic patients points out that sub-cortical structures are the most frequently involved, but it does not seem too fanciful to suggest that when the functions of these areas have been as closely studied as the functions of the cortex, they too will be deposed from their present position as physical substrata of the personality.

2. Intellectual Factors

That an individual's intellectual capacity determines to some extent the life he leads is obviously the case, but that it may also determine the sort of person he is, is less certain. Intelligence certainly has little bearing on one's attitudes. Men of the highest intellectual standing may hold very different views on religion, politics and art, and are often quite unable to accept the principles of those who disagree with them. In so-called disorders of personality, the situation is much the same. Mental illnesses of different categories are found in all intellectual grades, although it must be admitted that the symptoms demonstrated may largely depend on intellectual factors. For example, a highly intelligent person with a scientific training is less likely to attribute an unfamiliar somatic sensation to the presence of a devil or of radar waves, than an unintelligent person who will catch hold of any ready-to-hand explanation to account for his experiences. However, the frequency of psychotic disturbances among the general population is not found to depend on intelligence, any more than on any other easily identifiable factor.

In the case of the psycho-neuroses, the situation is a little different. At one time, there seems to have been a popular belief that the neuroses occurred in the "better classes"—i.e. the more intelligent and better educated members of society. It was almost regarded as the price one had to pay for sensitivity and thoughtfulness. Since the National Health Service brought psychiatric care to all grades of society, however, it is becoming clear that the very opposite is nearer the true fact. Low intelligence, by placing an individual under

constant strain, may make him more liable to neurotic illness than his more intelligent colleagues.

Since many of the methods used for assessing personality reflect intelligence as well as traits, attitudes, etc., a person's intellectual level has to be taken into close account when interpreting personality test results, but more will be said about this when considering the individual tests.

3. Social and Cultural Factors

The effect of the environment on personality development has received much attention in recent years. In general, the conclusions are still somewhat unclear. Attempts have been made to assess differences due to environment as opposed to heredity, by studying individuals born to different cultural backgrounds, and those with different hereditary predispositions raised in a given culture from early age. The following points seem to be the only ones unequivocally established:

(1) The more primitive and automatic a tendency is, the less it is influenced by cultural environment. Yawning, crying, smiling, sneezing, etc., are less subject to cultural influences than are art, politics and religious ceremony.
(2) The younger an individual is at the time he is subjected to cultural pressures, the more likely he is to be influenced and moulded by them.
(3) The rate of progress in infancy (i.e. the age at which a baby smiles, etc.) is quite independent of social factors (Dennis, 1940).

That a great many conventions, customs and habits are culturally determined is beyond dispute, but the extent to which social factors are also responsible for the idiosyncracies of the personality within each culture is much less clear. It is often presumed that those tendencies which cannot be attributed to the social group as a whole can be explained by the influence of the family (or other sub-group), but the manner in which social pressures act to mould the personality is still speculative. The three mechanisms most usually postulated are:

(1) imitation,
(2) identification,
(3) learning through reward and punishment from the group.

Imitation is seen in most children, but as pointed out by Newcomb (1952) only operates within a fairly limited field. Children are very selective in their choice of model and "many a parent laments that his child utterly fails to imitate the 'correct' models set before him" (p. 11). The exactness with which people imitate varies from one culture to another, but in no culture yet studied does any act become imitated by all who see it. The laws which decide what fad will become a fashion have not yet been discovered.

Identification with a parent—or parent-substitute—will result in a child striving to attain the goals which it believes its parent to be striving for. But what leads to identification? Two members of a family brought up in exactly the same way may respond to parental example and precept in completely opposing manners (Argyll and Robertson, 1962). One may identify itself with its father and strive for the same goals as it sees him striving for; the other rebel against its background and withdraw.

Social pressures are presumed to influence people through rewards and punishment. In the majority of cases a simple mechanism of learning can be traced, but more often than not the whole picture becomes extremely complicated. Social rewards (usually in the form of status symbols) overcome factors which would otherwise act as punishment, even if both the reward and the punishment take the form of social approbation. For example, the criminal who carries out anti-social manœuvres with skill and evades retribution, is often a more popular hero than the man who devotes his life to helping others.

MECHANISMS IN THE FORMATION OF THE PERSONALITY

How is the personality formed? How does it become identified or integrated? In addition to the three main mechanisms postulated above (imitation, identification, learning) several others have been suggested by the clinical observations of the psycho-analysts, especially Freud. It was he who first described *Projection* (thrusting one's own feeling on to others), *Compensation* (adoption of a substitute function or role to provide satisfaction otherwise unobtainable), *Rationalisation* (making excuses to justify acts), *Sublimation* (compensation in a socially approved manner) and *Repression*. The

psycho-analytical interpretation of personality does not lend itself to experimental investigation, since it allows for so many alternatives and possibilities that the failure to predict an observed behaviour can always be explained away. Thus if a youth who is frustrated in his desire to become a great scientist becomes a butcher instead, he can be said to have sublimated his desires. If he becomes a murderer, he has compensated for them, if he becomes a national hero in war he is rationalising, and if he becomes neurotic, he is repressing. An observer who predicted the wrong future simply, according to psycho-analytical doctrine, chose the wrong mechanism; his failure does not challenge the doctrine as a whole.

CONDITIONS CAUSING BREAKDOWN OF THE PERSONALITY

It is easier to obtain definite evidence of the conditions causing breakdown than of the mechanisms involved in the formation of the personality, and it is in this sphere that experiments with animals have proved valuable. At least four different conditions have been identified in the aetiology of breakdown: Conflict, Repetition, Uncertainty, Frustration.

1. Conflict

Masserman (Masserman and Pechtel, 1956) used to feed a healthy, mature good-natured cat in the corner of its cage every day. The appearance of its food was preceded by a flashing light, and the cat soon learned that shortly after the light began winking, its food would arrive. It would wait by the trough with an appearance of happy anticipation. Then, one day, Masserman began plowing puffs of air into the cat's face every time it went to take its food. The cat's whole behaviour underwent a complete and permanent alteration. At the sign of the flashing light it would withdraw as far away from the food trough as possible. There it would lie either immobile and listless, or licking its fur in frenzied haste. Instead of greeting its handler gently and with pleasure, it would attack anyone who approached it. Even outside the cage, it refused to eat or be comforted.

The experiment on this animal was repeated many times with other cats and with different variations, and it was found that the

simultaneous arousal of any two sets of conflicting drives—such as those of approach and escape mentioned here—produced the same result.

2. The Repetition of Noxious Stimuli

Liddell (Anderson and Liddell, 1935; Liddell, 1938) placed a sheep in a small pen and attached electrodes to one of its legs by means of which a mild electric shock was given to it at regular intervals. The shock itself, when given only as a punishment (on a choice discrimination task) seemed only to produce a mild discomfort, but its repetition regularly and inescapably produced in the sheep signs of a "neuroses" similar to that seen in Masserman's cat. Liddell repeated this experiment on pigs as well as on other sheep and found that permanent signs of behaviour disorder characterised by disruption of normal functions and the appearance of unadaptive actions occurred in the majority of animals.

3. Uncertainty

Pavlov (1927) trained dogs to expect food when they saw a circle but not to expect it if they saw an oval. When the two signs became so similar that the dogs were unable to discriminate between them, the majority of them underwent a neurotic breakdown similar to that already described. But not all dogs broke down at the same level of strain. Some seemed to have a considerably lower threshold than others. Those which were slow to condition in the first place were the slowest to collapse.

4. Lack of Need-satisfaction

Harlow (see Butler, 1954) raised infant monkeys away from their parents. Some monkeys were placed in contact with dummies (or surrogate mothers) covered with soft cloth: others on wire frames. Every dummy was fitted with a milk-bottle from which the monkeys obtained all the food they needed, but those raised on the wire-frame surrogate mothers grew up to be nervous, easily disturbed in strange situations and lacking all the natural curiousity of the normal young animal. It was concluded that early deprivation of a cuddlesome, comforting body left a permanent defect in the monkey's behaviour which could never be filled.

Many of the conditions mentioned above can be recognised as

causes of stress and strain in human beings. The effects of early maternal deprivation on the development of children have been particularly stressed by Bowlby (1953). But if the life-histories of enough human beings are studied carefully, conflicts, deprivation and uncertainty will appear in the majority. Why is it that some break down and others do not? Why are some people easily made neurotic and others, like some of Pavlov's dogs, resistant to neuroses?

As yet, psychology has little to say on this subject. It cannot give us all the answers, but by providing us with scales to measure certain limited aspects of the personality it is doing something on which we may hope to build a better understanding in the future.

ASPECTS OF THE PERSONALITY WHICH CAN BE MEASURED

Not all aspects of the personality are yet amenable to measurement. Those parameters which are best covered to date are:

(1) Types.
(2) Needs.
(3) Traits.
(4) Adjustment.
(5) Mood.

Some tests claim to give measures in two or three of these parameters at once (i.e. the Rorschach can give an indication of needs, adjustment and mood; some questionnaires and inventories give measures of type and trait); others concentrate on one parameter only. It is important for a psychologist or tester to bear in mind what aspects of the personality he is most interested in assessing, before he decides what test to use.

Psychological tests commonly give their measurements in terms of normal performance and deviations from the normal. What do we mean by normal? In clinical psychological tests normality has two definitions—the first is defined statistically as the mean of the population; the second clinically as well adjusted and healthy. There are a number of occasions in which these two may be at variance. Thus a normal performance in terms of adjustment or stability is often very rare statistically in the test situation, for most people show signs of anxiety, tension or nervousness when they know that their mental activities are under scrutiny.

As a general rule, tests used in clinical practice tend to regard normal as signifying healthy or well adjusted, but as will be seen later, there are exceptions.

1. The Measurement of Types

Putting things into categories or classes (typing them) is usually regarded as the first essential step in scientific procedure. As soon as we know into what class to put an object, we know a great deal about it. In the case of personalities, it is held that once we can "type" a person on the basis of his response to one situation, we are able to say how he will behave in another situation; we can predict something about him. But can we? Are we sure that a person who is withdrawn, anti-social and "schizoid" in large gatherings, may not be most friendly, warm-hearted and generous to his own close friends?

There are several criticisms against typologies in the sphere of personality study.

(i) Knowing the class to which a person belongs in one mental sphere does not necessarily indicate how his mental functions may be organised in another, as has already been indicated above.

(ii) Typologies tend to lose sight of the uniqueness of the individual.

(iii) The nature of the personality types selected in most studies and classifications is so arbitrary that it seems to be almost meaningless.

It is true that some of the types have been determined not from simple observation, but as a result of "factors" or "trait clusters", thrown into relief by factor analysis. Yet even these are not infallible as predicting agents.

Despite these criticisms, typologies have been much used by psychologists, and the types identified by them fall into three main groups: the psychological, the physiological, and the sociological.

(a) Psychological

The best-known and developed of these is, undoubtedly, the classification into Introvert and Extrovert suggested by Jung on the basis of the clinical observations of Kraepelin and Bleuler. Although few people are found who represent pure examples of either type,

there is general agreement among most observers that such pure types do exist, even if only in a few cases, and can be clearly distinguished from one another.

(b) Physical

Some personality types thought to be associated with physical characteristics have already been discussed. Those identified by Kretschmer and Sheldon and associated with body-build have much in common with Jung's Introvert and Extravert and like them, are found only seldom in their extreme forms. It has been suggested by Eysenck that all typologies, whatever the names given to the types identified are really descriptions of the same sort of behaviour-differences and the underlying cause of these differences may be related to "suggestibility". Until the nature of suggestibility itself is defined more clearly, however, we do not seem to be very much farther forward for this interpretation.

(c) Sociological

Sociologists have attempted to classify people according to the attitudes, interests and basic characteristics they demonstrate, and the similarity between these and certain stereotyped national tendencies. Thus, there is the Bohemian, the Philistine, the Conservative or the Radical.

The measurement of types may be undertaken by means of some of the personality tests to be described later.

2. Needs

The assessment of *needs* is usually regarded by all psychologists as essential for the understanding of the personality. Unfortunately, there is much less agreement among those concerned over what is to be included under the term need, how a need may be assessed and how its function is to be interpreted.

Attempts to define and categorise personality needs were probably first made by McDougall (1923) (under the name of instincts) and have been later refined by Cattell *et al.* (1950). It seems important to distinguish between three types of need:

(*a*) Those that are inborn or innate and appear in the first few days of life (i.e. physiological needs such as those for food).

(*b*) Those which are inborn but only develop with maturation (such as the need for company or approbation).
(*c*) Those which result from social pressures.

Needs are generally assessed by inference rather than by direct observation, and may be measured by specially designed questionnaires or projection tests.

3. Traits

The number of different personality traits which could theoretically be described and measured is almost infinite, and indeed Cattell's list of personality traits extends to almost 300. Not all these traits are of equal importance to the person trying to understand mental illness, or have equal clinical significance, while the stage at which a trait of normal personality becomes a sympton of illness is extremely difficult to decide. For instance if a person claims to be afraid of mice, is he suffering from a phobia in the clinical sense, or is this a trait of an otherwise well-adjusted personality? Are all symptoms exaggerations of normal personality traits carried to extremes, or do they constitute something different?

There is one school of thought which would subscribe to the opinion that symptoms of mental illness are in the same category with regard to normal tendencies as are the symptoms of cerebral derangement with regard to normal mental functions. That is to say, they are elaborations of disinhibitions of tendencies previously present in the personality, but normally kept under control. Thus the person who develops a phobia for mice does not do so primarily because of his illness, but because his illness has made him incapable of controlling a dislike always present but previously under control. Not all psychologists or clinicians would agree to this, however. While they regard traits as descriptive of adequate mental adjustment, they consider symptoms to be signs of inadequate adjustment and thereby to fall into a different category.

Distinction of traits from symptoms is an important part of the clinical psychologist's task (Foulds and Caine, 1958), but more often than not, the distinction has to be based not on the presence of a trait itself, but on the presence of other signs of illness in the patient's mental make-up. For example, a tendency on the Rorschach inkblot test to incorporate many of the small details in interpretations

is common both in normal people with a meticulous personality, as well as in obsessional neurotics. The rest of the Rorschach picture must be relied on to tell the investigator whether the personality as a whole is well integrated, or pathologically disturbed.

4. Adjustment

Adjustment is a relative term. A person may be well or badly adjusted with respect to either (1) himself, and his ability to reach the goals he sets himself, or (2) society. These are quite independent and should be assessed separately. For instance, the psychopath may be well adjusted towards himself and his ability to reach his own goals, but his adjustment to society would hardly be rated high. At the opposite extreme, some individuals with high social ideals have such elevated goals that they themselves are never satisfied or able to relax.

The measurement of adjustment, unlike the other aspects of the personality so far considered, is fairly unequivocal and straightforward. It can be made in terms of either degree of adjustment present in special situations, or in terms of the amount of stress which has to be applied before a subject shows signs of breaking down. However, the cut-off point at which maladjustment can be distinguished from good adjustment is difficult to define in general terms. The usual procedure is to put a subject in a variety of hypothetical situations (either by questions such as "what would you do if . . ." or in Projection tests) and compare the way in which he responds to these with the responses of other people. Responses indicating coolness and lack of emotional disturbance are taken to indicate good adjustment; those demonstrating panic or severe emotional upset would be taken to indicate the opposite.

Much evidence has been drawn up recently (e.g. by Bowlby and Harlow) suggesting that ability to withstand stress is dependent on security in early life. The "deprived" infant tends to show earlier breakdown under conditions of stress than the one that is indulged.

5. Mood

Mood is not really an aspect of the personality which can be separated from the whole. Everything a person does is coloured by his mood; all his traits and tendencies will reflect it. On the other hand, it is possible in certain conditions of illness for a person's mood

to be disturbed without his behaviour being altered in many other spheres.

Most severe disturbances of mood are liable to cause complete disruptions of the previous personality pattern. A severe depression may make a person alter his whole way of life, doubt his own beliefs and change his attitude to all important events; but at the same time, a feeling of depression may follow, instead of causing, disturbance of personality. Thus it may be secondary to a major mental disorder of some other kind—most notably early schizophrenia—or it may be the primary cause of the personality disorder.

The clinical psychologist is seldom in a position to decide whether the symptom of mood disorder is primary or secondary; in other words, to diagnose the illness or state the aetiology. This distinction depends largely on the clinical history. On the other hand, the degree of depression present in a patient, the symptoms with which it is associated, and the conditions influencing it can be measured on psychological tests, and may assist others in forming their diagnosis.

Elation of mood, besides being less common is also harder to assess qualitatively than depression, and is difficult to distinguish from normal (in the sense of healthy) good spirits. Usually, it is only if elation or euphoria is accompanied by lack of judgement, over-activity and some disturbance of thought, that it is considered pathological.

METHODS OF PERSONALITY ASSESSMENT

A full assessment of the personality in any single person is a major task, involving, as already mentioned, many different aspects of the individual in the clinical setting. A full personality assessment in every patient would be impossible. Fortunately, it is seldom necessary. The majority of clinical problems associated with personality centre around diagnosis, and clinical diagnosis itself is based on a number of variables which include the patient's history and present symptoms. The clinical psychologist is seldom either called upon or in a position to know all these variables, to weigh up their relative importance and form a diagnosis. His job is to assess the patient's present symptoms or mental state and report on them, to the relevant quarter. It is the clinician's job to collect together all the data from the special investigations he has set in motion and decide from the

total picture what the patient is suffering from, and how he should be treated.

Before starting a personality assessment, therefore, the psychologist should bear in mind (*a*) the questions he is required to answer, (*b*) the aspects or dimensions which will have to be assessed in order to answer them.

Broadly speaking, personality tests can be divided into three groups: (1) rating scales, (2) questionnaires and inventories, (3) projection tests.

1. Rating Scales

In this procedure, a check-list of traits is drawn up, and each subject is rated by an observer for the amount of the trait he is believed to show. Ratings may be made from biographical data, from personal observation or from inference.

The method has obvious unavoidable disadvantages, many of which have been outlined and discussed by Eysenck (1953). The principal defects to which he draws attention are:

(1) The different interpretations of trait norms by different individuals.
(2) The "halo effect"—a tendency to contaminate the rating on one trait with the rater's own general impression of the subject. The effect of unconscious bias (i.e. a tendency to rate as good or bad in a subject a tendency which the rater likes or dislikes in himself) has been stressed by Shears (1936).
(3) The different abilities of different raters.
(4) The effect of acquaintance. Although close acquaintance with a subject is necessary in order to be able to rate him accurately, it has been pointed out by Vernon (1938) that too great a familiarity may lead to impairment rather than improvement of rating ability. As soon as a rater arrives at the stage of accepting his subject's idiosyncracies, he is inclined to overlook them.

Despite these criticisms, surprisingly good agreement has been found in a number of cases between ratings and observed behaviour, particularly in the studies carried out by Hartshorn and May (1928). In clinical practice, rating scales have some value as research tools, especially in the assessment of change following different therapeutic

methods, but in the sphere of diagnosis or therapy they have little application. It is impossible to find out more from a Rating Scale than is directly observable.

2. Questionnaires and Inventories

Measurements of this type are in common clinical use. Before describing some of the better-known tests individually, a word may be said about the advantages and disadvantages of this type of test in general.

Advantages. They have three major advantages:

(1) They can be administered quickly and to large numbers of people simultaneously, so that large amounts of data can be gathered and norms can be reliably calculated.

(2) They are quite objective and can be given even in the absence of a psychologist or tester. The "halo-effect" is thereby eliminated.

(3) They can be scored quantitatively. Dimensions can therefore be measured in numerical terms, and comparisons—either between different individuals or between different traits in the same individual—can be made. (There are some people who would question this point, and maintain that no trait can ever, in fact, be measured in quantified terms.)

Disadvantages

(1) Much clinical insight may be lost if the psychologist is not observing a person's reactions at all moments during the test. It is not just what a person does that is important clinically, but how he does it—his hesitations, doubts, self-criticisms.

(2) The reliability of a subject's answers to a questionnaire depends on his insight, co-operation and seriousness of intention at the time of answering. Although his rapport may be excellent at the time he starts filling up a questionnaire there is no way of knowing whether he retained it throughout, or whether an adverse influence undermined his intention half-way through.

(3) The results may be vitiated by a subject's desire to appear in a good light, and to give answers which he believes to be socially desirable.

(4) The ratings on questionnaires are only valid for subjects corresponding in all essential details to the community on which they are standardised.

Questionnaires and inventories have been developed by three main techniques.

(a) Analysis of personality from the common-sense point of view

The Cornell Index, which was developed during the Second World War, consists of ten items to which the subject has to answer only Yes or No. Its chief use has been in the selection and screening of military personnel, but re-tests have indicated that scores may change after a time interval, even though a person's apparent mental state remains unaltered (Anastasi, 1954).

Bell's Adjustment Inventory aims to measure adjustment in four spheres—home, health, social, and emotional. Norms are only available for American subjects.

(b) Factor-analysis of trait ratings

The Bernreuter Personality Inventory is a self-rating scale, on which the subject rates himself for symptoms or traits such as neurotic tendencies, self-sufficiency, introversion or extraversion, dominance or submission, sociability and confidence. It has only been standardised on American subjects, and is not suitable for individuals who lack insight, e.g. psychotics.

The Guilford–Martin Personality Inventory is based on the factor analysis of thirteen selected variables from which four principal traits have emerged. The test consists of simple statements (e.g. "You are often in low spirits") to which the subject has simply to state Yes or No. Such a procedure is aimed at overcoming resistance on a subject's part and at eliminating the main effects of intelligence. Its chief use is to locate trouble-makers in industry, but there is some doubt about its reliability (Anastasi, 1954).

Cattell's Sixteen Personality Factor Questionnaire is the most ambitious of this group. The inventory, available in two parallel forms each containing 187 items, is based on the factor analysis of ratings on normal people. Ratings on sixteen traits can be obtained, but the validity of these (i.e. the degree to which behaviour can be predicted from them) has not yet been proved.

(c) Analysis of clinical symptoms

The Minnesota Multi-Phasic Personality Inventory (*M.M.P.I.*) is not only the best-known test in this group, but is infinitely the most widely used personality inventory in clinical practice. Since its first appearance in 1940, several hundred papers have been published on this test alone every year (see *Buro Mental Measurement Year Book*).

The full test contains 550 statements, each printed on a separate card, which the subject has to sort into three piles, "True", "False", "I don't know". Scoring is carried out by using a key, from which it is possible by simple inspection to read off scores on nine different "clinical scales". A considerable advance over other questionnaires and inventories is the inclusion of three scales designed to check the validity of the subject's responses. High scores on any one of these (which show that the subject has tried to make himself out to be more socially desirable or conforming than he is) should make one regard the whole result with some suspicion.

The test has several advantages from the clinical point of view, but at the same time, it can be much criticised. Based on clinical observation, and designed originally to measure clinical symptoms, the aspects of personality measured by it are particularly relevant to the clinician. Indeed, each of the scales or dimensions measured was at one time given a clinical name—hysteria, paranoia, schizophrenia, etc.—and was denoted by the first two letters of the symptom measured—Hy., Pa., etc. Further research showed that scores on the M.M.P.I. scales did not always correlate highly with clinically observed symptoms—that a high score on the Hy. scale did not correlate with hysteria as defined clinically—but since measures on the scales were found by many psychologists to have value in their own right, and to show higher reliability than clinical assessment, the scales themselves have mostly been retained, but their names have been altered. They are now simply known by the letters denoting them—Pa., Hy., Sch., etc.—and clinical diagnoses are sought in patterns of M.M.P.I. scale scores (i.e. peaks in two or more scales) rather than in scores along the individual scales.

There have been a number of efforts to draw up new scales using items chosen from the M.M.P.I. but showing closer correlations with clinical symptoms (Foulds and Caine, 1958), but none of these has yet proved to be more reliable than the original. Hence it must be

concluded that while the M.M.P.I. probably gives a good indication of personality make-up in terms of traits and tendencies and may be a useful screening device, it is not a reliable guide to symptoms of illness.

The time factor is always an important one to bear in mind. The M.M.P.I. takes a long time to administer and score, but it has the advantage for the clinical psychologist in that as long as he uses his own special skill and experience in the interpretation of the results, he can be absent during the administration and scoring. The patient can be left alone and allowed to sort the cards in his own time, and a technician with the minimum of experience can enter the results on to score sheets. This practice, however, results in the psychologist losing all the clinical insight he might gain from observation of the patient's behaviour, and while the test has value in research projects and the evaluation of group data, it is not to be recommended in assessment of the individual.

Other questionnaires and inventories designed to measure particular symptoms or tendencies (e.g. aggression, homosexuality) have been devised by a number of people. Each is published with its own manual, containing instructions for application and scoring.

3. Projective Tests

In these tests the subject is presented with a vague, poorly defined situation (such as a picture, an uncompleted sentence or a single word) and asked how he would deal with it, or what it reminds him of. It is assumed that, since the test situation itself provides few clues, all the subject's responses will be controlled by his own internal make-up. What he does will depend on his own behaviour tendencies; what he sees will be put there by himself. He will project into the situation his own desires and needs, reflect his own conflicts, see his own problems, and deal with these in his own individual way. Hence some light may be thrown on his attitudes and traits, on the integration of his personality, and hence, by inference, on the situations in which he might be expected to suffer greatest stress.

These tests, like all others have both advantages and disadvantages.

Advantages

(1) The subject in such a situation may show a much greater range and variety of behaviour than he could on a questionnaire or

inventory. He will also probably show mainly that type of behaviour which comes most easily to him—i.e. the traits which characterise him most clearly.

(2) Dissimulation is difficult. Since there is no right or wrong response, and since the subject does not know what is expected of him, there is little likelihood of his pretending to be or do anything foreign to his nature.

(3) Such tests are particularly valuable with children, and those who do not express themselves easily. Ability to verbalise or to understand complex instructions will have little effect on the test results.

Disadvantages

(1) Scoring is not as objective and quantifiable as it is on rating scales or questionnaires, and a great deal is dependent on the experience of the examiner. This has led to the obvious criticisms that projective tests are "unscientific", that interpretations may be severely contaminated by the bias of the interpreter, and that they offer little more than glorified interviews.

(2) Norms are less good, as less data are available from which to calculate them. As projective tests are only given individually, they have been given to less people than have the group tests. Hence, standardisation is, in general, less accurate.

The existence and use of projective tests appears to have divided psychology into two violently opposed camps. On the one hand there are those who believe that the clinical insight they afford (their advantages) overrides any deficiencies; on the other hand there are those who believe that if psychology is to hold its place as a science, it must follow closely the practice of objectivity and reliability. The "antis" quote various research projects indicating that interpretation of blind records have little reliability either in diagnosis or predictions, when large groups of cases are studied, while the "pros" maintain that since the tests are designed to throw light on individuals and the uniqueness of each person, group results have little significance. Indeed, the experiments and investigations designed to test (and often quoted to discount projective tests have usually proved little more than the views of the investigators. For example, Eysenck (1957) quotes an experiment in which the Rorschach records of prospective

pilots in the Air Force, were compared with their follow-up records. The pilots were divided into two main groups: (1) those who broke down during the course of their service, (2) those do did not. "Not one of the experts succeeded in predicting with better than chance success the future performance of these airmen." Against this, it might well be argued, that it is not the most neurotic or unstable personalities who are most likely to break down during military service. Indeed a number of neurotics find the steady routine of service life a considerable prop, and suffer their greatest stress when forced to face the uncertainties of civilian existence. Lack of breakdown under military discipline does not therefore indicate a clinically stable personality, and the failure of a projective test to predict breakdown in this situation does not invalidate the technique.

The Rorschach Test

This is without doubt the most widely used projective test in clinical practice. First developed by Rorschach, who published his only account in 1921, the test has remained almost unaltered since this date.

The Material. The test consists of ten cards, each bearing an inkblot made by pouring some drops of ink on to a sheet of paper, folding it over, and then opening it out. The blots are almost symmetrical around the mid-line. Cards I, IV, V, VI, VII are in black and white only: cards II and III are in black and red, and cards VIII–X contain several different colours. The ten cards chosen by Rorschach, and constituting the test, were selected from several thousand. Each card appears to present a different form of stimulus, and so evokes the subject's reactions to a different situation. Card VI is particularly apt to reveal disturbances in sexual matters: cards VIII–X tap emotional adjustment.

Procedure. The instructions are not rigidly standardised. In whatever words the examiner likes to use, he gives the subject to understand that he is desired to look at each card for as long as he likes, and to say all that he can see in it or what the blot reminds him of. In putting this over to the subject, it is necessary (*a*) to avoid leading questions or suggestions, and (*b*) to impress on the subject that he is to say as *much* as he can. (If he wishes to turn the card at different angles, he is allowed to do so, but he must not be specifically encouraged to turn it.) All responses, verbal and non-verbal, are

recorded and coded. At the end of the test—or after the subject has finished with each card—the examiner should make sure, by questions if necessary, that he knows the part of the ink-blot and the particular aspect of it used by the subject in each interpretation.

During the administration, the examiner notes:

(1) the time the subject takes to make his first response to each card (R.T.) and any particularly long pauses during the interview.
(2) the angle at which the card is held for each response, usually signified by the marks $\wedge$ $>$ $\vee$ (the point indicating the top of the card).
(3) all verbal responses—taken down verbatim if possible.

If the subject's spontaneous responses are unrevealing, a useful procedure has been developed by Harrower and is described by Klopfer and Kelly (1942) under the heading "Testing for Limits". Various suggestions are made to the subject ("Some people say it looks like a skeleton—do you agree?" "Some people see it as a nasty mess—or a man dancing") and those accepted by him are noted (see Bell, 1948). The amount of pressure which has to be exerted before the subject will accept a given construction ("They call it a dog, do you see it?—this part here—here is the outline") is another measure sometimes used.

Scoring. The important aspects to look for in each response were first noted by Rorschach and have been little changed (although somewhat elaborated) since. These are:

Location. Where and how much of the blot is concerned in each interpretation? Is it the whole (*W*), a large detail (*D*), a small detail (*d*), or a white space (*S*)?

Determinant. What aspect of the blot determined the interpretation? Was it simply the shape of the outline or form (*F*), and if so was it a good interpretation, such as a real object (*F*+) or only a vague one (*F*−)? Was the thing itself seen as being in movement (*M* for human, *FM* for animals), or was it specifically seen as being suspended in its action, hanging up, hovering or dead (*m*)? Was the interpretation based on the shading (*k*) and if so was it just a formless response to the shading as in "clouds" or "smoke" (*k*) or a response in which shape and shading combine as in "X-rays of the spine" or "a fur rug" (*Fk*). If colour is present on the card, was it

combined with shape such as in "a red stocking" (*FC*). Did colour predominate over shape, as in "A painting of a garden" (*CF*) or was it quite shapeless as in "a lot of spilt paints" (*C*)?

Content. The main classes into which contents of responses have been grouped are: human, animal, object, map, X-rays, anatomical.

Special signs. Some responses to the test have special diagnostic significance.

"Shock" which is signified by an especially long reaction time and by signs of uneasiness—even refusal to respond—indicates anxiety and difficulty in coping with that particular situation. Shock most frequently occurs on the colour cards (indicating difficulty in dealing with emotional stimuli) and on card VI, the sexual one. Shock may be delayed, and occur on a card following the one which really caused it.

"Explosive" responses (fireworks, atom bombs, earthquakes) suggest poor integration of intellectual and emotional aspects of the personality. They are frequent in adolescents and psychopaths, and often occur during the course of recovery from cerebral traumata.

"Contamination"—i.e. responses in which two different constructions are seen together—is almost diagnostic of schizophrenia. Contamination does not always occur in this condition, but it seldom if ever occurs in any other.

"Anatomical" responses (pelvis, breast-bone, vertebrae, etc.) if made by subjects who have *not* had a biological training, are suggestive of withdrawal and abnormal introspection, but if made by those whose work would orientate them in that direction (medical students, nurses, etc.) have little significance.

"Catastrophic" reactions—inability to see anything in the inkblots despite intense effort—occur occasionally in schizophrenia, but more often in cases of organic cerebral impairment (Piotrowski, 1937). The subject frequently shows signs of physical stress such as sweating, crying, or fidgeting.

Interpretation. This should be based on the record as a whole. The importance of individual responses varies, depending on whether they occur in isolation or in an otherwise full and varied record. For example, card VIII might be described as "like a firework display"—a response indicating explosive emotional reactions. If this were the only thing a subject could say about the card, it would suggest poverty of emotional integration, especially if the previous cards had

been seen as commonplace objects or animals. If the response "firework display" was simply a person's initial comment ("My first impression is a firework display, but I see there are two animals here . . .", etc.) or if it was given as one of many other possible constructions, it would have much less diagnostic significance.

The significance of rejecting a card depends on the time taken by a subject to decide whether he can or cannot see anything in it. A person who takes one quick look at a card and turns away from it with the comment, "Nothing—it doesn't mean a thing to me," is likely to be inhibiting—consciously or unconsciously—the reactions first aroused by it. The subject who spends several minutes turning the card this way and that before finally deciding that it means nothing to him, is in a different category.

A great deal has been written about the exact interpretations which should be given to different scores and the different proportions of each type of location or determinant which should be regarded as diagnostic of each condition. Whether the scoring of a test such as this can ever be subjected to statistical evaluation of this nature is, however, doubtful. In general, it is the confusion caused by interpretation based on statistical analysis of scores which seems to have brought the Rorschach test into such disrepute with would-be scientists. Much greater value is gained from looking at the test as a whole and sizing up a person's mental make-up from his general performance to it, than by attempting to calculate statistically significant measures.

Bearing in mind these points, interpretation should be based on the following signs:

Approach. Querulousness, uncertainty and diffidence at the beginning of the test are common in normal people, but are usually quickly overcome. This condition only persists throughout the entire test in subjects who have abnormal difficulty in forming constructions, and such people are usually found to be suffering from organic cerebral impairment, of a transitory (i.e. post-concussional) or permanent nature. Long reaction times to individual cards, or pauses during the course of the test, indicate anxiety. The anxiety may be directly aroused by the card confronting the subject at the time he makes it, or may reflect a mental disturbance caused by the previous one. In depressive states where psycho-motor retardation is prominent, long reaction times are normally recorded to all cards, but the

responses finally given by the subjects are usually of fairly good quality. Perseveration—i.e. a tendency to see the same things again and again in different cards—is always indicative of abnormality, but since it may occur in a number of different conditions, is not of much diagnostic assistance.

"*Total R.*" The average number of responses to the total test (Total *R*) is between 10 and 20. The more intelligent and imaginative the subject, the more he can usually see in the ink-blots, but although "Total *R*" is usually higher in the intelligent subjects, it cannot be taken as a direct measure of intelligence. Obsessional, pedantic individuals will often continue seeing things in the small details of the ink-blots *ad infinitum*. While intelligent people suffering from mental disturbances may make few responses, subjects with abnormally low intelligence also find the constructions hard to make, and usually achieve only a small number of the more "popular" ones. Hence, personality assessment of the mentally defective cannot adequately be made with this test.

Location. The location scores indicate the way in which a person approaches a situation or task. The intelligent, well-adjusted adult usually starts off by giving some interpretation to the whole blot ("A moth or a bat"), then goes on to interpret the larger details ("Two boots on either side"), and ends up with the small details ("This might be a little gnome"). In the course of this orderly procedure, he may see new wholes (*W*'s) or weave small details (*d*'s) into larger details (*D*'s), but his record will contain a fairly good selection of these three main scores. There is a great deal of difference between the whole (*W*) response which shows a good interpretation of the form, and one that is mainly formless—i.e. between the response "two clowns dancing" and "a black smudge". The former indicates a good constructive intellect, while the latter may be given by the unintelligent or the emotionally disturbed. Those of low intelligence, even if well adjusted, find difficulty in making constructions involving the blot as a whole, unless they resort to the stratagem of interpreting all as animals or simple, stereotyped generalities such as "a badge" or "a picture". Thus a record consisting entirely of poor *W*'s or *D*'s indicates restricted intellectual capacity, whereas one of good *W*'s indicates imagination.

A record exceptionally high in *D* responses in a person with high I.Q. (as judged from other tests) indicates a tendency to stick to the

obvious and simple aspects of a problem, to be unimaginative and unoriginal. A preponderance of *d*'s in the location scores indicates obsessional tendencies or anxiety. It may also occur in schizophrenics who have obsessional ideas, but is not in itself diagnostic of psychosis.

Constructions involving the white spaces rather than the coloured parts (such as "island" on VII, "spinning top" or "lampshade" on II) indicate oppositional tendencies and negativism. Some well-adjusted adults may give these responses when they have gone through every other possible part of the blot, but "*S*" responses seldom appear as a first or only response to a card except in adolescents or schizophrenics.

Determinants. The determinants indicate those aspects of the environment to which the person is most responsive. It is generally agreed that responses to *form* indicate intellectual reactions, those to *movement* show constructiveness or imagination, those to *colour* emotional reactions and those to *shading* reflect anxiety.

The well-integrated, intelligent adult will include all aspects of the ink blots in his constructions. He will turn the shapes into recognisable forms and imbue these forms with movement. He will weave the colours into his shapes, and will use the shading in the blot to fill out his interpretations.

Records which show a response of little other than *form* (i.e. almost entirely composed of objects and animal figures) suggest high critical faculties but little constructive ability or imagination. If the responses to the colour cards (VIII–X) do not include responses to the colour itself (i.e. all *F*), there is indication of emotional coldness.

In assessing the emotional reactions, the most important guide will be the relationship between form and colour on cards VIII–X. When form predominates (*FC*) it can be assumed that the subject has little difficulty in establishing good inter-personal relationships. If colour predominates (*CF*) egocentricity should be suspected. Reactions to colour unaffected by form (*C*) suggests impulsiveness, and a schism between emotional and intellectual behaviour. Such responses are often seen in normal children, but in an adult indicate severe disturbances of personality.

Movement responses (*M*) reflect the "richness of associative life" (Bell) but movement which is restricted or hampered (*m*) indicates mental tension and uneasiness.

Responses to the shading (*k*) indicate anxiety and perplexity.

Where this is included with a form response ("tiger-skin rug") it is likely that the anxiety has a definite focus or cause. Free-floating anxiety is characterised by constructions involving the shading alone (e.g. "clouds").

Content. The content is probably the least significant aspect of the test response from the clinical point of view, since it is more strongly influenced by interest and experience than by adjustment or integration. The only real exception is in the case of schizophrenia, where content may be revealing of symptoms. The importance of the "contaminated" response and of anatomical responses has already been dealt with.

The number of very common or "popular" responses made by a subject shows the degree to which he conforms with his social environment.

Application. The Rorschach test has been used in a great many research projects. It has been used to assess the mental changes following different forms of treatment or changes in physical state, and to assess changes in mental make-up during the course of maturation or those caused by cultural factors.

By far the most common use of the Rorschach test, however, is as an aid to clinical diagnosis, for it may help to throw a great deal of light on the way in which a subject's personality is integrated, even if it cannot help to elucidate the causes of faulty integration. Table 1 shows some of the tendencies generally noted in five broad diagnostic categories. These are the responses typical of the groups, and it must not be forgotten that every individual can be an exception to the general rule. Moreover, a single feature, if strongly marked, can be diagnostic in itself and overcome in importance all other contradictory features of the record. For example, if a response contains several obviously "contaminated" constructions, one would have little hesitation in saying that it was made by a subject suffering from a schizophrenic illness, even if it also contained several good *FC* responses and there were no *d*'s or *S*'s.

In general, however, it is perhaps wiser for the psychologist when interpreting the record to stick to a description of personality in terms of traits and symptoms, rather than to attempt diagnosis. He will probably find the clinician more grateful for his services and less critical of his skill.

The Rorschach test has also been used on children, where it appears

that the same responses have the same significance that they do in adults. The young child's natural distractability and inadequacies of verbalisation do not make this as useful a test for children as some of the other projection tests to be described later.

TABLE 1

Rorschach response	Neurotics	Schizophrenics	Manic depressives	Psychopath	Organics
Total R	Few. Some cards rejected	Irregular. Many cards rejected	Few	Normal	Few
R.T.	Slow to all colour	Irregular	*V.* long	Normal	Long
Location	Mainly *D* and *d*	Mainly *d*, usually *S*	*W* or *D*	Normal	*W*
Determinants	More *FM* than *M*; few *FC*	More *F*– than *F*+. More *C* and *CF* than *FC*. Often some good *M*	Normal	Low *M* and *F*; high *C*	*F*–; no *FC*
Content	Many animals	Neologisms, contaminations, anatomical self-references, card descriptions, explosive responses	Normal	Confabulation. Many animals, self-references, explosive	Card descriptions

THEMATIC APPERCEPTION TEST (T.A.T.)

After the Rorschach, the T.A.T. is almost certainly the most useful projection test in clinical work. First described by Morgan and Murray in 1935 (Murray, 1943) the true T.A.T. has undergone little modification since, although the principles on which it is based have been applied to other material.

Material. This consists of thirty pictures—ten for men, ten for women, and ten which are used for both sexes—chosen from illustrations to magazines and from art galleries. Each picture is photographed on to a white card.

Procedure. The test as described by Murray is given in two sessions, ten cards being used in each. The subject is asked to make up a story about each picture individually, indicating particularly what is going on in the picture, what led up to the scene, and how the situation will work itself out. Some prompting can be given in the form of questions

to elicit these points, but should be avoided if possible. Leading questions must only be used to probe specific areas of thought.

Scoring and interpretation. Scores are not quantified, but are based on the supposition that the subject will identify himself with the hero of his stories, and will describe in his plots all the stresses, conflicts and problems which he meets in his own inner life. He will also give some indication of how he would deal with these.

In analysing the stories, the following points are regarded as the significant features:

Hero. What sort of person is he or she—masterful, submissive, dissatisfied, cheerful? Note is made of the needs, habits, emotions and attitudes attributed to the heroes in the different stories, and it is presumed that those tendencies which occur more than once are likely to reflect the subject's own personal tendencies. There is said to be a tendency for homosexuals to misidentify the sex of the hero in some pictures: other subjects have difficulty in telling stories about pictures in which they cannot identify themselves with the principal character.

Press. What sort of things influence the hero? What sort of life does he lead? What are the factors which benefit him? Recurrent ones are likely to be drawn from the subject's own personal experiences.

Thema. What happens in the story? How does it progress? This will reflect the subject's own desires or reactions to a situation.

Outcome. The outcome of the story reflects the subject's attitude to life. It will show whether he is pessimistic or optimistic: whether he sees it all in turmoil or settling into peaceful quiet. It is often from this part of the story that a clinician will gain the most valuable insight into a subject's mental state.

Analysis of the T.A.T. along the above lines gives one a thumbnail sketch of a person's inner mental life, and especially how he sees himself. It does not give a clinical diagnosis, but the main features of T.A.T. responses which are seen in five different diagnostic groups are shown in Table 2.

Application. The T.A.T. is best used, not as an alternative to the Rorschach, but as an addition to it. Whereas the Rorschach shows how a subject's personality is made up, the T.A.T. shows how it got like that. The Rorschach shows how he will react, the T.A.T. how he has reacted in the past, either overtly or in imagination. The two

TABLE 2

Diagnostic category	Approach	Content
Schizophrenia	Circumstantial, incoherent. Neologisms, strange modes of expression, lack of causal connections. Blocking; incompleted sentences	Bizarre, incoherent; delusional incursions, irrelevant soliloquies, literal descriptions, socially unacceptable content. Stories may continue from one picture to the next
Neurosis	Aware of self-revealing and probing nature of test. Try to avoid giving away anything	Tend to show need of achievement and dominance
Anxiety states	Stories tend to be brief, show much conscious identification with hero	Readily autobiographical. Conflicts often superficially futile; action dramatic
Depression	Retarded, stories fragmentary, speech halting	Projection of guilt and sin; gloomy
Organic	Hesitant, "perplexed", no coherent stories. Pictures described; little projection	Consists almost entirely of picture descriptions

tests can be used independently or together, but it is a mistake to think that one can be substituted for the other. They do not both give the same information.

The T.A.T. has valuable application in personnel selection and modifications of it have been used in social research projects, but it is in the field of clinical psychology that it has been most widely applied.

Variations and modifications. There are probably few clinical psychologists who still use the T.A.T. exactly in the way described by Murray. The majority of workers shorten it by selecting the pictures most suitable to their particular problems, and restrict the test to one session instead of two.

The test can be given to groups, but here it is necessary to ask the subjects to write their stories instead of speaking them. Probing of particular areas can be undertaken later, but except for screening purposes, this is not to be recommended. A subject in such a situation will give his "second thoughts" rather than his immediate reactions, and is less likely to reveal all the information a clinician might find helpful.

The story-telling technique can be and often is used with different pictures. For the examination of children, a special set of pictures has been developed by Bellak and Bellak (the C.A.T.). In several research projects, new pictures have been drawn in an attempt to probe special spheres of mental activity, or to provide stimuli in a more quantified manner.

Other projection tests

ROSENZWEIG PICTURE-FRUSTRATION TEST (see Rosenzweig, 1947)

This test was first described by Rosenzweig in 1944 and is mainly used to measure group conformity. In the clinical setting it has little general application.

Material. Twenty-four pictures each depicting two figures in a particular situation are shown to the subject one at a time. In each picture one of the figures is doing something to frustrate the other. The faces of the people and the caption blocks are left blank, and the subject has to write in the caption block what he thinks the frustrated person is saying.

Scoring is based on the supposition that the subject identifies himself with the frustrated person. Scores are based on the number of intra- or extra-punitive tendencies shown by the subject in the spheres of obstacle-dominance, ego-defensiveness and need-persistence.

SZONDI TEST (see Deri, 1949)

This test was produced in Hungary some years ago, but was not used in the West till 1946. The simplicity of the idea caught the imagination, and the test was received with widespread acclamation and interest. In the years shortly after the Second World War, it was applied extensively, but examinations of the results showed it to be highly unreliable and unrevealing.

Material and procedure. Material consists of forty-eight photos in six sets, each set containing a picture of a homosexual, a sadistic

murderer, an epileptic, a hysteric, a catatonic and a paranoid. The subject has to choose out of each set the two photos he *likes* and the two he *dislikes* most.

Scoring. Choices are entered on a profile form and are said to give an indication of latent tendencies. In particular, disliked choices are said to represent repressed or sublimated tendencies.

MAKE-A-PICTURE STORY (M.A.P.S.) (Schneidman, 1952)

This test was published by Schneidman in 1952. It has been much quoted in recent papers, but its validity has yet to be proved.

Material and procedure. Twenty-two picture backgrounds are provided which can be fitted on to a toy theatre. Sixty-seven cut-out cardboard figures form the other section of the test material. For each background, the subject has to select two figures and tell a story about them.

Scoring is based on psycho-analytical principles and the stories are treated in much the same way as the T.A.T.

WORLD TEST

This was first published by Lowenfeld in 1939; it was later adapted by Bühler in 1949, and has considerable use with children.

Material and procedure. A large number of miniature pieces, including houses, people, animals and vehicles are set up before the subject, who is told to "Make whatever you like out of any of the pieces".

Scoring is based on a number of criteria including the number and variety of objects used, closed or fenced-in arrangement, rigidity, organisation, aggression (use of lethal weapons, animals hurting men or vice versa) and the amount of space utilised.

4. Drawing Tests

The use of drawing tests in the assessment of personality have much the same advantages and disadvantages as other projective tests.

Advantages. They are often advocated for use with children, with illiterates, and with people who might not co-operate on other tests. They may also lead a subject on to verbalise about repressed or suppressed material.

Disadvantages. Scoring is even more arbitrary and subjective in these tests than in most other projective techniques. There is a lack of normative data, and diagnostic patterns are not clearly recognised.

(1) BENDER–GESTALT

First used as a measure of maturation and adjustment in children, (Bender, 1938), it has since then been extensively used by many workers, mainly as a measure of adjustment, and as a means of distinguishing organic from psychotic conditions (Pascall and Suttell, 1951).

Material and procedure. The subject has to copy eight fairly simple designs consisting of dots, circles and lines.

Scoring is based on such things as arrangement of designs on the paper, accuracy, distortions, angle of lines to one another, omissions.

Interpretation. There is so much overlap of scores said to be diagnostic of immaturity, organic disorder and psychosis, that the test has little diagnostic value, although it may give some insight into the subject's difficulties in the visuo-motor and perceptual spheres.

(2) DRAW-A-PERSON TEST

This was first described by Machover in 1949. The subject is first asked just to "Draw a person". After he has drawn one person he is told "Now draw one of the opposite sex". After the drawings, he is asked to "Make up a story about them". Comments are noted and are followed up by an inquiry.

Scoring is based on various factors such as absolute and relative size of masculine and feminine figures, positions, quality of lines, omissions and disproportions of parts, etc.

(3) HOUSE-TREE-PERSON (Buck, 1950)

The idea stems from the Goodenough test (see Intelligence). The subject is asked to draw each of the above objects in turn. Spontaneous comments and behaviour while drawing are noted. The drawings are followed by a period of "post-drawing" interrogation.

Scoring. Pathological indications are based on line-quality, self-criticism, attitude, drive, and are scored according to degrees of deviation from the average.

5. Verbal Tests

(1) WORD ASSOCIATION TEST

This was one of the first mental tests ever to be described, and is often regarded as the forerunner of projective techniques in general. Its first systematic use was by Jung (1918), and it has since been used in various forms for many purposes (see Bell). The most common

use nowadays is probably in conjunction with the P.G.R. as a "lie detector". The technique has also been used in several studies on the development and maturation of speech processes (Riess, 1946).

Material and procedure. The subject is told to "Say the first word that comes into your head as quickly as you can" after each stimulus word given by the examiner. The stimulus words are usually selected in advance to investigate various emotionally laden areas.

Scoring. Jung's method of scoring was based on (1) reaction time, (2) verbal or involuntary responses (e.g. repetition of stimulus word, muscular movement, questioning of stimulus words, etc.), (3) content of responses. Content was divided into—(*a*) egocentric or subjective responses, (*b*) supraordinate responses (naming the class to which stimulus belongs), (*c*) contrast or opposite, (*d*) miscellaneous (causality, coexistence), (*e*) speech habit (syntactical associations). The content of the response was said to give a measure of intelligence, while the other verbal and involuntary responses were looked upon as "complex-indicators".

Kent and Rosanoff (1910) analysed the content of the responses to 100 words given by 1,000 subjects. They found marked differences between children and adults in type of response, and believed that the "popularity" of responses given by a subject was indicative of many features of his personality.

(2) Sentence Completion Tests

Various modifications of the word association test have been devised to measure different traits and adjustment to different situations. The most popular is the sentence completion test. The subject is usually asked to complete a sentence or story which directs him to a certain area of thought—e.g. "I am most proud of . . .", "I feel afraid of . . .". Scoring is usually based on the areas which provoke unacceptable or anxiety-indicating responses.

CHAPTER 3

SPEECH AND LANGUAGE

THE historical background to the study of speech disorders has been fully recorded by many authors (e.g. Penfield and Roberts, 1958; Brain, 1962), but only a few of the studies in this field have taken into consideration the factors influencing speech and its acquisition in normal people, or have tried to compare and distinguish the disorders arising from organic injury with those due to other causes, such as mental deficiency and mental illness.

WHAT IS SPEECH?

Speech is a method of communication using the medium of laryngeal sounds. Each sound is associated by the common agreements of society with a certain meaning, but since people usually desire to express more meanings than there are sounds to express them with, it is often necessary for the individual sounds (phonemes) to be strung together into sequences (words), and for these sequences to be strung together in yet other relays (sentences). Speech itself is not innate, although the sounds made in speech probably are. Speech, unlike almost every other mental function, is believed to be the prerogative of man alone. Although animals may have means of communication, and although many of these means may involve sounds, the way in which man associates these sounds to meanings and *teaches* these meanings to his fellows seems to be unique (Kainz, 1961). I say "seems to be" on purpose. We still know very little about the systems of communication present in the animal world, and it is possible that evidence of speech and language (as defined above) in some animal species may be forthcoming before very long.

The sounds used in speech are broadly divided into two kinds:

(1) *Vowel sounds.* The tongue is held still, but the shape of the mouth is altered.
(2) *Consonants.* The shape of the mouth is varied: the tongue and lips are used to direct the pressure of air from the larynx.

It will be clear that in forming consonants greater voluntary control of musculature will be necessary than in forming vowels. This control seems to parallel control of other motor-skills, for it is found that in mental defectives and in those suffering from brain injury or toxic states, consonant formation is often poor, so that speech becomes slurred.

Vowels and consonants vary not only in the way they are formed, but also in their functions. While vowel sounds carry over great distances, and are therefore particularly suited to emotional (warning) cries, it is found that for the expression of ideas (whatever the language) most of the meaning is conveyed by the consonants.

Speech, in its present state is ideally suited to convey meaning, however imperfectly heard, as a great many of the sounds uttered in it are redundant. The listener can miss out nearly half the number of actual sounds a speaker makes and still grasp his meaning, as long as the interruptions are short. Moreover, the highest and lowest sounds can be lost entirely and the meaning of a passage still not completely destroyed (Miller, 1951).

Written language is not identical with spoken speech, although it, too, has to be learned. Writing depends even more than articulation on motor skills, but it also involves ability to organise visual data.

Difference between Expression and Comprehension

Although both the utterance and the understanding of language depend on learning and convention, and follow parallel stages of development, understanding precedes utterance at almost all stages. Expression and comprehension differ, moreover, with respect to ease of evocation. The shorter the word the easier it is to utter, and the more frequently it is used, but in comprehension, longer words are often easier to understand as they provide more consonant sounds than short ones. Thus when giving letters over the telephone or any other artificial communicating system, a standard word is often used to signify a letter—"A for apple, H for Harry".

In the breakdown of language, ability to utter words is often affected without any loss of comprehension. Whether the converse is also true, and ability to understand words is lost without loss of expression is difficult to say for certain, but many cases have been reported in which a subject with unimpaired hearing seems to lose all ability to understand what is said to him and yet utters words fluently, even if nonsensically.

CONDITIONS AND FACTORS INFLUENCING SPEECH

1. Development

(a) Expression

The words a person uses and the way in which he uses them are influenced by maturation.

Various stages have been described in the development of speech in children (Simon, 1959; Watts, 1944). It has been stressed by all workers in this field that words do not arise from the fortuitous combination of babbling sounds; indeed the most frequently used language sounds are not those most frequently used in babbling. The stages generally accepted are:

1. *Pre-linguistic*—reflex sounds (laughing and crying) associated with physiological states.
2. *Vocal play*—the child seems to be aware of and able to respond to his own sounds, and the sounds of others. His own babbling becomes repetitive and he mimics the sounds of others.
3. *One-word sentences* (holophrases)—words are mixed with babbling and jargon, but are different from the latter in that they are used for a purpose.
4. *Acquisition of a vocabulary*—words are given a specific meaning and are used with greater differentiation than in stage 3.
5. *Two-word sentences*—proper names are used, often in conjunction with verbs—e.g. "Mama gone."
6. *Transition verbs*—two nouns are combined with a verb to form sentences—e.g. "Dog—hurt—baby."
7. *Prepositional phrases*—simple prepositions are included in sentences—"Baby put ball *under* chair."
8. *Temporal clauses*—e.g. "*When* I go, you come too."

9. *Causal clauses*—these include the word "*because.*"

10. *Conditional clauses*—these include the word "*if.*"

11. *Subordinate clauses*—a relative pronoun is used as an object as in the sentence, "I have a cat *which* I feed every day".

The refinement of language is a skill which continues to develop during the whole of childhood and often into late adult life. The acquisition of new words may never cease. With maturity and sophistication, however, there is a tendency to use fewer words than in youth. Where a child may need three or four common words to describe an object or an event, an adult may be able to use one specific noun. A child talks about "the thing that pulls corks out of bottles", an adult about "the corkscrew". Thus with increase in the number of different symbols used, there comes decrease in redundancy. The stage of elaboration is followed by one of pruning.

In the breakdown of speech, the loss of this ability to prune may be one of the first signs of disfunction; conversely, when speech is recovering after temporary disablement, circumstantiality and over-elaboration are often the last symptoms to clear up (Elvin and Oldfield, 1951). This is probably due to the necessity of using several common words to replace the rare one which cannot be evoked.

The pronunciation of a word and the correct use of a word in a sentence from the syntactical point of view does not imply that the word is necessarily given its correct meaning. In such cases, should one consider the error to be an error of language or one of thought? This is often a difficult point to determine, and one which has led to considerable confusion.

The development of language to convey meaning, and the connection between speech and thought have been discussed by philosophers and psychologists from time unrecorded. Most authorities are agreed that much human thinking is dependent on the use of language. As O'Connor and Hermelin (1962) put it, we tend to ascribe to each object a symbol or name, and when thinking, to work within this verbal framework. These authors have demonstrated that imbeciles find such a process difficult. Below a certain mental age, working within verbal systems is extremely slow, yet even imbeciles often manage to acquire a vocabulary and formulate simple sentences to express their desires. Thus, language can be considered as having

two aspects: (1) The acquisition of symbole or simple "stock phrases" (see Watts, 1944), (2) The manipulation of these to express ideas.

Many authors (e.g. Miller, 1951; Skinner, 1957; Piaget, 1926) have outlined stages in the development of the second phase—that of manipulating words to express ideas. There is little evidence, however, that when language breaks down, any of the phases so far suggested by these or other authors are recapitulated, although loss of succinctness and a tendency to be circumlocutory in expression may appear in organic conditions, even when the ability to pronounce individual words remains intact.

The acquisition of language also leads to the establishment of verbal habits, which may influence or affect thought processes. These have been studied experimentally by means of word association tests and measurement of the physiological processes which accompany them. In one experiment, using the P.G.R. as the measuring instrument (Riess, 1940), it was found that the greatest generalisation to conditioned words was given to a synonym by adults, whereas in children it was given to a like-sounding word. A similar tendency for word-threshold to be altered with age is to be seen in the verbal responses to word association tests. Children up to the age of 11 years tend to respond to a stimulus word with related sounding words, while adults respond with synonyms (Miller, 1951).

(b) Comprehension

Comprehension proceeds at a rather different rate in childhood from expression. The milestones given by Miller (1951) are as follows:

(1) *At* 2 *months*—the baby changes its activity at the sound of a human voice.
(2) *At* 6–9 *months*—the baby changes attention at the sound of familiar words, selecting some as more interesting than others. Words habitually accompanied by gestures (e.g. "Bye-bye") attract attention earliest.
(3) *At* 12 *months*—there is understanding of the word "No".
(4) 17 *months*—the baby understands short commands such as "Give me that", and can point to parts of the body to command.
(5) *At* 2 *years*—the baby echoes sounds.

Although there is considerable variation in normality in the chronological age at which any child may reach any of the stages listed above, speech acquisition tends to be slower than normal in children with a history of birth injury (Myklehurst, 1959), and is greatly retarded in those who show mental deficiency in later life.

2. Intelligence

The acquisition of speech is dependent to a large extent on intelligence. This factor not only affects the development of thought and meaning, but also the acquisition of words (Matthews, 1959). Idiots (I.Q. less than 25) usually remain mute, or at the best learn to jabber. Imbeciles (I.Q. 25–50) and Morons (I.Q. 50–80) differ mainly from normal individuals by being much slower to reach the milestones of speech development, in failing to achieve a wide range of words (vocabulary) and in poor sentence construction.

In addition it has been claimed that they use more elementary sounds in their speech than normal individuals. Emotional calls and vowel sounds are well developed in the mentally retarded (Miller, 1951). Analysis has been made (McCormick, 1957) of the sound-types uttered by subjects with high or low I.Q. Briefly, the differences are:

Measure	High I.Q.	Low I.Q.
Syllable duration	Long	Short
Syllable intensity	Great	Small
Percentage speech time	Much time used making sounds	Long pauses
Pitch variability	Great	Small

Not all words are learned equally easily by mental defectives. A summary of the impressions gained by one speech-therapist (Renfrew, 1959) is given below.

(1) Nouns are easier to learn than verbs but—
(2) Mental defectives experience some difficulty in learning to differentiate between objects of a similar nature or texture. The word "basket" is applied to both a shopping basket or a waste-paper basket, the subject failing to see the difference between them.

(3) Prepositions—except *in, on* or *under*—are acquired with difficulty.
(4) Defects are often seen in the formation and building of sentences (syntax).

The mental defective who wishes to converse but lacks the words to do so, frequently resorts to echolalia (Renfrew, 1959; Stengel, 1947).

In both the child and the normal young adult, there is a close correlation between the acquisition of words, and performance in the other spheres of mental activity indicating intelligence. As O'Connor and Hermelin have shown, mental defectives do not seem to use words as a control over their actions or behaviour to the same extent as brighter people, even though the ability to perceive, remember, learn and generalise may be as good in them as it is in normals, in situations where words cannot be employed (e.g. when sorting or remembering "nonsense shapes"). Hence, I.Q. is usefully assessed by verbal tests, especially those involving definitions (vocabulary) and those involving the appreciation of word-relationships. Lack of intelligence is reflected in a small vocabulary, in the concrete use of words, in lack of logical reasoning, and in sentence formation of the primitive type. High intelligence is reflected in a large vocabulary, and in the ability to express ideas succinctly with lack of redundancy. With increasing age, the correlation between verbal and non-verbal intelligence tests declines, due to specialisation and habit. The people whose work or hobbies involve the use of speech may continue to increase their vocabulary, but in subjects who have led a more practical existence, vocabulary and the ability to express oneself verbally may decline.

3. Culture and Upbringing

Since language is evolved predominantly to expedite communication with other people, the enormous extent to which it is influenced by culture and upbringing is not surprising. This is no place to discuss the comparative differences of languages throughout the world (this has been done very efficiently by many other authors, e.g. Brain), or even the changes undergone by the language of any one cultural group in the course of time; but one aspect of culture and upbringing is important from the point of view of language measurement. The

more frequently a word is used in the community in which a person lives, the sooner that person acquires it in childhood, and the more resistant it is to disruption (Rochford and Williams, 1962). Yet the frequency with which words are used changes with each decade. Words which were common in the everyday expressions of our grandparents are almost obsolete now, while new ones such as radio and television have become household words. Others, such as space and rocket, are acquiring a new meaning.

Whether the resistance of words to disruption is due to the number of times they have been used by a person during the course of his life, or to the age at which he learned them is uncertain. The relative frequency of different words fifty years ago can only be deduced now from literature, but the relative frequency of spoken and written words is not identical (see later under *context*).

Taboo words (swear words, etc.) have a special significance both to the healthy and the dysphasic subject. The many strictures placed upon them by society appear to give them added impetus. In those whose speech is impaired from organic causes, taboo words are sometimes just the ones to be uttered most readily, in the same way as they are by normal people under stress.

4. Context

Context has a marked effect on both expression and comprehension. Context may be of two kinds—(1) environmental, or physical (where a person is, and what he is trying to do), and (2) verbal (the other words in a sentence).

The influence of context is better known for its effect on comprehension than expression. A mass of data has been accumulated from the work on radio and telephone communication which has important implications for the understanding of normal speech. Comprehension will therefore be considered before expression in this section.

(a) Comprehension

The ease with which a word is understood is usually gauged by the accuracy with which it is heard against some sort of extraneous noise or interference. The familiar 'cocktail party situation' in which one tries to make out what a person is saying against the babble of con-

versations has been adapted to experiments by asking a subject to wear earphones and playing a different message into each ear. The subject is asked to repeat or shadow what he hears in one ear, and ignore what he hears in the other (Cherry, 1953).

It has been found that the accuracy of reproduction in these circumstances, although to some extent dependent on factors inherent in the listener, is also strongly influenced by (1) statistical probabilities within the message, (2) the nature of the interference.

(1) *Statistical probabilities.* If the number of possibilities is small, so that a subject only has to make a choice between few alternatives, he will need to hear comparatively little of each signal or word in order to make the correct response. For example: if he knows in advance that the word he hears will be either Yes or No, he will be able to make the correct choice if he hears nothing more than the vowels.

In most spoken speech, a large proportion of the words uttered is determined by those preceding them, i.e. the first words in a sentence determine those which shall follow and this lowers the probability of the later ones. Thus, if we hear the first words in a sentence, we can guess the ones which will come next. If we hear "God save the . . ." we can be pretty sure that the next word will be King or Queen, and therefore need to hear little of either word to understand it.

The degree to which the words in a sentence follow one another in the expected order is known as the redundancy of the passage. Methods of measuring redundancy have been described by Cherry (1953) and Treisman (1963). It is consistently found that the ease with which a passage is understood against interference or interruptions is related to its redundancy.

(2) *The nature of interference.* The greater the familiarity or emotional importance of the interference material, the more disrupting its effect. In the normal cocktail party situation, it is a common finding that one's attention may suddenly be distracted by the sound of one's name or by the ring of a familiar voice. Both of these variables have been tested experimentally in the two-channel earphone situation, and both have been found to have a significant effect on comprehension (Treisman, 1963). An unfamiliar foreign language has very little effect on a subject, compared to a stirring passage in his own language.

(b) Expression

Some words tend to be uttered much more often than others. The frequency with which 30,000 different common words of the English language have been used in a wide sample of literature has been estimated by Thorndike and Lorge (1944). Short words with an indefinite meaning (e.g. "thing") are in general more frequently used than longer words with a specific meaning. The correlation between word-length and frequency may, however, be due to the tendency to abbreviate words that are used a great deal (i.e. "phone" for telephone, "telly" for television). The utterance of a word, like its comprehension, depends on both the general environmental aspects of its context, as well as on the words surrounding it. In writing, the most frequently used word is *the*, although on the telephone, the word with the highest frequency is *I*.

Perceptual factors may increase or decrease the tendency to word-formulation. When subjects are asked to name objects, those which are seen most easily are named most readily. This is not just due to the obvious fact that a person clearly cannot name an object till he knows what it is. Even *after* he knows what it is, he still seems to have difficulty in finding the correct names for rare objects (Oldfield and Wingfield, 1964).

Verbal context is just as important as general context. The first words of a sentence decide to some extent those which follow. If ten people are asked to put one word in the space at the end of the following sentence—"A bird has wings so that it can . . ." the likelihood is that all will put the word "*fly*". In the space at the end of the following sentence—"On looking up I saw a great . . ." the chances are that each will put something different. The tendency with which one word follows another—i.e. the likelihood of a word being expressed in a given sequence—depends on:

(1) The meaning of the sequence as a whole.
(2) *Association.* Words come to be associated with one another in a sequential way. The word *the* so often follows *of* that after hearing *of* there is a strong tendency to say *the*. The tendency of one word to arouse another has been much studied in word association experiments and tests.
(3) *Phonation.* There is a strong tendency to say a word with a similar sound to that which preceded it (alliteration) despite

the meaning. If a person is asked to complete the series *danger, dancer, desperate, dog, —*, he is likely to put a word beginning with the letter D. In patients who have difficulty in expression due to cerebral pathology, it is found that words of lowest frequency—i.e. rare as judged by the Thorndike/Lorge count—are lost sooner than those of high frequency (i.e. common), but the other factors and variables affecting expression still apply. A word is easier to produce if a "warming up" context is given than if it is in isolation (Rochford and Williams, 1963).

The most satisfactory way of accounting for all these findings is to assume that each word has a given threshold to production, and that this threshold can be raised or lowered by the various factors mentioned. Words of high currency (common ones) have, in general, a lower threshold than those of low currency, but the threshold of a high currency word may be rendered lower than that of a low currency one by contextual factors. In pathological cases, the same rule generally applies, but the threshold of all words is raised.

5. Cerebral Dominance

The idea that speech and language functions are dependent on healthy activity within the left cerebral hemisphere, is due to two main findings:

(1) The association between faulty speech development and left-handedness in children.
(2) The prevalence of speech disorders in left-hemisphere lesions.

For many years, the belief was held that stammering and stuttering were associated with left-handedness, or with crossed cerebral dominance (the dominant hand and eye being located on different sides of the body). Whether this is so, or not, is still in some doubt.

Evidence of crossed cerebral dominance in stutterers was demonstrated in a large group of cases by Bryngelson (1942). Although psychological factors may also be important in the development of stuttering (Hill, 1944) E.E.G. studies show a high proportion of abnormally distributed cortical excitability in stutterers, and the fact that stuttering occurs more often in boys than in girls (Ainsworth, 1959) also suggests that a constitutional factor is probable.

The frequency of other forms of speech disorder in left-handers

has not been reliably demonstrated, although among the children who have reading difficulties at school (dyslexia), above the normal proportion are left-handed. One of the difficulties is assessing the relationship undoubtedly is that of determining handedness. So-called left-handers include a large proportion of ambidextrals, and as a general rule, left-handers are not so unequivocally sinistral as right-handers are dextral (Humphrey, 1951). Again, the fact that an individual uses his left hand for a number of activities does not prove that he is right-hemisphere dominant.

Among children who show disorders of speech development, there is a high frequency of other signs suggesting impaired left cerebral activity (Zangwill, 1961). There is frequently mirror-writing, sinistral scanning, poor copying, etc. These disorders are not necessarily accompanied by left-handedness, although left-handedness is common in the family history of such children. Zangwill concludes that although the majority of left-handed children probably have no reading or writing difficulties, these difficulties when they occur may be due to cerebral ambilaterality.

In summary, it seems that the effect of cerebral dominance on speech development is still uncertain. If cerebral dominance *is* influential, the effects of left-handedness are mainly as follows:

(1) Retardation in the development of speech.
(2) Blocking of the articulatory mechanism, causing stuttering.
(3) Specific disturbances of reading and writing, associated with defects of visuo-spatial construction.

In adults, data relating the function of language to activity in the left cerebral hemisphere in right-handed people have been accumulating for many years. The possibility that in left-handed people it might be mediated by the right hemisphere seemed therefore obvious, but extensive recent evidence on this topic has been provided by Russell and Espir (1961). Analysing the locality of wounds and the nature of speech disorders following them in 1,166 soldiers injured during the last war, they conclude that the left hemisphere is more concerned with language than the right, whichever the subject's preferred hand. Whether it is possible to go further and localise different types of language disorder (central aphasia, motor aphasia, agraphia and alexia) with lesions in different parts of this hemisphere, is not so certain. For such to be possible, it would be necessary to have a

reliable quantitative measure of language function, as well as adequate methods of determining exactly what parts of the brain have been damaged. Neither of these two requisites are available at the moment.

DISORDERS OF SPEECH

Disorders may be either congenital or acquired. Congenital disorders are due to either inheritance or to pre-natal trauma, causing injury to the left cerebral hemisphere. In these cases, it is usual for the right hemisphere to take over the function of language, in which case subjects show many of the tendencies already noted in left-handed people or even mutism, dysarthria or generalised retardation. Some of these disorders are often associated with faulty development of other sensory or motor functions, though care must be taken not to confuse dysphasia in children with deafness. In some cases of mild congenital disorder, the only psychological evidence of trauma may be relative impairment of verbal fluency on intelligence tests (Annett, Lee and Ounsted, 1961).

Acquired disorders may arise from a number of different causes, and result in a variety of defects, most of which are recognised qualitatively rather than quantitatively. The causes of acquired speech disorder are (1) mental illness, (2) general cerebral atrophy, (3) focal lesions in and around the temporal lobe of the dominant cerebral hemisphere.

1. Mental Illness (Schizophrenia)

Language function is frequently altered or disturbed by mental illness, especially schizophrenia. Comparatively few studies have been made of the disturbances in conditions other than this, but Busseman (see Miller, 1951) reports that the ratio of active (verbs and adverbs) to qualitative (adjectives) words, used by children showing emotional instability is higher than average, and decreases as improvement in emotional integration takes place.

In an analysis of fifteen neurotic patients Balken and Masserman (1940) found the characteristics shown below:

Diagnostic category	*Language characteristics*
Obsessional–compulsive neuroses	Lavish use of qualifications
Conversion hysteria	Many adjectives but few verbs
Anxiety states	More verbs than adjectives

Payne *et al.* (1959) found that when interpreting proverbs, schizophrenics used more words and took a longer time than did neurotics, and appeared to accept that neurosis alone did not affect language as such.

The language of schizophrenics

Verbalisation may be grossly impaired in schizophrenia but disorders of speech do not occur in all schizophrenics, nor are they necessarily constant in any one group or in any one single patient. The disorders of speech which have been described include:

(1) Constriction of vocabulary (Whitehorn and Zipf, 1943) and reticence (Gottschalk *et al.*, 1961); sometimes mutism.
(2) Concreteness (which has been defined by Goldstein, 1948; Payne *et al.*, 1959) of thought and expression.
(3) Irrelevancies and changes of context, including circumlocution and substitution.
(4) Perseveration of single phrases, stereotypy or echolalia.
(5) Paraphrasias, neologisms, and word-salads.
(6) Alterations of tempo, continuity, cadence and rhythm.

The degree of disturbance present in the speech seems to be a fairly reliable indicator of severity of illness, in that as the patient improves in other respects, so his speech returns to normal (Gottschalk, 1961). Much attention has been paid to the similarities and differences between the speech disorders of schizophrenia and those seen in (1) children, (2) organic intellectual deterioration, and (3) patients with localised cerebral pathology (aphasia).

(1) Similarities between the *speech of children* and those of schizophrenics were studied extensively by Storch (see White, 1926). Similarity between the speech of a child and one schizophrenic with childish tendencies were noted by Whitehorn and Zipf (1943) in that both showed egocentricity and little diversity. Cameron (1938a) found no similarity between the way sentences were completed by children and their completion by schizophrenics in various stages of dilapidation.

Using sentences such as "The man fell down because . . .", Cameron divided the children's responses into three groups following Piaget: (1) motivational, (2) those showing logical justification (3) those showing appreciation of cause and effect. In young children

type (1) responses predominated, but with increasing intellectual development, responses tended to show more appreciation of cause and effect. Schizophrenics with speech fragmentation, according to Cameron, showed no regression down the scale of development. With increased disintegration of speech function, the only outstanding tendency was for type (2) responses to increase.

Cameron subdivided the schizophrenic responses into three types:

(1) Asyndetic—those showing paucity of genuine causative links.
(2) Metonymic—those showing "near misses".
(3) Interpenetrative—those showing personal references and projection.

Only responses of the first type (asyndetic) were common in children.

(2) Comparing the speech of schizophrenics with those of patients suffering from *senile dementia*, in the same situation as that described above, Cameron (1938b) again found differences between the two groups. The senile patients showed none of the disorders seen in schizophrenia. Their only failures on the sentence completion test were due to disorientation, lack of knowledge, or faulty memory.

(3) Comparisons between the speech disturbances of schizophrenia and those of patients suffering from focal *cerebral lesions* (aphasia) have been made by several authors. Schneider (1927) compared them for form, expression and articulation. He noted that schizophrenics showed no language impairment in the absence of thought disorder, and that whereas the sentence design was seldom disturbed, it was the end product, or meaning which went astray. In organic dysphasics on the other hand, the meaning or intention was unimpaired whereas words might be missed out and sentence construction was often imperfect. Fleischbacker (see Woods, 1938) found similarities between a number of schizophrenics and organics in the field of word-finding and circumlocution, from which he concluded that in some schizophrenics, focal cerebral lesions might occur. Angyal divided the speech disorders of schizophrenics into three groups: (1) those whose speech disorder was secondary to thought disorder, (2) the aphasics, (3) those showing formal disturbances of speech.

Woods (1938) discussed all these findings and made further comparative studies of his own, from which he could find no similarities between the speech disturbances of schizophrenics and organics.

A quantitative comparison between the language disorders seen in a group of long-stay schizophrenics whose verbal communication had been severely restricted for a minimum of eight years, with those in a group of patients suffering from senile dementia, was made by Rochford and Williams (1963). It was found that in both groups of psychotic patients, comprehension was more impaired than expression, relative to a group of patients suffering from organic speech disorders, but the type of error made by the schizophrenic patients was different from that seen in any other category of subjects. When asked to point to named objects, the schizophrenics often pointed to an object close to but just to the side of the object named, suggesting negativism rather than true failure of comprehension.

On a test of naming common objects, schizophrenics showed differences from both children and patients suffering from organic dysphasia. In both the latter groups, an important factor in determining failure is frequency of usage—the rarer a word in common usage, the harder it is to find. The failures of schizophrenics did not show any relation to word-frequency, but often seemed to be due to faulty recognition of the object to be named.

The schizophrenic and senile patients did relatively better on tests of writing and reading aloud than the organic patients, but were not so good on a test in which words had to be matched to pictures.

Attempts to differentiate *disorders of speech from those of thought* in schizophrenia have been made by many people, but seldom with any great success. Tests of verbal classification, proverb definition, etc., usually produce equivocal results.

The basic defect in schizophrenic speech has been considered by the majority of the above authors. Considering the wide variety of schizophrenic illnesses which are often grouped together under one heading, the different degrees of illness which are possible but are seldom treated separately, and the variety of tests used, there is an astonishing amount of agreement in the conclusions reached.

The basic factors (*Grunstörung*) which have been postulated can be divided into two groups: (1) mechanical, (2) psychological.

(1) *The mechanical factors* postulate some form of disturbance affecting the stream of expression. Kraepelin regarded the basic disturbance as a derailment of associations. Bleuler postulated a "dynamic" factor, absent in sleep and in schizophrenia but present

in waking, which underlies the direction of thought and expression in normal people.

(2) *The psychological factors* postulated concern withdrawal, resulting in egocentricity and associability. As Cameron puts it: "In asyndesis, the patient finds it inconvenient to put himself in another's place; in metonymic thinking he does not feel it is necessary, and in interpenetration he is no longer able to effect it."

Both the psychological and mechanical interpretations agree that in schizophrenia, the disturbances of speech are mainly governed by those of thought. The patient is like one talking in his sleep. The rules of social communication are absent, and verbalisation follows the same logic as the thought processes seen in dreaming. Indeed, Cameron (1939) who compared the performance of schizophrenics on a sorting test with their verbalised account of what they were doing, found the same types of disorder to be present in the manipulation of objects as it was in that of words.

In *manic-depressive illnesses*, disorders of fluency and intonation are often seen, but syntax and word-finding are usually unimpaired.

2. Cerebral Atrophy

Impairment of verbal fluency often features in the syndrome of general mental deterioration in senility. In the pre-senile psychoses, it is especially associated with Alzheimer's disease, in which post-mortem studies frequently reveal extensive degeneration within the temporal lobes.

The general course of dissolution undergone by speech in association with senility has been described by Mayer-Gross, Slater and Roth (1960). Three stages are recognisable as follows:

(1) Naming difficulties and lack of precision.
(2) Speech is reduced to simple phrases, in which sounds and propositional forms remain intact, but which contain little meaning. Speech tends to go on endlessly and to be repetitive. Patients can comprehend the general trend of a conversation but miss the details.
(3) Comprehensible speech is limited to one or two sensible utterances or to echolalia. There is much repetition of inarticulate material.

Mayer-Gross, Slater and Roth suggest that syntactical errors and faulty speech structure are seldom seen in the senile speech disorders, in contrast to those due to focal lesions in younger people.

Cameron (1935a) as has already been mentioned, compared the performance of seniles with that of schizophrenics and children on tests of sentence completion, and noted striking differences between the three groups. The failures made by seniles were mainly due to disorientation and circumstantiality.

3. Focal Cerebral Lesions

Impairment of speech is frequently found in patients suffering from organic lesions involving the dominant hemisphere. Classifications of the disturbances have been made by many people, and can be divided into two broad groups: (1) those who regard all the disturbances as due to quantitative variations of a single disorder, (2) those who assign the defects to qualitatively different categories.

All observers agree that disturbances of articulation, expression, comprehension and of the written language may occur independently of one another, and that relative disturbances in the different spheres may occur with lesions in different cerebral areas (Table 3).

TABLE 3

Language function	Disorder	Cerebral area associated with it
Articulation, phonation	Dysarthria	Frontal or cerebellum
Expression	Motor dysphasia	Fronto-temporal
Comprehension	Sensory dysphasia	Mid-temporal
Reading, writing	Dyslexia, dysgraphia	Postero-temporo-parietal

However, there is much individual variation in the types and degrees of disorders following organic cerebral disease, and even the complete absence of a speech disorder in a patient does not rule out the presence of a lesion in the dominant hemisphere.

If it is difficult to correlate the site of a lesion with a speech disturbance, and it is even harder to say anything about the causal nature of the disorder. Almost identical symptoms have been noted after vascular lesions, space-occupying lesions, bullet wounds and closed head injuries. In fact the character of the functional disorder following

a cerebral disturbance is related more closely to the function itself, to how it has been built up and how it is normally performed, than to the cause or site of the disturbance.

Variability. Disorders of speech due to focal cerebral lesions are not necessarily permanent and irrevocable. Schuell (1961), indeed, classifies all the organic disorders of speech according to their prognosis, and maintains that this depends rather on the degree of disorder seen in the early stages following trauma, and on the concomitant disturbances present (apraxia, etc.), than on other variables. The groups identified by this author are shown in Table 4. Schuell provides details of the methods by which each group may be assessed and identified.

Variations, however, are not confined to progressive improvement or deterioration. In the case of all organic disorders, there are large day-to-day and even moment-to-moment variations. A person may feel that he can speak fluently at one moment, and yet be struck dumb another. These variations are also often noted by those in contact with a patient. But are they really due to some freeing or blocking of the tongue, or may they not be accounted for by alterations of the conditions controlling language function?

Tests in which difficulty and context are both carefully controlled, suggest that the moment-to-moment variations of the dysphasic are not as large as has often been supposed, and indeed may be almost entirely dependent on variations within the environment which seems to raise or lower word thresholds (Rochford and Williams, 1963). As spontaneous improvement does occur, it consists of a lowering of threshold for each word, so that each word becomes available with less reinforcement than it needed before. In deterioration, the converse applies.

The relative value of different therapeutic techniques has so far only been assessed anecdotally, but there is close agreement between all observers. It is generally felt that attempts at retraining based on repetition are more likely to hinder than to help. Not only does a subject fail to improve, but his frustration and disappointment may lower his self-confidence and so impair what little function he may have felt. Rehabilitation aimed at (1) discovering the optimal conditions for a person's performance, and (2) restructuring his environment so that these conditions apply, seem to be the most satisfactory (Butfield, 1958; Zangwill, 1947; Mitchell, 1958).

TABLE 4

Group	Criteria	Prognosis
1	Almost total loss in all modalities. No functional speech, reading or writing	Poor
2	Visual and motor functions intact. Reduction of vocabulary and retention span	Excellent
3	Reduction of vocabulary and retention span plus impairment of visual discrimination, reading and writing	Excellent for speech: reading and writing slower
4	A. Reduction of vocabulary and retention span with severe sensory-motor impairment—differs from (1) by good use of visual cues and comprehension of short units	Slow, but responds to treatment
	B. Reduction of vocabulary and retention span with motor loss. Speech hesitant and laborious	Good recovery of speech, although it never becomes automatic
5	Impairment of auditory, visual and motor processes subserving language, plus emotional liability	Improvement largely dependent on emotional status
6	Severe auditory imperception plus jargon	Guarded

THE MEASUREMENT OF LANGUAGE

The measurement of speech for clinical purposes relies mainly on eliciting *signs* of breakdown. It depends on the assessment of qualitative rather than quantitative defects.

The measurement of dysphasia in children is a difficult and specialised task. The differentiations of speech disorders from those of hearing and intellectual deficiency depend on elaborate equipment.

The measurement of dysphasia in adults depends on placing the subject in a number of different situations and noting his responses. Errors of a characteristic type are noted.

Procedures have been described by Head (1926), Goldstein (1948), Weisenberg and McBride (1935), Penfield and Roberts (1959), Schuell (1960), Eisenson (1954), Bay (1960) among others. Some of them involve complex measuring equipment; all demand a long time. Klein and Mayer-Gross (1957) describe a short series of tests which can be applied at the patient's bedside and do not take long to administer. They cover the fields outlined in the last few pages here.

None of these tests makes full allowance for all the factors known to influence speech, and from none of them is it possible to draw conclusions regarding the *relative* loss in the different language spheres, based on the performance of normal people. For example, allowance is not made for the fact that the same object does not present the same difficulty in a naming task as it does in a test of comprehension. Thus, if the same objects are used on both tests, it is impossible to say whether a person is more severely disturbed in naming than in comprehension.

Rochford and Williams (1964) have tried to overcome this difficulty by providing a scale for the measurement of dysphasia, based on age of acquisition. The close parallel found between age of acquisition in children and breakdown in dysphasia in some language spheres suggests that a person's relative verbal age in the different language spheres should indicate specific degrees of disorder in them.

To elicit the qualitative aspects of speech disorders, the following tests may be used.

1. Disturbances of Articulation

Conditions when seen. Disturbances in this sphere are only seen in the actual production of speech sounds, particularly consonants. Language is still almost perfectly understood, and the subject makes himself clear by gestures or by writing.

Errors

(1) Mutism—the subject is unable to make any sounds.
(2) Perseveration of either sounds ("Ai–ee"), single words or even short sentences.

(3) Slurring and thickness of speech, or pedantic articulation.
(4) Abnormal tone and rhythm of speech, which may be monotonous or sing-song.

2. Disturbances of Expression

Disturbances in this sphere occur commonly in free (or functional) expression, and in the finding of names for common objects.

(a) Free (or functional) speech

Conditions when seen. Subjects are engaged in conversation or asked to give an account of some period of their past lives. They may be asked to describe pictures, repeat sentences or give an account from memory of a verbal passage—e.g. a story.

Errors

(1) *Paraphasias.* Words may be used wrongly (e.g. "I was in a strange conformation") mispronounced or made up.
(2) *Faulty grammatical formulation.* Sentences may be shortened (telegraph speech), connecting words misused and misplaced, or sentences misconstructed.
(3) *Circumlocution and long-windedness (redundancy).*

The subject finds difficulty in "getting to the point" (Elvin and Oldfield, 1951). The sentence constructions made by an intelligent dysphasic may resemble those made by a healthy individual with poor verbal fluency, but can usually be differentiated from the latter by the superior thought content of the material, and by the dissatisfaction of the subject himself.

Factors influencing performance. The following factors may influence a subject's performance:

(1) *Intelligence.* Allowance must be made for a subject's basic verbal fluency, and the vocabulary he is likely to have at his command in full health.

(2) *Stress.* Subjects in a formal test situation are often under emotional stress which may inhibit performance and cause mistakes which would not otherwise be made. The speeding up of questions and the inclusion of time-stress readily produce break-down.

(3) *The nature of the task.* Familiar situations to which a subject can respond with well-rehearsed verbal patterns will elicit less speech

disturbance than those in which the subject has to formulate new phrases. Stock phrases and *clichés* will often be produced without error, when more varied sentence constructions cannot. A situation which can be talked round (such as a description of how one passes the day) will produce less evidence of disturbance than one which calls for the use of particular nouns (i.e. the description of a picture).

(b) Naming

Conditions when seen. Subjects are asked to name common objects, parts of the body, colours, etc. Opposites and synonyms may also be asked for.

Errors. Five types of error are common.

(1) Silence or blank.

(2) Perseverative—a word is given which has recently been used to describe another object, even though the subject knows it to be wrong. For example the subject is asked to name a *watch* and replies correctly, "That is a watch." Asked to name the *hands* of the watch, replies—"They're the—the watch—no, not the watch, the—the watch."

(3) The semantic near miss—the subject gives a name somewhat resembling the correct one but just short of it. For example, for the hands of the watch, he may say "the pointers", "the fingers".

(4) Assonant approximation. For example for the *hands*, the subject says "hens".

(5) Descriptive—the subject replaces the correct name by a description of the object's function, e.g. "the parts that point to the time", or by some "umbrella" term such as "thing", "what-not". Whether these errors reflect different degrees of a single disturbance, or different types of disturbance has not been established.

Factors influencing performance:

(1) *Nature of the task.* Familiar objects are named more easily than unfamiliar ones; parts of the body are named more easily than parts of objects, even though the two may be called by the same name (e.g. the teeth in the mouth are named more easily than the teeth of a comb). The ease or difficulty with which a name is pronounced (its threshold to expression) seems to be associated with the age at which it was acquired (Rochford and Williams, 1962). In both cases, difficulty is related to frequency of word usage—the more

commonly used words being the first learned by children and the last lost in dysphasia.

The giving of antonyms and synonyms are usually found to be more difficult than the naming of concrete objects, but antonyms which are frequently associated together (e.g. day–night, black–white) present little difficulty. Indeed the word *white* may be given in answer to the question "What is the opposite of black?" when it cannot be given to describe a colour. This is probably due to the effect of context—see below.

(2) *Context.* Names can often be produced in a sentence when they cannot be produced in isolation. Thus a person who cannot say the word *dog* when asked to do so, may be able to say it when asked to complete the sentence "I took my . . . for a walk."

(3) *Recency of performance.* If a word has been produced relatively recently it can often be produced again, in a situation which would not otherwise elicit it. For example if the subject has just named the hands on his own person, he may be able to name the hands of a clock, although unable to do so otherwise.

(4) *Warming up.* If the examiner starts to pronounce or spell a word, the subject is often able to produce it, when incapable of doing so without such assistance. It is interesting to note that the same factors seem to affect the ease with which a name is produced by a subject suffering from organic dysphasia as influence the comprehension of distorted speech by normal individuals (see back). The more choice is restricted by context and by readiness, the more likely is the word to be expressed.

3. Disturbances of Comprehension

When seen. After establishing that there is no hearing loss, subjects may be given various verbal commands to carry out, or be asked to point to named objects or to answer questions about a story.

Errors. These are difficult to classify, since what the subject understands can only be inferred from his behaviour. He is seldom able to express his difficulties. The behaviour of subjects suffering from disturbances of comprehension are characterised by:

(1) *Perseveration*—the first of a series of simple commands may be carried out correctly, but all subsequent commands elicit the same response.

(2) *Stereotypy*—subjects carry out a few stereotyped actions in response to all commands and respond to all questions with the same phrases.

(3) *Fragmentation of speech* often including jargon is common in this condition.

Whether the above behaviour-tendencies are secondary to loss of comprehension or really constitute a separate disorder, is difficult to say.

Conditions influencing performance. The factors influencing comprehension in dysphasia appear to be similar, basically, to those influencing it in normal people.

(1) *Speed.* Commands given slowly are more likely to be obeyed than those given fast.

(2) *Complexity.* Simple, short sentences and those of easy construction are better understood than more complex ones.

(3) *Repetition.* This has little effect on comprehension by itself. Repetition accompanied by slight variations may aid understanding, but the aid is more likely to be due to the variations than to the mere fact of repetition.

(4) *Familiarity and frequency.* Conversations about familiar topics and commands of a simple nature, referring to common acts, elicit more appropriate responses than others. Simple stereotyped questions (e.g. "How are you?") may elicit the appropriate answers where more complex ones will not. Names of common objects (assessed by asking the subject to point to one of several choices) are understood better than those of rare ones (Rochford and Williams, 1963). In this respect, comprehension parallels expression.

(5) *Context.* The verbal context in which a word appears assists its comprehension. In the grosser context, topics about which a subject has recently been thinking are better understood than those to which he is asked to turn suddenly.

(6) *Non-verbal cues* directing the subject's attention to a topic or to an object assist comprehension of language concerning it.

In general it seems that all factors limiting the choice of alternatives or otherwise assisting the readiness of a word to reach expression also assist its comprehension by an organic dysphasic, just as they assist comprehension by normal people against interference (Treisman, 1960).

4. Disturbances of Reading (Dyslexia)

Conditions when seen. Subjects are given material of graded difficulty to read, from single letters or symbols to narrative passages.

Errors

(1) *Mechanical.* Reading is slow and hesitant, and there is a tendency to work out polysyllabic words by reading each individual syllable. The understanding of words may be retained, even when ability to pronounce them is lost.

(2) *Perceptual.* Parts of words are omitted or misread. The part of the word on which an error occurs may be at the beginning, middle or end, and there is some indication that the part of the word misread may be an indication of the site of lesion (Kinsbourne and Warrington, 1962).

Factors influencing performance:

(1) *Simplicity of material.* The simpler the material, the more easily it is read.

(2) *Familiarity.* Familiar words, such as the subject's own name may be read, even though of a comparatively difficult nature.

(3) *Auditory cues.* If some words in a sentence are read aloud to him, the subject may be able to "read" the remainder.

5. Disturbances of Writing (Dysgraphia)

These are most commonly seen in handwriting. Disturbances of typewriting have been little studied.

Errors.

(1) Spelling mistakes probably constitute the most common type of error. Letters are usually missed out of words, but occasionally some will be inserted or transposed.

(2) Perseveration of loops on letters such as *m*, *l*, *e*.

(3) Reversals (*b* for *d*, *p* for *q*).

(4) Cursive (joined or flowing) handwriting may be lost, even when ability to write in capitals is retained. Circumlocution and clumsy grammatical construction of sentences are seen in the written work of many patients (Elvin and Oldfield, 1951), but are usually considered under the heading of expressive disturbances.

Factors influencing performance:

(1) *Simplicity of material.* Single letters can be written more easily than words, and single words more easily than sentences. Words

containing unpronounced letters in their spelling (e.g. lamb, cough, knife) present particular difficulty, but the subject's own name and address can frequently be written when nothing else can, except single letters.

(2) *Cues.* Cues given in a number of different ways, either visually (by giving the subject a model to copy) or verbally (by spelling the word for him) will reduce errors in the first of the above categories, but errors of the second category (perseveration and reversals) may even be increased by these factors. Thus subjects may decrease the number of perseverations or transpositions if prevented from seeing what they have written, and encouraged to write quickly and automatically.

In cases where there is disorganisation of visuo-spatial perception, words may be spelt correctly orally, even when they cannot be written down.

CHAPTER 4

MEMORY AND LEARNING

DISTURBANCES of memory are one of the commonest complaints of sick people. They are complained of by those recovering from operations and from all forms of debilitating illness (Zwerling, 1955) no less than by those suffering from mental disturbances. Complaints of failing memory are general in older people even when in fair health (Westropp and Williams, 1959), while in many individuals, a failure of memory is considered to be the basis of failure in other fields of mental activity. At the same time, memory may be impaired out of all proportion to other mental functions in a number of pathological conditions, so that an adequate measure of memory is important in clinical practice (Gillespie, 1937), not only to distinguish normal from pathological memory disorders, but also to assess changes if and when they occur. But what is memory, and how can it be measured?

THE NATURE OF MEMORY

Remembering can occur in a wide variety of settings, and is an integral part of all mental activity. Memory is traditionally divided into three stages:

(1) Registration.
(2) Retention.
(3) Recall or recognition.

It is only the third of these phases which is amenable to direct observation, and although there is some evidence that the other two may exist, the way in which they function can only be inferred.

Where memory defects are present, moreover, it is often difficult, if not impossible, to say in which stage breakdown has occurred.

Recent attitudes towards memory and learning are in favour of dropping this sharp distinction between registration, retention, and recall. In its place are offered a wide and somewhat bewildering selection of hypothetical systems and models, designed to explain the effect of experience on behaviour. These systems may take the form of mathematical formulae such as those provided by the behaviourists, especially Clark Hull, or more concrete models, such as those put forward by some protagonists of Information Theory.

These models have a useful part to play in categorising our ignorance and in suggesting lines for future research, but it is important to remember that they are still mostly unproven, and actual observations should be distinguished from the theories underlying them.

In the clinical sphere, it is more useful to consider the variables and conditioning which affect behaviour and the changes produced by them, than it is to discuss the mechanisms which might be evoked to account for such changes.

1. Learning

Learning may be defined as the modification of behaviour resulting from experience. The behaviour modified may be of an innate or reflex nature, or it may be a response pattern acquired from previous experience. It should be mentioned, however, that some of the behaviour changes which occur during the life-span of an individual may be due to maturation rather than learning, although as the two factors work very closely together, it is not always possible to distinguish one from the other.

Factors influencing learning

(1) *Reward.* We tend to repeat acts which cause pleasure and drop those which cause displeasure. "Pleasure strengthens; displeasure weakens." This suggests a close connection between reward and learning. But what is a reward? Food may be a reward if an animal is hungry, but will have little effect on the behaviour of a satiated one. Drink will only serve as a reward to the thirsty. In other words, rewards are closely associated with the *satisfaction of needs or the reduction of drives*, and this has led to the important definition of a

reward as anything which diminishes a drive (see for example, Hebb, 1948).

This, however, implies that for satisfaction or pleasure to result from an act, a previous need or drive must exist—a conclusion which is not always justified. A number of experiments carried out on animals (mainly rats) indicate that direct stimulation of certain cerebral areas (the "pleasure centres") with implanted electrodes, may act as a higher reward than any form of drive-reduction so far studied. Other instances in which learning occurs in the absence of reward are described by Broadbent (1961).

(2) *Intelligence.* Although the above conditions affect learning in all organisms, not all organisms learn as quickly as one another. They vary not only in how quickly they can learn a new task (the number of trials they need to reach a set criterion of excellence), but also in the amount they can learn in a set time and the length of time over which they retain the learned acts. What it is that really causes differences in rate of learning, is still not very certain. We tend to call it intelligence, but as intelligence is partly defined by learning-speed, this is rather a circular argument.

Various ideas have been put forward to account for it in physiological or anatomical terms, but as yet, direct evidence is still lacking.

(3) *Age.* The learning of different types of act is optimal at different ages. In man and the higher animals, it is now becoming fairly clear that we "learn" to distinguish perceptual data in very early life. Attention was first drawn to this by the now legendary observations of von Sendern (see Hebb, 1948) on people who had congenital cataracts removed in adulthood, and who, despite apparently perfect restoration of visual sensation, were never able to distinguish squares from circles or to recognise people by their faces without difficulty.

Motor skills are probably most easily acquired in middle childhood, and the rate at which such skills can be acquired falls off sharply in adults. The learning of new words and the increase in vocabulary, however, may continue into middle age if not later.

(4) *Previous experience.* Not all learning consists in developing new patterns of behaviour. A good deal of it takes the form of inhibiting or altering those already in existence—either innate or acquired. But the earlier patterns are seldom lost completely. Every now and then an individual will resort to actions thought to have been superseded or extinguished, which reappear in their entirety.

A well-known example of disinhibition is that shown by the snail (Humphrey, 1933). A snail, placed on a still lettuce leaf, will very soon extend its head and tail and begin to eat. As soon as the leaf is shaken it withdraws into its shell, but when the movement ceases it emerges again. The next time the leaf is moved, the snail does not retreat quite so far and when the movement stops, it re-emerges rather more quickly. As long as nothing happens to harm it, the snail will soon become *habituated* to the movement of the leaf, and its tendency to withdraw will be extinguished. But if someone were to blow a whistle in the vicinity or produce any other extraneous stimulus, the next shake of the lettuce leaf will be followed by withdrawal as complete as that shown originally.

One of the most important effects of past experience lies in the influence it has on the set to learn. Not only do we learn most easily those things which interest us, but we learn those we have been trained to learn. This, of course, is one of the main objects of education, which aims to teach not only facts, but methods of accumulating facts, in such a way that they will be available when required.

(5) *Subsequent events.* Not only is learning influenced by the events preceding it, but the extent to which a learned act is retained or repeated is greatly influenced by those following it, too. A great deal of the early experimental work in psychology was devoted to this subject, and there is little doubt that the more closely a task resembles that which it follows, the more seriously it impairs recollection of the first task.

Retro-active inhibition is least in evidence during complete mental relaxation, and the common idea that a task learned immediately before going to sleep will be better remembered than one learned in the middle of the day has been verified by a number of experiments.

The beneficial effect of normal sleep on the retention of learning is in great contrast to the effect of unconsciousness induced by mechanical means—i.e. by concussional head injuries or E.C.T. The latter is almost universally found to impair retention of previously learned behaviour, the damage being proportional to the degree of learning (the better a thing has been learned, the less it is impaired) and time (those learned last are the worst affected).

(6) *Factors within the learning situation.* These have been studied in many laboratory experiments, and are summarised in the majority of textbooks on experimental psychology.

The most important factors affecting learning are:

(*a*) *Repetition.* The more often a task is practised, the better it is likely to be retained.

(*b*) *Contiguity in time and space.* Two tasks which are learned together are likely to be remembered together or *associated.* Contiguity also affects the relationship between reward and learning. The faster a reward follows an act, the quicker the act is learned. On spatial tasks such as mazes, the nearer a reward is located to the turn preceding it, the quicker that turn is learned.

(*c*) *Serial position.* Whenever the task to be learned consists of a series of items—be it words, figures, or turns in a maze—the items at the two ends of the series are liable to be learned before those in the middle.

2. Memory

Not all experiences modify behaviour. An event may be brought to mind or remembered without any behaviour changes being seen, as in the case of the hardened criminal who doubtless remembers his prison sentence, but is likely to repeat the acts which incurred it without much alteration.

But when we come to assess the presence or absence of a memory, we are in a much less happy position than when assessing behaviour changes. The recollection of an event seldom reproduces it in exactly the same way in which it was experienced.

(a) Changes affected by forgetting

Some of the changes which are effected by an experience or stimulus during recall have been demonstrated by Bartlett (1932) and the Gestalt psychologists.

Some of the commonest changes are:

(1) *Displacement in time and place.* We remember having visited a place or having met someone, but exactly *when* it was and just *where* we were at the time, is often harder to establish with certainty.

(2) *Partial recollection.* One may remember part, though not the whole of an incident. Some aspects of it stand out while others are blurred. Bartlett showed that although it is usually the familiar events which are best remembered, any really odd or unexpected stimulus may be retained for a long time.

(3) *Distortion.* In remembering an event or stimulus, we are inclined to distort the original. We remember a thing as we would have liked it to be, rather than as it was. An ambiguous figure may be given a name, and then made to look more like the object named. An asymmetrical one becomes more symmetrical during repeated reproductions. The striving after meaning and striving after equilibrium have been demonstrated in a number of experiments.

(4) *Condensation.* Parts of the stimulus may be left out and other parts altered, till the object is condensed into a small, meaningful whole—or conversely,

(5) *Closure.* Pieces may be added to an incomplete figure, to make it fit more easily into a frame of reference.

These are some of the changes which occur in remembering, and which make it so difficult to measure. But that does not mean to say that we cannot study the process in another way. Instead of concentrating on analysing the function itself, we can study the conditions or factors which influence it.

(b) Factors influencing memory

Many of the variables which influence remembering are the same as those which influence learning.

(1) *Time-lapse.* That time-lapse causes forgetting was established by the classical experiments of Ebbinghaus (1885) who demonstrated that the greatest loss is seen immediately after the experience and that the rate of further forgetting is comparatively slow. Both forgetting and remembering are processes of integration and disintegration, rather than of pure loss (Bartlett, 1932).

Time-lapse, however, does not always lead to obliviscence. Sometimes there is a re-awakening of memories thought to be forgotten, shortly after the first period of forgetting—reminiscence (Ballard, 1913).

(2) *The nature of the stimulus.* Different types of event or stimulus are remembered with different degrees of ease and certainty (Rapaport, 1950; Hunter, 1957).

(*a*) Pleasant events are in general recalled more readily and are remembered longer than unpleasant ones (Rapaport, 1950), although

sometimes an unpleasant memory is "repressed" and not available to recall, rather than being truly forgotten.

(*b*) Events carrying some degree of affect tend to be remembered for longer than those without affective content (Rapaport, 1950).

(*c*) Familiar and easily assimilated stimuli (and those which form "wholes" in the Gestalt sense) are better retained in general, than their opposites (Bartlett, 1932).

(*d*) Unfinished tasks and those which give rise to some unrelieved tension are remembered better than those which are put aside as completed (Zeigarnik, 1927).

A critical discussion of these findings, together with details of the experiments on which they are based, is given by McGeoch and Irion (1952).

(3) *The manner of presentation.* The manner in which an event or stimulus is presented to a subject greatly influences the way in which it is remembered. The set to remember is of paramount importance (Belbin, 1950) in the recollection of single events, no less than in learning and in the acquisition of skills.

(4) *Events during retention interval.* Two factors are important in this sphere: (*a*) events occurring between presentation and test; (*b*) the number and time-relationships of intervening rehearsals.

(*a*) Events occurring during the time-lapse between presentation and recall have a marked influence on memory (retro-active inhibition). As in the case of learning, the nearer ensuing stimuli approximate in nature and content to the one to be remembered, the more disrupting is their effect on memory, while complete mental relaxation, including sleep, has the most beneficial effect on remembering.

(*b*) The effect of rehearsals during the time-lapse depends not only on their frequency, but also on the time at which they are made. The quicker initial rehearsal follows perception, the more accurate is memory (Williams, 1954).

(5) *The manner of testing.* Memory can be tested in two ways—by recall and recognition. The ease with which an event is recalled depends on the associative leads present at the time of recall. If a stimulus cannot be recalled spontaneously, it will often be remembered in response to cues (Williams, 1953); where these fail, it can

sometimes be brought to mind if the context is reconstructed, and more readily still if the original stimulus is re-presented in a test of recognition (Zubin, 1948; Mayer-Gross, 1943). Thus recall and recognition can be regarded as the two ends of a continuum, based on the reconstruction of the context. When memory is being tested or measured, the conditions under which recall is first elicited must therefore be carefully noted.

(6) *Individuality of the subject.* From what has been said above, it will be clear that what a person remembers of any event or stimulus will depend largely on a number of variables within himself. The chief of these are:

(*a*) *Social and cultural upbringing.* Subjects are better able to remember stimuli—i.e. names and designs—derived from their own cultures, than from those taken from linguistic and social organisations unknown to them (Bartlett, 1932).

(*b*) *Emotional associations.* The emotional and affective associations aroused by a stimulus will have a marked influence on the way it is recalled (Rapaport, 1950).

(*c*) *Intellectual ability.* Although memory span and learning ability are largely influenced by general intellectual ability (Eysenck, 1945), retention over long time intervals does not seem to be so (Ingham, 1952).

(*d*) *Age.* At different ages, people tend to retain impressions in a different way (Gomuliki, 1952). Children and young adults learn by rote, and tend to recall individual items much as they were experienced. With increasing age, there is a tendency to fix all items to be retained to a solid frame of reference; and first select and then condense those which are retained.

3. Physiological Basis of Learning and Memory

What happens in learning and memory?

In general, it is believed that traces must be laid down in the central nervous system to account for it, but if so, where and how?

At the moment, the evidence is far from conclusive. As has already been mentioned, it is a fairly constant finding that any agents which cause unconsciousness, such as E.C.T. or concussion, suffered soon after a task has been learnt will cause some loss of learning,

proportional to the efficiency with which learning has taken place, and proximity in time to the period of learning.

On the other hand, it is also claimed that the application of some stimulants—e.g. strichnine and picrotoxin—speed up the rate of learning and slow down the rate of forgetting in animals, whether they are administered either before or after learning has taken place (see Deutsch, 1962).

However, improvement after stimulating drugs only occurs in those individuals who are originally dull or slow. It makes them behave like normal ones. Normal ones are not turned into geniuses! It is also important to bear in mind that the experiments demonstrating these effects have so far mainly been done on animals, such as rats, and the majority of animals learn in a very different way to humans. When rats are put into a situation involving directional choice in a maze, they quickly develop a tendency to alternate their choice of turns, and it is possible that the agents which affect their learning are affecting some aspects of their behaviour such as alternation bias rather than trace-formation.

But even if traces are laid down, where are they laid?

Lashley in his classical series of experiments (Lashley, 1960)—again mainly done on rats—showed that removal of a single area of the cortex never removes a single memory trace. The only consistent finding is that impairment is relative to total area removed—i.e. the more cortex is removed, the greater the impairment of memory in general. All areas of the cortex seem to act in the same way.

However, some recent work does suggest that under some circumstances, behaviour learned by one half of the brain may be confined to that half and cannot be carried out by the other hemisphere. (For a review of this, see Deutsch, 1962.)

The evidence of localisation of memory functions in man comes mainly from clinical material. Although there is no evidence that in man, any more than in rats, destruction of discrete cerebral areas removes the traces of individual memories, Penfield has claimed that electrical stimulation of some parts of the temporal cortex will *evoke* past memories as if they were stored there. The individuals in whom this has been demonstrated have all been suffering from epilepsy, but Penfield has not claimed that even in them, removal of the given area will remove ability to voluntarily call up these memories later on. The evidence for any area acting as a storehouse is therefore not

very convincing, but very convincing evidence *has* been accumulated to suggest that ability to register and retain new impressions is lost in lesions involving the mammillary and hippocampal zones, and the circuits which link these with the anterior nucleus of the thalamus (Brierly, 1961; Hoenig *et al.*, 1962; Whitty, 1962).

This suggests the possibility of localising the functions involved in learning and memorising even if we cannot localise the things learnt.

THE MEASUREMENT OF MEMORY IN CLINICAL PRACTICE

Having considered the various factors and variables which affect memory and learning, are we any nearer to being able to measure it?

In the majority of ways, clinical memory disorders are little different from those seen in normal people under laboratory conditions. Breakdown occurs in almost exactly the same ways, and is affected by the same variables. The main difference is that in organic conditions, learning is much slower and forgetting much faster. In the space of a few seconds an event may be as distorted, displaced or resistant to recall as it would normally be after some days or weeks.

But in clinical material, one is also faced with a situation which is almost unknown in normal people—namely that in different clinical conditions *some aspects or functions of memory may be impaired while others remain intact.* That is to say, different aspects of memory function may break down differentially, and the differential breakdown is often of diagnostic importance.

The aspects of memory which can be recognised or isolated in this way are:

(*a*) The ability to reproduce an act or recall an event, immediately after perceiving it (Immediate Recall).
(*b*) Learning—i.e. the ability to assimilate new material and thus to modify actions in the light of experience.
(*c*) Retention of isolated experiences (Delayed Recall).
(*d*) Memory for personal experiences.
(*e*) Memory for specific skills.

Figure 1 shows the performance of four groups of patients on a memory scale, in which tests of the first three functions have all been equated on the basis of normal performance, and can be compared

on a nine-point scale. It will be seen that there are two quite different patterns of response. In one pattern, word-learning is low, but performance on all the other tests is about average. In the other pattern, digit span is high or normal, but the two learning tests (and particularly the delayed recall) are low.

It will also be seen that these two patterns are representative of two different clinical groups. Loss of word-learning in the presence

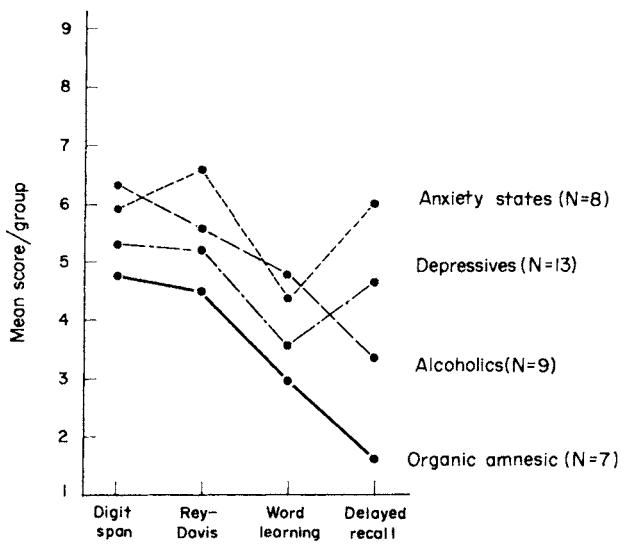

FIG. 1

of good digit span and delayed recall is shown by subjects suffering from affective and emotional disturbances. Loss of delayed recall is shown by those suffering from organic disorders, although the "alcoholics" in this investigation were all under 60 years old, were showing no gross evidence of memory impairment at the time tested, and did better on the tests of learning and immediate repetition than the patients suffering from affective disorders.

The experiment from which the above data was taken was carried out on small groups of patients only, and the tests themselves have not been sufficiently well standardised for the above data to be taken as conclusive. Nevertheless, the fact that these different patterns can be identified even in this small sample indicates that in the clinical

setting, the measurement of memory function should cover at least four aspects of behaviour, and that these should be scored independently, but on comparable scales. The aspects requiring measurement are:

(i) Immediate repetition (memory span).
(ii) Learning.
(iii) Retention.
(iv) The recall of personal experiences.

TESTS FOR THE MEASUREMENT OF MEMORY

1. General Memory Scales

Two memory scales have been published for clinical use, which aim to cover several different aspects of memory in one battery. These are: (*a*) Wells and Martin (1923); (*b*) Wechsler (1944).

(*a*) The *Wells and Martin* contains twenty-six test items, which cover all aspects of memory function, but which also include items not usually understood to measure memory as such—e.g. repetition of the alphabet backwards, and naming of objects. Tables are given from which points scored on the different tests can be reduced to a percentage of the norms; the scores can be read as a profile, as well as in terms of general memorising ability or memory quotient. Shorter and more up-to-date versions of this test have never been published.

(*b*) The *Wechsler* Memory Scale contains seven sub-tests. These include a test of "mental control", (counting backwards, counting by 3's, repetition of the alphabet) but do not include any measure of retention. Scores are given only in terms of general performance compared with age and intelligence—memory quotient—and the test does not provide any means of picking out the different diagnostic patterns.

2. The Measurement of Immediate Recall

Tests of immediate recall consist in presenting the subject with sequences of stimuli, usually of increasing length or difficulty, and asking him to reproduce the material immediately afterwards. The tests measure the greatest length of sequence the subject is able to

reproduce correctly. Their simplicity of administration and scoring have made these popular in clinical practice.

Any type of material may be used as test stimuli. The most common tests, classified according to the material employed, are:

(a) Digit span tests

Materials. Prepared lists are supplied in many texts and papers: others may be composed as required.

Digits forwards. Lists of digits in non-serial order are read aloud to the subject at the rate of approximately one per second. At the end of the reading the subject has to repeat them in the exact order given. No second reading is permitted. The lists are increased in length by one digit after every correct reproduction, until two consecutive failures have been recorded.

After ascertaining the subject's span for "digits forwards" in this manner, it is customary to see how many he can reproduce backwards—i.e. in the opposite order to that given by the examiner.

Norms. The average performance varies with mental age in children and with intellectual ability in adults.

TABLE 5. TERMAN–MERRILL (NORMS FOR DIGIT SPAN)

Mental age	Forwards	Backwards
2 years 6 months	2	
3 years	3	
4 years 6 months	4	
7 years	5	
9 years		4
10 years	6	
12 years		5
Sup. Adult I		6
Sup. Adult II		8
Sup. Adult III		9

Norms taken from standards supplied by Binet and Wechsler are given in Tables 5 and 6.

Interpretation. As seen from the norms given in Tables 5 and 6, performance on the digit span test is influenced by mental age and

TABLE 6. W.A.I.S. (NORMS FOR DIGIT SPAN)

I.Q. (Ages 18–44)	I.Q. (Ages 45–54)	Total digits, forwards and backwards
147	149	17
135	143	16
129	136	15
123	126	14
117	126	13
111	114	12
105	108	11
99	102	10
81	102	9
76	96	8
64	72	7
52	61	4–6

intelligence. Full allowance must be made for this when interpreting performance (Eysenck and Halstead, 1945).

A low score in digits is found in any condition affecting mental concentration but as yet, little evidence is forthcoming to indicate exactly what allowance should be made for this factor. In the neuroses, digit span is usually low and performance is somewhat irregular. Digit span deteriorates to some degree with age, as seen in Table 6.

Adequate repetition of digits backwards depends on the ability of the subject to organise the material in a certain way. It is probable that intelligence and concentration are more closely involved in this aspect of the test than in the retention of isolated stimuli over long time-intervals (Ingham, 1952).

In the organic amnesic states without dementia, the span for digits forwards may be well retained (Zangwill, 1943; Milner 1959). In those disorders which only affect the mechanical side of speech production (dysarthria), performance may be unimpaired, but in the majority of cases involving speech disturbance, reproduction is very limited. In general, it is unwise to attempt this test in any subject whose powers of speech or hearing may be in question.

(b) Sentence repetition

Material. Lists of sentences are supplied in the Binet scale (Terman and Merrill) and in the Babcock scale (Babcock, 1933).

Sentences of gradually increasing length are read aloud slowly and clearly to the subject, who is asked to repeat them as they are presented. A note is made of the longest sentence the subject can repeat correctly. No account is taken of the sentence content, and it is presumed among those who construct the tests that all connected sentences of the same syllable length present the same degree of difficulty. This, however, is doubtful, since the ability to repeat sentences depends on the contextual constraints within them (Miller and Selfridge, 1950).

Norms. The norms given by Terman and Merrill for children and

TABLE 7. NORMS FOR SENTENCE REPETITION BY CHILDREN (FROM TERMAN–MERRILL)

Mental age	Number of syllables correctly reproduced
4 years 6 months	11
5 years	12
8 years	16
11 years	20
Average adult	25

TABLE 8. NORMS FOR SENTENCE REPETITION BY ADULTS (FROM BABCOCK SCALE)

Mental age	20	19	18	17	16	15	14	13	12
Number of syllables correctly reproduced	24	20	20	20	20	18	16	13	11

by Babcock for older subjects are shown in Tables 7 and 8. It will be seen that except for adults over 20 years, there is little agreement between them.

Interpretation. As in the case of digit span, full allowance must be made for age and intelligence. Organic speech disturbance disrupts performance on this type of test very readily (Zangwill, 1946). Dysphasic subjects tend to perseverate errors in a characteristic way, and even those who show no signs of speech disturbance in the course of normal conversation may break down on this test. Thus if a patient whose I.Q. is known to be high, and whose performance on other memory tests is up to the expected level, shows incapacity on this test some form of organic speech disturbance must be suspected. In older subjects (65+) the ability to reproduce sentences shows a greater fall off with age than does digit span (Shakow, 1941). Memory span for verbal material of this type is seldom, if ever, affected to an appreciable degree in cases of cerebral lesion without presence or history of dysphasia (Zangwill, 1946).

(c) Paragraph repetition

In these tests a paragraph or short story is read aloud to the subject, who is either asked to repeat as much as he can remember of it, or is asked to answer questions about its content.

Material is supplied in the Binet scales, and the Wechsler memory scales, and in Henderson and Gillespie (1936). The "Cowboy Story" is probably the most commonly used in practice (see Talland and Ekdahl, 1959).

Administration and scoring. The scores obtained will depend very much on how the test is conducted—i.e. whether the subject is asked to repeat the content alone, to reproduce the story "word for word", or to answer questions about it.

In the Binet scale, different methods of testing are used for the different ages; subjects are only required to answer questions in their early years, verbatim reproduction is demanded later.

Norms. Norms for different ages and intellectual levels, as well as for the different forms of testing, have not been supplied by the majority of workers, but Zangwill (1946) points out that qualitative disturbances of reproduction often help to distinguish the organic amnesic state from typical neurotic behaviour. The patient with *organic memory defect* can usually reproduce the first few words of a story, and will respond to questions by reproducing more of the gist than he can recall unprompted. Some neurotic patients, in contrast, maintain that they cannot recall any part of a short story,

immediately after hearing it. Talland and Ekdahl give the following data for the "Cowboy Story" from the result of a study of twenty-two Korsakoff patients and thirty matched controls:

Number of items to be recalled = 27

	Korsakoff	Normals
Immediate verbatim recall (average points per patient)	3·97	8·32
In response to questions (average points per patient)	9·30	no data

Talland and Ekdahl also tested their subjects after time intervals ranging from one hour to one week, and compared the rate of forgetting in the two groups. The number of items recalled by the two groups were as follows:

	1 hour	2 hours	3 hours	24 hours	1 week
Korsakoff (original 5·82)	3·62	2·44	1·81	0	0
Control (original 9·12)	8·12	8·00	8·00	9·75	8·75

Interpretation. The following factors influence performance on paragraph repetition.

(1) *Intelligence.* Since the ability to perform this test varies with mental age and with intelligence (Eysenck and Halstead, 1945), it apparently reflects intellectual ability.

(2) *Age.* The manner in which subjects tend to remember or recall material of this type alters with age (Gomulicki, 1952). Younger subjects tend to remember and reproduce isolated items, while older ones tend to form more generalised abstractions of the contents. In subjects over the age of 65, ability to reproduce this type of material depends on the persistent practice of verbal skills throughout life (Williams, 1960).

(3) *Cultural background.* The influence of cultural background on recalling material of this type, has been shown by the tendency to select certain items and distort and displace others in the "effort after meaning" (Bartlett, 1932).

(4) *Organic impairment.* Subjects with gross defects of memory perform badly on this test, and often fabricate in their reproductions (see above). Fabrications due to organic impairment unless very gross, are not always easy to differentiate from those due to cultural factors.

Conclusion. As summed up by Zangwill (1946) tests involving the reproduction of short stories "are notoriously difficult to score and standardise. Patients with very gross organic retention defects are . . . unable to give the gist of a short story . . . but in such cases the impairment is evident enough . . . without the help of special tests." In general, inability to recall the gist of a story in the absence of gross intellectual impairment, and failure to respond to questioning, is more suggestive of a functional than of an organic condition.

(d) Designs from memory

Material is supplied in the test scales provided by Babcock (1933), Terman and Merrill, Wechsler (1944) and Benton (1945).

Administration and scoring. The method of administration and scoring varies with the test but as a general rule, the subject is shown individually a number of designs of increasing complexity for a set time each (about ten seconds) with instructions that he will be asked to draw each one as soon as it has been removed. Scoring is based on the number and types of errors present in his reproduction.

In a test designed by Rey (1941) and Osterreith (1944) one single but very complex figure is used. After its exposure for ten seconds, the subject is told to draw as much of it as he can. The figure is then shown to him again for another short period, and he is allowed to correct or add to his original reproduction. Short exposures are repeated as often as required. Scoring is based on the number of exposures required by the subject to make an accurate copy.

Norms. On all designs from memory tests, performance depends on the designs used. Scoring criteria are supplied with each test, but none of these tests clearly indicates *causes* of failure, or the differential diagnoses associated with scores. On the Binet and Babcock scales allowance is made for age and I.Q., both of which influence the results.

Interpretation. Intellectual ability has a marked effect on this as on all tests of immediate recall or reproduction (Eysenck and

Halstead, 1945), and allowance must be made for it when considering individual scores.

It stands to reason that visual acuity must also be adequate before this test should be applied. Simple visual acuity is usually easy to determine, but subtle grades of visuo-spatial disorientation, such as those which may occur with lesions of the parieto-temporal area and which often accompany disorders of speech, (see Chapter 5) are far harder to ascertain with certainty. These disturbances, however, have a profoundly disrupting effect on the copying and remembering of designs. Thus, if an examiner is tempted to test the memory of a dysphasic subject, by the use of designs instead of verbal material, he should take care to ensure that the subject can adequately *copy* the designs if he fails to reproduce them from memory. When scoring is based on the accuracy of reproduction, full allowance must be made for drawing ability, and since this is often grossly impaired by mental and physical disorders (Pascall and Suttell, 1951), disorders of memory should never be adduced from the reproduction of designs, unless the reproductions made from memory are consistently worse than those made from a model.

(e) Summary on tests of immediate recall

Their handiness and ease of administration have made tests of immediate recall universally popular with clinicians, but the close correlation with intelligence and mental development, which is seen in all performances on these tests, makes it doubtful whether the measurement of immediate memory is not rather more a measure of intellectual ability than of memory.

Diagnostic implications. In general, immediate memory span does not deteriorate in organic impairment, nor does any defect in performance indicate the presence or locality of an organic lesion. Heilbrun (1960) found no significant difference on memory-span tests between subjects with right and left brain damage, nor any significant difference between normal and brain-damaged subjects on three different tests of immediate memory, including Digit Span and Benton's Visual Retention Test.

Performance on tests of *digit span* are more likely to be disturbed by defects of concentration and anxiety than by defects of remembering. *Sentence repetition* is influenced by verbal fluency, and possibly also by the meaning-content of the test material. *Paragraph repetition*

is difficult to score quantitatively, due to differences of reproduction style, which may depend on age, cultural background and personality. The reproduction of *designs from memory* is much influenced by appreciation of spatial relationships and by mental state, quite apart from the influence of basic drawing ability. In short, tests of immediate reproduction seem to indicate the manner in which a person perceives and organises material, rather than how he remembers it.

Nevertheless, tests of immediate repetition or memory span have some clinical use. They provide a good base-line from which to assess other defects.

3. The Measurement of Learning

Learning in the clinical setting is usually measured by the speed (i.e. number of trials) with which new acts or associations are acquired, to a set criterion of excellence. In the laboratory, it is also measured by fall-off of performance after a set time interval, or the difference in the number of trials necessary to relearn a task, compared with that necessary to learn it originally ("saving").

Since the rate of learning is known to depend on a number of variables, including the difficulty or strangeness of the material for the subject, and the way in which it is presented, care must be taken to control as many of these variables as possible in all tests of learning.

Standard methods for assessing learning ability can be divided into two groups, depending on the material employed: (*a*) those involving verbal material, (*b*) those involving non-verbal material.

(a) Verbal tests

(1) Sentence Learning

A simple test of verbal learning has been described by Zangwill (1943). Sentence No. 23 from the Babcock Sentence Repetition Battery (Babcock, 1933), "One thing a nation must have to be rich and great is a large, secure supply of wood", is repeated alternately by the examiner and subject, till the subject's production of it is word perfect. Whereas subjects without sign or history of cerebral lesion can usually learn this sentence in about six trials, those suffering from organic amnesic states very rarely master it in less than ten trials, and tend to perseverate their early errors throughout their entire performance.

It is, however, admitted that speed and efficiency on this task are considerably influenced by I.Q. As an improvement to this test, it is

suggested that the subject's immediate memory span should be ascertained on a sentence repetition test, and that he should then be asked to learn a sentence four syllables longer than the longest one he could repeat on a first attempt. This method has an additional advantage, in that subjects with organic disorders of speech may be recognised from their poor repetition of very short sentences, before they are condemned as being incapable of learning.

Scoring. Correct performance within six trials showing a gradual and steady improvement throughout trials can be regarded as normal.

Interpretation. Those suffering from organic memory disturbances are differentiated from normals by: (1) very poor learning performance in relation to memory span, (2) inability to correct initial mistakes and tendency to perseverate those made in early trials.

(2) WORD ASSOCIATION

The learning of word pairs, whether associated in meaning or not, forms one of the traditional tests of learning. Suggested pairs for presentation in the clinical field are supplied by Monrad-Krohn (1948), Babcock (1933) and Wechsler (1945). The best-known of these is probably the list supplied by Wechsler.

Administration. The Wechsler Memory Scale (Wechsler, 1945) supplies ten pairs of words, five of which are associated in meaning, and five of which are not. The list is read aloud by the examiner at the rate of one pair every five seconds. At the end of the first reading, the examiner gives the first word in each pair, in a different order to that in which they were presented, and the subject has to supply the second. The list is usually read and tested a total of three times, the words being given in a different order each time.

Scoring. Unfortunately, norms for this part of the memory scale have not been supplied by Wechsler independently of norms for the whole test. Babcock's method of scoring gives additional credit for speed of response, and it is possible to work out norms for different I.Q.s, for the data given by her (see Table 9).

(3) NEW WORD-LEARNING TEST

Walton (1959) and Walton and Black (1957 and 1958) have described a method of assessing learning ability in which full allowance is made for I.Q. The subject is asked to learn definitions of the first ten words on one of the standard vocabulary tests which are unfamiliar to him. Thus, a person who fails on the Binet test at No. 15,

TABLE 9. BABCOCK ASSOCIATION AND LEARNING TEST

	(a)		(b)	
Seven pairs of words	earth	hole	barn	house
	cane	beat	oil	coin
	lawn	cap	ice	mumps
	spark	tears	man	boot
	lion	wolf	mile	hill
	twig	song	ring	muff
	fun	coal	bump	way

Present and test three times: presenting and testing words in different order each time.

Scoring: score only for 2nd and 3rd trials:

correct in 1 sec = 3
correct in 1–2 sec = 2
correct in 1–10 sec = 1

Sum scores for 2nd and 3rd trials and divide by 2. Maximum = 21.

Average score for different mental ages (see Brody)

M.A.	20	19	18	17	16	15	14	13	12
Score	13	12·25	12	12	12	11·25	10·50	10	9·25

will be told, and asked to learn the meaning of words 16 to 25. One who does not fail till Binet 23 will be asked to learn words 24 onwards. For the more educated and intelligent, obscure words may have to be chosen at random from a dictionary. After the meaning of all ten words have been given, the examiner reads through the new words again, asking the subject to define each one. If the subject is unable to define a word, its meaning is given to him a second time, but the wording of the definition is slightly varied, so that it is the meaning of the word rather than a rote definition of it, which is learned by the subject. The list of words is read out, till the subject scores six out of ten successes. The total number of failures up to this point constitutes his learning score.

Scoring. Scores, based on the number of repeat definitions the subject has to be told before he is able to define six out of ten new words, are given by Walton and Black.

Interpretation. Little work has been published on this test except by the authors who first described it, and who claim that it distinguishes between organic and functional learning disorders. In the experience of the present author, much depends on the definitions given by the examiner to each word, and on other mnemonics he consciously or unconsciously supplies.

Although in principle the words and their definitions to be learned are scaled to the subject's level of intelligence, it is doubtful whether a word which is unknown to a subject is any the easier to learn because it is known by a large number of other people. A new word is still a new word, whether in fact it is rare or common, so that the test's main claim—that of being intelligence-free—may be doubted.

(b) Non-verbal learning tests

The majority of non-verbal learning tests which have been used for clinical studies involve much elaborate equipment and laboratory facilities. Although many interesting and important findings have been reported from research projects using them, few of the tests used in these studies have been standardised or are suitable for general clinical use. On tests of manipulative skill, increasing age increases the number of trials necessary to learn a new task and the number of errors made while learning. These are mostly due to perseveration of initial errors (Welford *et al.*, 1958; Kay, 1951). On a wire puzzle, the heart and bow (Katona, 1940) which involves learning by insight, subjects with severe organic memory defects showed normal short-term learning of the principles, but no carry-over of insight after short time lapses (Williams, 1954).

A great deal of work has been done in the animal field on the learning of non-verbal tests such as mazes, but the value of this to an understanding of human problems is doubtful. The application of mazes to the measurement of memory in human beings seems to be limited. Performance on a very simple pencil and paper maze test was shown to improve with both practice and training in subjects with severe dementia, who were unable to see the route on inspection, but in these subjects carry-over was of short duration (Williams, 1960). The number of non-verbal learning tests used in clinical practice is thus very small, and reports in the literature on differential learning performance with non-verbal material are scarce.

REY–DAVIS

A non-verbal test which has been found of considerable use in clinical practice was first described by Rey (1934), was further developed by Davis, and is discussed in detail by Zangwill (1946). This test consists of four 6-inch square boards, on each of which are three symmetrical rows of three pegs. Eight of the nine pegs on each board are removable; one is fixed. The fixed peg is in a different position on each board. The boards are presented in a consistent order, and the patient is required to discover the fixed peg by trial and error. The boards are then given again in the same order, and the patient repeats the procedure. This is continued until the patient can demonstrate unhesitatingly the position of the fixed pegs on all four boards on two consecutive trials. When learning is complete, the test may be prolonged according to Davis's method, by rotating the four boards through 90°, 180° and 270°, and testing the patient at each new orientation. If he fails at any point, the learning procedure is resumed as before.

Scoring. Until recently, no scores have been given in terms of trials necessary for learning. However, an attempt is now being made to establish norms based on the number of trials necessary to learn the pegs at two fixed positions (Williams, 1963). Up till now, interpretations have been based on qualitative signs. Rey (1934) distinguishes five methods of approach to the test seen in children of different ages, and thought by him to characterise the different genetic levels of learning. These were termed:

(*a*) *Isolated choice*—the response is confined to grasping an individual peg at random, regardless of the instructions. There is no learning, and this is only seen in children under 4 years and in imbeciles.

(*b*) *Systematic choice*—the subject tests the peg on each board in a systematic fashion, but repeats the same procedure on all trials. There is no learning. This approach is seen in children between 4 and 5 years of age and in morons.

(*c*) *Unilateral perseveration*—the subject discovers the position of the fixed peg on one board, and refers this position to all other boards. This level is seen in children of 5 to 6 years and in high-grade mental defectives.

(*d*) *Limited experimental behaviour*—the subject shows some

grasp of the task, but does not manage to evolve a scheme linking the positions on all four boards. This is seen in children over 6 years.

(*e*) *Comprehensive experimental behaviour*—this is the normal procedure in older children and adults.

Rey points out that these levels of reaction are not rigidly discrete, and he does not attempt to equate them with mental age as defined by the Binet scale.

Zangwill points out that in patients with organic retention difficulty, learning is slow, but he emphasises that patients with high intelligence may overcome their inability by ingenious methods and the use of mnemonics, though the latter are rare.

Five tendencies characterise the performance of subjects with organic memory disturbances, and although it is rare for all five tendencies to be present in any one person, they form a useful basis for diagnosis. Assessment is based on the quality of a performance, rather than on speed of learning. The tendencies in an organic patient are:

(1) *Stereotyped error*—a pattern of response evolved in one trial is repeated on several successive trials, with the same error.

(2) *Confusion of squares*—the response appropriate to any one board is consistently elicited by one of the other three.

(3) *Unstable learning*—continued testing provokes breakdown on one or more boards, after learning is apparently established.

(4) *Forgetfulness*—errors which are apparently due to transient absent-mindedness, and are even self-corrected.

(5) *Breakdown of routine*—repeated learning at the standard orientation of the boards is followed by breakdown and inadequate relearning, after one or more rotations.

Patients showing functional disturbances of memory (e.g. neuroses) may demonstrate one or more of the above signs, but in addition, frequently exhibit peculiarities of tempo and procedure, rare in the organics. There is often undue hesitation in choosing a peg, when confronted with a given board. Alternatively, the patient may examine the peg with an almost feverish rapidity, and in many cases re-examine pegs which he has found to be movable seconds earlier. Overt expressions of anxiety (e.g. sweating) are not uncommon, and

are relatively easy to distinguish from the sudden catastrophic reaction of the organic case in the event of excessive difficulty.

Interpretation. If interpretations are based on quality of performance alone, the reliability of the test administration and scoring will depend on the experience and observational powers of the tester. However, new norms should shortly be available, which will allow subjective judgements to be checked against objective criteria.

(c) Summary on tests of learning

Although in normal healthy individuals, the ability to learn new tasks (as measured by the number of trials necessary to achieve perfect performance) is closely related to general intelligence, cases are frequently seen in clinical practice where learning breaks down independently of many other mental functions. This is in contrast to immediate memory span, which is seldom affected independently of other mental functions in clinical abnormalities.

The amount and quality of material which can be assimilated by subjects with organic impairment still depends on the original intellectual level. Thus a highly intelligent person will, despite considerable deterioration of learning ability, still probably be able to learn more in a given time than a non-deteriorated dullard.

It is therefore very important when learning ability is assessed, that full allowance should be made for the easiness or the difficulty of the material to the particular subject. A useful and usually satisfactory combination of procedures is to assess the subject's memory span on a sentence repetition test, and to compare this with his ability to learn a sentence four syllables longer.

Generalisation about subjects' learning ability in general should never be made unless both verbal and non-verbal tests have been given. In older subjects especially, one type of ability may fall off quite independently of the other, due to disuse of skills rather than impairment of memory (Williams, 1960).

Breakdown in learning may be due to both organic and functional causes. It is possible to differentiate between these on the basis of qualitative factors, developed from clinical experience.

Any organic disturbances which affect mental function are liable to have an adverse effect on learning, but the effect is sometimes masked or overcome by other factors. Thus, although E.C.T. in general causes an impairment of learning (Hetherington, 1956) it is

possible for an improvement in general condition following this treatment to be accompanied by improvement in learning performance (Thorpe, 1959).

4. The Measurement of Retention

Tests for the measurement of retention are conspicuous for their absence in standardised clinical memory scales, despite the fact that this is the aspect of memory which shows the greatest impairment in organic conditions (Williams, 1954; Milner, 1959), and the fact that this is the only aspect of memory which does not appear to be dependent on intellectual activity (Ingham, 1952). In patients with some cerebral lesions, retention as measured by delayed recall may break down quite independently of other mental abilities.

Reluctance to measure retention is probably due to the difficulty of doing so satisfactorily. The manner in which a stimulus or event is recalled depends on a number of variables, quite apart from basic memorising ability. The most important of these are:

(*a*) Nature of the stimulus.
(*b*) The number and time relationships of rehearsals.
(*c*) The manner in which testing is conducted.
(*d*) The time interval between presentation of stimulus and test, and events occurring during this interval.

Recall is, moreover, notoriously difficult to score quantitatively, as it frequently contains slight alterations, distortions or displacements of the stimulus, which are arbitrarily defined as normal or abnormal (Bartlett, 1932; Zangwill, 1949). Studies of the effects of organic impairment on memory have indicated that displacements, especially in time, and distortions of the recalled material increase as memory is increasingly disturbed, and as the total amount of material retained diminishes. Resistance to spontaneous recall and dependence on prompting by cues, are also features of recall impairment (Williams, 1953).

A great many experimental studies have been reported in which retention has been assessed, using a variety of different techniques. In studies of controlled comparisons (i.e. studies comparing certain groups of patients before and after treatment, or those comparing the performance of patient-groups with normal controls) the material used and the technique by which it is applied are unimportant, so

long as the conditions are the same for the different groups of subjects under comparison. Unfortunately for the diagnostician, a great variety of tests and methods have been used in these studies, with the result that insufficient information is available about any one of them for diagnostic purposes.

Mental and physical conditions affecting delayed recall

As a result of experimental studies, many of the conditions in which delayed recall is adversely affected have been established. These are principally:

Localised cerebral pathology, especially lesions in the temporal lobes, around the third ventricle and hippocampus.
Chronic alcoholism and Vitamin B deficiency.
Electro-convulsion therapy.
Epilepsy (events occurring just before or after a seizure are particularly liable to be forgotten).
Old age.
Intoxication from various drugs or N2O (the effect is usually of short duration).

In the following conditions, delayed recall or retention has not been found to be adversely affected:

Neurotic disorders—anxiety states, hysteria, etc.
Psychotic disorders—manic-depressive psychoses, schizophrenia.
Intellectual deficiency—except at the lowest extreme.
Disorders of personality.

Clinical tests

(*a*) "NAME–ADDRESS–FLOWER" TEST

It is common clinical practice to tell the subject an arbitrary name, address and flower at the beginning of an interview with the warning that he will be asked to repeat it some time later (Klein and Mayer-Gross, 1957).

Scoring. Excellence of remembering is usually based on (1) the amount of the stimulus recalled, (2) distortions or displacement of the recalled items. It is common for subjects to remember one or two items from the whole stimulus, but either to distort or paraphrase names, or to replace them by names more familiar to him, or

associated by him with them in past experience. Thus, *Smith* may be replaced by *Jones* and *Holly Road* by *Ivy Road.*

Most clinicians applying this test use one particular stimulus on all occasions, and give it to the subject at a set time within a fairly standardised interview. The estimate of the subject's retention ability is based on the past personal experience of the clinician. An account of one subject's actual performance is unlikely to convey much helpful information to clinicians using different stimuli, or a different interview technique.

In a short verbal test of orientation and information applicable to older people (Doust *et al.*, 1953), a modification of the *Name–Address–Flower* test has been included. An address is given to the subject to remember towards the beginning of the questionnaire, and his recall is asked for it at the end of the interview. The time lapse and the manner in which it is filled are thus both held fairly constant. Unfortunately, norms for the recall of the address are not given independently of norms for scores on the whole questionnaire.

Interpretation. Because of the variety of stimuli and test-conditions used in this test, no performance norms are available. This test can therefore only be applied usefully by individuals who are prepared to build up their own standards, both for presentation and scoring.

(*b*) BABCOCK

Delayed recall of a paragraph read and repeated in an earlier part of the test battery is one of the sub-tests in the Babcock Scale (Test II, Babcock, 1933).

Administration. Subjects are read a short paragraph at an early part of the interview (i.e. as Test No. 4), and are asked to repeat as much of it as they can. The paragraph is then re-read to them, and they are told they will be asked to give another account of it later. After Test 10, subjects are asked to give as much of the paragraph as they can recall. If they fail to recall any items within ten seconds, they are given the following prompt—"Was it about a snowstorm, a fire, a flood or an earthquake?"

Scoring. The score is based on the number of correct responses, minus the number of absurd responses. One half-point is given for each memory recalled after being given the verbal prompt. Maximum score = 20.

Interpretation. Judging from Babcock's deterioration index, norms for different mental ages can be worked out as follows: (see Table 10).

TABLE 10. NORMS FOR RETENTION SCORE ON BABCOCK RETENTION TEST WITH EQUIVALENT MENTAL AGES

Mental age	20	19	18	17	16	15	14	13	12
Retention score	13	12	12	12	11·7	11	10·5	10·2	9

These scores are based on the scores obtained when the retention test is given as part of the total Babcock scale. In view of the effect on retention of both time interval and interpolated tasks, any alteration to this method of administration would be expected to cause alterations of score in normal individuals.

(*c*) CATTELL

Cattell (1936) describes a test of retentivity. There are four sub-tests: (1) a page of pictures, (2) a page of nonsense syllables, (3) a page of nonsense shapes, and (4) a page of ten words.

Administration. In each sub-test the material is exposed for thirty seconds, after which the subject is asked to name as much of it as he can remember. Recall is tested after a lapse of one hour.

Scoring. The retentivity score is based on the number of items recalled first time, minus the number recalled after one hour.

Interpretation. No figures are given for the performance on the test of normal subjects. The delay of one hour between presentation and test is not controlled for content, so that retroactive inhibition and rehearsals may influence results obtained. This test is the only one available which takes into account the importance of comparing the effect of time lapse with immediate memory span, but since no guide is available to interpret the significance of the discrepancy, the test has little practical value as yet.

(*d*) THREE-DIGIT RECALL

Cameron (1943) and Burns (1959) both describe a test of retention using digits as the stimulus.

Administration. Three digits are presented, which the subject is asked to keep in mind. He is then either allowed to sit in silence or is engaged in other mental tests for a few minutes, at the end of which he is asked to repeat the digits in the order presented. If he does so

correctly, he is presented with another set of three digits, recall of which is asked for after a slightly longer measured period.

Scoring. This is based on the length of time over which the subject is able to keep in mind the three digits presented, and on the degree to which his recollection is impaired by interpolated tasks.

Interpretation. Norms for younger people without amnesic defect are not given, but in a group of twelve senile patients showing retention defects "it was found that subjects could usually retain the information for at least a few minutes, provided that no other activity was engaged upon, but were quite unable to recall digits if the memorising was followed by one minute during which they were asked to spell simple lists of words backwards" (Cameron, 1943).

(*e*) SUMMARY OF TESTS OF RETENTION

Retention is usually the first aspect of memory to be impaired by physical disturbances. Every malaise, from fatigue to worry, seems to cause some impairment of this function, as based on subjective feelings of poor concentration or absent mindedness. It is only in certain organic conditions affecting the brain that retention is impaired out of all proportion to other aspects of memory and intellect.

The measurement of retention is therefore not only important in itself, but in comparison with other aspects of memory function, is essential for the diagnosis of organic memory impairment. While slight degrees of retention defect in association with defects of learning and immediate recall are of little diagnostic significance, gross discrepancies between these aspects of memory suggest one of a limited number of abnormal cerebral conditions.

Standardised tests for the measurement of retention are almost non-existent in clinical practice. Diagnosis tends to be based on the personal experience of the observer, rather than on established test performance. The four methods by which retention can be measured are:

(1) Time elapsing between presentation and perfect reproduction.
(2) The amount of test material recalled spontaneously after a given time interval.
(3) Clarity and accuracy of recall (distortions and displacements of recalled items) after a given time interval.
(4) Readiness to recall (the amount of prompting necessary to produce recollection).

The first of the above methods of assessment—that based on the measurement of the amount recalled—is easy to ascertain, but unlikely to give an accurate picture of retention. Thus, two individuals may both deny any recollection of an incident, but whereas the first may be able to recall it in full detail after a small amount of prompting, the second may still deny having experienced it, even if he is replaced in the original context (Williams, 1961).

Distortions and displacements are notoriously difficult to measure quantitatively. This leaves the method of measuring the *amount of reinforcement* necessary to produce recollection to a given criterion of excellence. Attempts are being made to devise a test for clinical use, based on this principle (Williams, 1963).

5. The Measurement of Memory for Personal Experiences

Although the measurement of memory for personal experiences is seldom undertaken in normal people, it is often important in the clinical field, in view of the many observations indicating that it may be impaired in the following conditions:

(1) After sudden loss of consciousness caused by such factors as E.C.T. and concussional head injuries.
(2) After illness involving certain areas of the brain (e.g. tuberculous meningitis).
(3) In progressive cerebral degeneration.

In the two former cases, some loss of memory for personal experiences may continue to exist, long after full recovery of normal mental functions, and may remain as a permanent memory gap. In cerebral degeneration, loss of memory for personal experiences may become progressively more severe with increased organic deterioration.

The events lost in such circumstances are determined by a number of factors, chief of which appear to be:

(1) Time of experience.
(2) Importance attached to event.
(3) The number of times it has been rehearsed or described.
(4) The age of the patient at the time he is interviewed.

(1) *Time.* When we normally try to recall past events, it is the most recent ones which are apt to stand out most clearly. Indeed,

inability to recall an episode is often attributed to the fact that "it happened so long ago", and the dating of past events is frequently based on the clarity with which they can be recalled. "It seems like yesterday" is a common way of describing a memory which appears with undue vividness.

With increasing age, it is held that experiences and events of the remote past tend to be recalled more easily than those of the recent. However, exceptions to this rule have been noted. Speakman found that the older subjects had greater difficulty in identifying the colours of a 3*d.* stamp which had been common in their youth, than they did in identifying its more recent colour (Speakman, 1954).

In the case of cerebral injury, those events experienced most closely to the onset of cerebral derangement are the most liable to be lost. Thus, it is the recent rather than the remote memories which are the most seriously affected, although all memory for past experiences may be affected to some degree. In the case of more remote memories, impairment may be very slight, and consist only of a haziness, a difficulty in spontaneous recall or a displacement. But recent memories very often cannot be recalled at all, despite every effort, leaving the impression on the subject of a definite memory gap (Williams and Zangwill, 1952).

In the retrograde amnesia following head injuries, the greater the degree of cerebral injury the longer is the gap (Russell, 1959), although not all those events which a person is unable to recall on first regaining consciousness are necessarily lost for good. Many may be recalled after full restitution of normal mental functions, and the shrinkage undergone by the original memory gap tends to follow a temporal sequence, in that the events experienced earliest in time tend to be the first regained.

The residual or permanent memory gap following head injuries and E.C.T. is usually restricted to a few seconds. In tuberculous meningitis (T.B.M.), however, all memory for personal experiences preceding the onset of illness by several years may be entirely lost (Williams and Smith, 1954).

In progressive neurological degeneration, the most recent memories tend to be those which are lost first, while progress of the illness is accompanied by a regression of memories according to time sequence (Ribot, 1885).

In the preceding paragraphs, the word "tend" has been used freely

and on purpose, for although the association between time and amnesia is a very common observation, a number of exceptions to the rule have been reported. Thus, in the memory gaps following head injuries and in T.B.M., islands of memory for isolated events are frequently described, while in the apparently intact memories preceding the memory gap isolated incidents may be reported as forgotten (Janis, 1950; Brody, 1944).

Some of these exceptions may be due to:

(2) *Importance attached to event.* In the organic amnesic states, the same variables affect retention as in normal remembering (Williams, 1954). Events of personal importance and significance are more liable to be remembered than others. Thus, the same events may be recalled with different degrees of clarity by two different people. For example, the way in which he spent his first pay-packet is better remembered by a man whose first and only source of income it was, than by one who did not seriously need the money earned. The celebration of a 21st birthday will be more easily recalled by someone who had a special party to mark the occasion than by one who did not pay any attention to it.

(3) *Rehearsal.* The number of times an event has been described or rehearsed has an important bearing on its retention. It is particularly important to bear this in mind when assessing the retention of acquired information or personal orientation, and when testing a patient for the recollection of events leading up to his hospital admission. In the absence of any sudden or violent episode precipitating admission (i.e. in the case of long-standing illnesses) patients can seldom recount with any great certainty what they were doing the day before they entered hospital. This they usually attribute to the fact that they had not paid much attention to events, as they had not expected to be asked about them. Patients admitted for sudden episodes or accidents, however, usually reel off a well-rehearsed story, which they tend to repeat to every questioner (Williams, 1954).

In the case of personal orientation, memory loss follows a fairly constant pattern (Cosin *et al.*, 1957). The temporal localisation of recent events is the first thing to be lost, followed by the subject's ability to give his own age. Childhood occupations are the next to go. Marital state and the occupation of self or spouse follow, and own name is the last to be lost.

Questions relating to impersonal events or acquired knowledge are lost in the following order:

(*a*) Names of recent public figures (e.g. Prime Minister).
(*b*) Recent world news.
(*c*) Details of remote world events.
(*d*) Facts learnt at school.
(*e*) The names of members of the Royal Family.

(4) *The age of the patient at the time he is interviewed.* During the normal processes of maturation and ageing, there are marked changes in the way individuals feel they can remember their own past experiences. Young people tend to remember them as isolated events, older people as parts of a whole life-period.

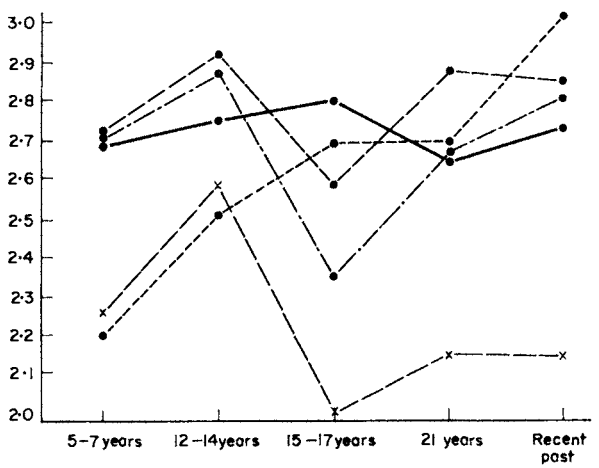

FIG. 2

15–20 years ————————
21–30 years – – – – – –
31–40 years —·—·—·—
41–50 years · · · · · · · · ·
51–60 years x— — —x

There is also a change in the apparent intensity of recall of recent as opposed to remote events, with increasing age. When asked to compare the vividness of events which happened one year ago with those which happened in early childhood, people between the ages

of 10 and 30 say without hesitation that the more recent events are the clearest. After the age of 40, earlier events tend to stand out more vividly than recent ones, and after the age of 60 this tendency is even stronger.

Nevertheless, when recall for the different life-periods is objectively measured in different age-groups, the only significant trend with age lies in a tendency to forget things which happened longest ago (see Fig. 2). There does not seem to be a steady regression down the ages, so much as a tendency to remember particularly clearly only those past events which occurred in middle childhood.

A patient's memory for personal experiences is usually assessed by asking him a series of simple questions, such as "What is your name?" "How old are you?" "What school did you go to?" "How old were you when you got married?" (see Doust *et al.*; Wechsler; Babcock).

It must be remembered, however, that a number of such questions can be answered adequately by the repetition of simple, stereotyped phrases, and that such phrases are not necessarily accompanied by complete recollection of the period. Thus, a person may be able to say that he was 5 years old when he first went to school, without being able to remember anything of the school itself or of his other experiences at that time. In order to ensure that he really is able to recall an event, he should be asked to give some details about it.

When evaluating memory on the basis of the events described, the tester should make allowances for the probable emotional value of the event itself. He should also bear in mind the way it is described, i.e. whether the subject gives an account of "remembering" or whether he appears to be reconstructing or guessing ("I think I went . . ." or "I expect I went . . .").

The conditions under which recall is elicited should also be noted. Did the subject produce the description spontaneously, or only in response to leading questions? Has he recently been reminded of the episode by visitors?

In order to check accuracy, two or three different questions can be prepared by the investigator relating to the same episode or life-period, and asked at different periods during an interview. Consistency in such circumstances can be taken as a fair measure of reliability, for confabulating subjects are inclined to give replies

more closely associated with the context of the question, than the events they are being asked to remember (Weinstein *et al.*, 1962).

When assessing the extent of a retrograde amnesia following head injury, subjects are usually asked simply "What is the last thing you remember before the accident?". If the examination is confined to this, other gaps or islands may be overlooked. Subjects may be able to remember quite clearly isolated events, which succeeded a supposed last memory by considerable periods of time but because such recollections have no solid frame of reference, they may be displaced and referred to a distant period of the past.

When assessing retrograde amnesia in terms of time, it is never easy to be certain at what point continuous memory for personal events ceases, and patchy memory begins. If a patient cannot be questioned till some weeks after an event took place (i.e. till full consciousness is regained after a long post-traumatic amnesia) it is not easy to know how much of the amnesia to regard as normal forgetting, due to time-lapse.

To conclude, the assessment of past personal memories is a very difficult task. The function is influenced by a great many variables, which should all be taken into consideration when evaluation is made. Although time is an important factor, estimation of memory-loss based solely on length of time is unlikely to be reliable.

CHAPTER 5

PERCEPTION AND ORIENTATION

DISTURBANCES of orientation and perception are among the first and most common indications of acute cerebral disturbance, and indeed, if present, almost always indicate an organic disorder. Loss of spatial orientation and of topographical memory are also among the most outstanding psychological defects arising from parietal lobe lesions.

The clinical signs and symptoms of faulty perception and of disorientation are fairly easy to recognise, but what exactly it is that has gone wrong to cause them, is much harder to understand. As in the previous sections, the first stage undertaken here will be that of definition.

Orientation is usually considered to be involved in the following skills:

(1) Identification of person, place and time.
(2) The ability to find one's way around familiar places and perform common praxic skills.
(3) The recognition and expression in verbal terms of spatial dimensions (e.g. left and right).
(4) The recognition and expression in pictorial terms of spatial dimensions ("spatial perception").

Perception is a much harder function to define. It involves not only awareness of the environment, by means of data supplied by the sense organs, but also interpretation of this data by central mechanisms. Thus, we tend to select from the actual information supplied by the sense organs only a few key items, and we interpret our surroundings in terms of these—a tendency which can lead to a

number of mistakes or illusions, which normally do not detract from our efficiency (Audley, 1963).

Most people with normal eyesight appear to rely on visual perception more than on any other sense for their knowledge of the world, and it is in this sphere that perceptual disorders are most often seen by the psychologist. Disorders in other perceptual fields will not, therefore, be considered further here, even though it may be mentioned in passing that the pseudo-hallucinations of the schizophrenic seem to be far more often auditory than visual (Mayer-Gross, Slater and Roth, 1960).

FACTORS AFFECTING PERCEPTION AND ORIENTATION

1. Development

The development of visual perception in children has been studied fairly intensively, and the information gathered to date is summed up by M. D. Vernon (1962). Recognition of movement seems to be the first function developed by children; recognition of colour comes next, followed by that of shape. Awareness of space and distance, and the judgement of size are the last aspects of the visual environment to be perfected, probably because they are largely dependent on experience.

Young children do not appear to co-ordinate individual stimuli (figures) with their backgrounds in the same way as adults do, so that to the latter, an object seen upside down or in a mirror does not lose its identity. It is only with learning and experience that they learn to distinguish an *n* from a *u* or a *p* from a *q*. At the same time, they have difficulty in appreciating patterns as wholes, and concentrate on the single parts.

The development of visual perception does not stop after childhood. In a series of fascinating experiments first begun by Stratton in 1896 and continued in recent years (see M. D. Vernon, 1962), it has been shown that if adults are made to wear a pair of spectacles with lenses which reverse the whole visual environment, the world after a time comes to look the right way up again. These experiments show the remarkable powers of habituation in adult people. On the other hand, a great deal of evidence has been produced indicating

that certain aspects of visual perception only become established if a person is subjected to them at an optimal age in life (Hebb, 1948). Thus, a person who only becomes able to see for the first time in adult life may recognise movement and colour fairly well, but never learns to distinguish shapes as easily as a person with normal vision from youth.

In between these two extremes, it appears that there are a number of visual skills which develop gradually during early childhood, become stabilised then, and so come to be regarded as innate. If an adult looks at a square table-top from the side, he still "sees" it as a square, even though the shape falling on his retina is much distorted. If he looks at a piece of white paper in shadow, he will still judge it to be whiter than a grey piece of paper in the sunlight. Visual "constancy" as this is called, depends largely on a comparison between the object being scrutinised and other objects in the visual field. If there is no background against which to make the judgements, the subject tends to accept the simple sensory data—i.e. to call the table-top a trapezoid, and the white paper grey.

Constancy is largely dependent on experience. The European child and the adult raised in a different environment from our own (e.g. the Australian bushman) show less constancy in visual perception than the Westernised adult.

The child's conception of space has been carefully studied by Piaget and his collaborators, but their conclusions are not easy to grasp, and give no very clear idea of what happens during the course of this development. It has been established that our awareness of space depends largely on other bodily sensations (e.g. awareness of movement) and on binocular disparity At the same time, much of our spatial awareness is due to deductions based on a number of other cues. The performance of one group of adult mental defectives, to whom some of Piaget's tests were given, showed many resemblances to that of children in that in both groups, space and its attributes tended to be limited to the immediate environment of whatever object they were considering (Woodward, 1962).

The development of visuo-motor skills in childhood has been subjected to much investigation. It has long been recognised that ability to draw and copy lines in the vertical and horizontal precedes ability to draw them in diagonals (squares are drawn before diamonds in the Terman–Merrill scale); that ability to copy designs from a model

precedes that of drawing them from memory, and that the accuracy with which a child can draw common objects (man, tree, house), can copy designs (Bender–Gestalt) and can perform block designs, is a very adequate measure of mental age.

Comparatively little attention has been paid to the development of topographical orientation in childhood, but a recent study has shown that the child masters the ability to find his way around, several years before he is able to describe directions in verbal terms, or appreciate them in pictorial ones such as on maps (Williams and Jambor, 1963). It was also noted in the same study that a child is able to copy the position of a spot, nearly two years before he can describe its position in verbal terms without prompting.

The words *right* and *left* are employed in relation to the child's own body, nearly two years before they can be referred to outside objects (Piaget, 1962; Benton, 1955; Williams and Jambor, 1963). From all these observations, one can generalise and say that visual perception and the development of the motor skills usually precede acquisition of the verbal ones. This, however, does not mean to say that words may not play an important part in stabilising the cues on which orientation is based. Indeed, it has been known for many years that the way in which one interprets ambiguous visual material depends largely on the name first called upon by the visual impression. Recent experimental work by Luria and by O'Connor is throwing more light on the connection between language and visual perception.

2. Intelligence

The effect of intelligence on the performance of visuo-motor skills, including drawing and block-design making, is so considerable that these tests are often used as a basis for the assessment of intelligence in normal people. Orientation for person, place and time are not usually considered to be dependent on intellectual ability, but it may be that these are so simple that even the stupidest individuals can achieve them.

Topographical orientation, and distinction between left and right seem to have a different basis. Whereas the normal child can differentiate between left and right both on himself and on others by the age of 9, and by the age of 11 can read maps and appreciate plans (Williams and Jambor, 1963), there are a number of children and adults who demonstrate considerable intelligence in other spheres,

but who always have difficulty on such tasks. Topographical orientation and right–left discrimination are never achieved automatically in these people, and have to be distinguished with the help of landmarks.

3. Culture and Upbringing

Some of the effects of culture and upbringing on visual perception and on the performance of visuo-motor tasks have been mentioned in the preceding pages. In all forms of perception, there is a tendency to see what we are expecting to see. Hence we overlook the slight peculiarity, unless it is so marked that it strikes and rivets the attention. The best-known example of this is our tendency to overlook misprints, such as reversed or omitted letters in familiar words.

Another effect of the cultural environment lies in the development of visual constancy, already described. The fact that language may influence our perception is another factor which has to be taken into consideration, especially in the sphere of reading and the recognition of words. As might be expected, it has constantly been found that the more familiar a word, the more easily it is seen, as judged by the time taken to recognise it. A slightly less forseeable result of culture lies in its apparent effect on the ease with which we can recognise pictures or letters in different parts of the visual field. While people accustomed to reading English usually recognise words better in the left visual field than in the right, there is some evidence that in those who are taught to read from right to left (Yiddish) the tendency may be reversed (Mishkin and Forgaye, 1952). Where the recognition does *not* involve written material, and where exposure times are short enough to rule out reading habits, the tendency to recognise material better in the right half of the visual field than in the left is very marked (Wyke and Ettlinger, 1961). A possible explanation for this has been put forward by Efron (1963).

Although little systematic work has been done on orientation for time and place in different cultural groups, it seems from some of the anthropological accounts available in the literature, that concepts of these also show cultural influence. Although it is clear that our own division of time into hours, days, weeks, etc., even though based on certain apparently immutable movements of the heavens, is entirely arbitrary, it might seem to us that ideas of *before* and *after* derive from basic logic and allow no dispute. Yet in some cultures, before

and after refer only to a small group of associated events, and have reality only within that circumscribed setting. Much work still, however, remains to be done to elucidate all the factors responsible for temporal orientation and time judgements.

4. Context

As already mentioned, much of what we *see* depends on our expectations. These may be aroused not only by our upbringing and past experiences; but also by the set with which we view them at the moment. The best-known example is that of the golfer who will pass without noticing them a hundred white flowers and pieces of paper, until he starts searching for a lost ball. Then, every white object in the environment immediately springs into view.

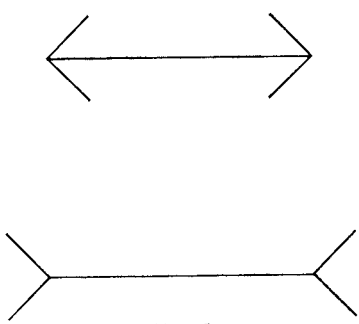

FIG. 3

Set may be aroused by immediate past experiences, by goals for the future, by desires and aspirations, and perhaps most important of all, by other factors in the immediate visual environment. For example, the apparent length of a line will be determined by the lines adjacent to it as in the familiar Müller–Lyer illusion (Fig. 3), where both horizontal lines have the same absolute length. The visual perceptions experienced by a person who could see only one half of the visual field or whose vision was limited to a small central area would clearly be very different from those of others.

Orientation for time and place are no less affected by set than is visual perception. During the early phases of returning consciousness, after concussion or any other form of cerebral disorder, the majority of people pass through a stage when orientation for person, place and time is inconsistent and fluctuating, and appears to be

dependent on isolated cues. The answer a patient gives to any question depends on the way the question is put, on his visual environment at the time, and often on isolated memories of the conditions under which consciousness was lost (Williams and Zangwill, 1952; Weinstein *et al.*, 1962). In a later stage, it is common for the patient to develop a fixed disorientation, determined by past memories as well as by his immediate perceptual experiences (Paterson and Zangwill, 1944).

5. Cerebral Structure

That visual perception is dependent on activity within the brain is, of course, obvious; but exactly how they are connected is still largely unknown. Certain visual phenomena are presumed to be dependent on cerebral activity, and to be due to neural fusion or blocking. For

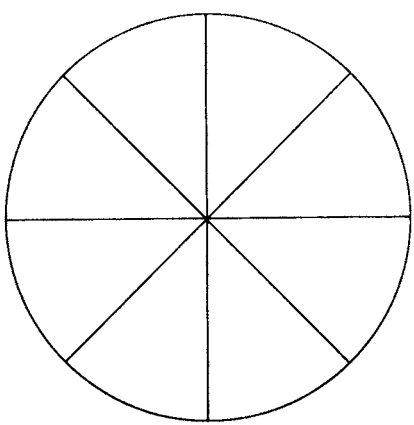

FIG. 4

example, if two visual stimuli are presented too closely together in time or space, they tend to fuse or to be seen as a single object in motion—a phenomenon very familiar in the "moving picture" or cinema. If pictures or diagrams with two equally meaningful interpretations are fixated for a prolonged period, the observer will tend to see first one shape and then the other. In Fig. 4 first the spaces between one set of arms will stand out as a cross and then that between the others.

How and where all these processes occur is not really known. If

our two eyes observe the same scene from a slightly different angle, as is our normal experience, we tend to see a single scene in three dimension. However if each eye receives a completely different set of stimuli (as can be arranged in the laboratory), the observer does not see the two scenes superimposed, but first one whole scene and then the other whole scene will come into view, regardless of any effort he may make to prevent them from doing so.

If these phenomena are the function of one single part of the brain, where is that part? It has been suggested that the parietal lobes are particularly involved, that of the dominant hemisphere being the most important. Evidence for this has usually been taken from the common observation that left-handed children appear to have greater difficulty in visuo-spatial orientation than right-handed ones, and that adults who have a life-long difficulty with right–left orientation are usually basically left-handed. These observations have been reviewed recently by Zangwill (1960) who agrees that visuo-spatial difficulties (as measured by tests of drawing, block-construction, map-reading, etc.) and of some aspects of language function (especially reading) are commonly seen together, and possibly do occur more often in left-handers than in right-handers. The difficulties may occur in every aspect of perception and orientation, and are not necessarily accompanied by lack of general intelligence. This correlation has been noted in at least three countries (France, U.S.A. and Great Britain), but as Zangwill points out, "cerebral ambilaterality does not in itself imply any abnormality of psychological development" (Zangwill, 1960, p. 25). In other words, many left-handed people function perfectly well, and moreover, handedness itself (from which cerebral dominance is argued) is difficult to determine (Humphrey, 1951).

In another warning, it is emphasised that correlation only shows co-existence, and does not imply a causal connection. Spatial difficulties, verbal difficulties and left-handedness, although they may be connected by a physiological basis, also occur more frequently than normal in children with difficult home backgrounds (Lynn, 1957). The possibility of negativism or of emotional factors retarding development, and so causing the connection, have not been completely ruled out by the evidence to date, although the majority of experts seem to regard emotional disorders as subsequent to the psycho-physical disorder, and not as its cause.

6. Cerebral Derangement

General. The brain, in its waking state, is geared to deal with sensory information and indeed, if such is not forthcoming for it to work on, the individual feels acutely uncomfortable. Volunteers who have been subjected to prolonged periods of sensory deprivation report extreme distress, often leading to hallucinations and delusions.

On the other hand, excessive stimulation leads to fatigue, and this in turn leads to a number of perceptual abnormalities which have been much studied in recent years, because of the dangers which might occur if aeroplane pilots or the operants of complex machines were unable to make the necessary quick and accurate readings of their indicators or dials. In general, it is found that with increasing fatigue there is: (1) relative indifference to small changes in dial readings, (2) a tendency for habitual response-patterns to be carried out in the wrong order, (3) concentration of attention on the dials most often responded to, together with lack of attention to those rarely used, and (4) failure to ignore distractions "which become increasingly obstructive and annoying" (Vernon, 1962).

In the case of permanent brain injury, differences in the performance of cerebral palsied and normal children have long been recognised, and consist mainly of difficulty in appreciating whole objects or patterns as distinct from their parts, and of differentiating a figure from its ground. In these children, visuo-motor performance is also frequently impaired. Abercrombie (1963) describes a 13-year-old girl with a M.A. of 11·5 years who was unable to copy an oblique line, but could say, "This is a diagonal. I can spell diagonal, d-i-a-g-o-n-a-l".

Severe general cerebral derangements nearly always cause disorientation for person, place and time. In the most severe cases, all three aspects may be impaired; in the milder cases, orientation for person may be retained, and in the very mild cases, orientation for person and place are retained, and only time may be impaired. The pattern of recovery shows the same picture; orientation for person is regained first, followed by orientation for place, then for time. It seems as though orientation for person is *easier* to retain than the other two, and that for place is easier than that for time.

Localised

Frontal lobe. Teuber (1963) has drawn attention to the fact that lesions in this area frequently cause disorders of perception of a kind

attributable to poor interaction between posture- and distance-receptors. Thus when the head is tilted, vertical lines may appear tilted too. Such disorders are easily distinguished from those seen in connection with lesions in the other lobes.

Occipital lobe. In this area, lesions cause visual disorders somewhat similar to those seen in retinal injury. Contours may be displaced, multiple images may appear, distortions of visual perceptions are common. The defects noted depend on the extent of the injury, but tend to improve in the course of time.

Teuber concludes that frontal and occipital injuries affect the perception of space, by distorting the cues being received from the eye. The defects noted are different from those seen in temporal and parietal injuries.

Temporal lobe. Specific defects in this area, especially in the dominant hemisphere, consist of defects of verbal expression and of orientation. Constructional apraxia (inability to carry out learned skills) may be seen, but is less frequently so than in parietal lobe lesions (Piercy *et al.*, 1960).

Parietal lobe. It is particularly in connection with lesions in the parietal area that the defects of spatial orientation and of perception are noted.

The symptoms which are commonly observed are:

(a) Visual agnosia

(1) Visual object agnosia—inability to recognise common objects by sight, although they can be recognised by touch.
(2) Simultagnosia—inability to recognise a whole picture as opposed to its parts.
(3) Agnosia for colours.
(4) Agnosia for space—inability to judge distances and to compare dimensions.
(5) Neglect of left side.
(6) Loss of imagery in dreams.
(7) Loss of stereoscopic vision.
(8) Loss of topographical memory.
(9) Prosopagnosia—inability to recognise faces.
(10) Metamorphopsia—a tendency for objects to appear distorted.

(b) Spatial agnosia (disorders of spatial thought)

(1) Defects of route-finding.
(2) Disorders in the recognition of symbols, letters, etc.

(c) Constructional apraxia

(1) Apraxia for common skills.
(2) Failure on stick and match tests and on Kohs blocks.
(3) Failure on paper and pencil tests.

(d) Body-image disorders

(1) Sensation that the right side of the body is missing.
(2) Neglect of left side of body.
(3) Supernumerary phantoms.

According to many observers, lesions in the dominant and non-dominant hemispheres can be distinguished by the different psychological symptoms produced. These have been classified by Critchley as shown in Table 11.

TABLE 11. SYMPTOMS OF PARIETAL LESION IN RIGHT-HANDED PEOPLE (from Critchley, 1953)

Bi-parietal	Left-sided	Right-sided
Visual central blindness	Disorders of language	Anosagnosia
Visual disorientation	Apraxia	Neglect of left side
Object agnosia	Gerstmann's syndrome	Spatial agnosia
Constructional apraxia	Pain asymbolia	Constructional apraxia
Somatagnosia	Astereognosia	
Stupor	Loss of topography	
Loss of visual imagery	Loss of abstraction	
	Loss of attention	
	Loss of memory	

Effect of right parietal lesion in left-handed people

Transient dysphasia
Right–left disorientation
Impaired verbal intelligence
Spatial agnosia
Left-sided neglect
Dressing dyspraxia
Visuo-constructional defects

In the final analysis, it seems doubtful whether any of the defects shown by patients with spatial misperception and disorientation differ in more than degree from those shown by normal people in certain states of stress or near-threshold difficulty. Who is there who has not at sometime had to stop and wonder how old he is, what the date is, or what time of the day it is now? "Depersonalisation" may occur as a transitory sensation in a number of conditions, and does not appear to be qualitatively different from the disorientation of the organically confused. Who is there who has not also at some time had difficulty in telling his right from left, in orientating himself along a familiar route (especially if it is partly obscured by fog) or in putting together mechanical implements which he feels should be well within his powers?

The laws determining spatial perception and organisation in normal people, so far as these are yet known, are followed in abnormality, but what is difficult for a normal person becomes impossible for an injured brain, and what is moderately easy for a normal person becomes difficult for a person with an injured brain and produces symptoms of breakdown. Very little study has been made of the influence of brain injury on various factors in visual perception, such as constancy, etc. (see Stevens, 1951). Observations by Kinsbourne and Warrington (1963) of intense and disturbing visual after-images in patients with occipital lobe lesions, suggests that this might be a profitable field.

When orientating ourselves in place and time, we are all dependent on (1) present stimuli, (2) recall of immediate past, (3) habits and memories from the remote past. In which of these spheres disorders are most prominent in cases of disorientation, it is difficult to know.

THE ASSESSMENT OF ORIENTATION

The tests used to detect and measure disorientation mainly consist of placing the subject in situations where "signs" may be easily elicited. Such tests are open to a number of criticisms. For the most part, they make little allowance for the factors outlined in the past pages. Thus, in those tests which are known to reflect intelligence, little attempt is usually made to allow for a subject's basic intellectual ability, while on the other tests, normal variations of response are unknown.

Despite these shortcomings, they have considerable value in placing the subject in a number of well structured and closely controlled situations, so that his behaviour under different conditions can be observed and assessed. Details of a useful series of such "tests" are supplied in the handbook by Mayer-Gross and Klein (1957) and in the larger work by Critchley (1953). They may be described again as follows:

1. Visual Agnosia

(1) The subject is shown and asked to name a number of common objects, and is asked to say what is going on in a more complicated scenic picture (e.g. "The Telegraph Boy" or some other scene from the Terman–Merrill series).

Signs. In the case of objects, the subject cannot name them by sight, or from pictures, but can do so as soon as he feels them. On pictures representing scenes, he may enumerate individual objects, but fails to appreciate the scene depicted.

(2) Two objects are held at different distances, and the subject is asked which is the nearest to him; or they are held at different heights, and the subject is asked which is the highest.

Signs. Incorrect responses.

(3) The subject is shown skeins of wool of different colours, each colour being paired, and asked to (*a*) name a colour pointed to by the examiner, (*b*) choose one the same colour, (*c*) pick out a colour named by the examiner.

Signs. Agnosia for colours is shown by difficulty in matching the colour, not by failure to sort the wools (see Goldstein–Scheerer test), or by inability to recognise the colour by name. Thus it will be seen only on (*b*) above.

2. Spatial Agnosia

(1) The subject is asked to show the way round the ward—or alternatively to mark the position of his bed on a plan of the ward.

Sign. When showing the way round, the subject indicates no "bump of locality" but orientates himself by landmarks ("It must be down here—I remember one turns by the yellow cupboard."), or by other memories. ("I know it's about twenty paces down this corridor—I've counted them to remind me.") On the sketch plan of the ward, he is unable to indicate his own position.

(2) Reading and writing tests (see Chapter 3).

Signs. In writing, the subject tends to reverse or transpose letters; in reading, he is inclined to mistake some words for similar-looking ones (e.g. salty for salute).

3. Constructional Apraxia

(1) The subject is asked to carry out simple, everyday tasks such as (*a*) comb hair, (*b*) light cigarette, (*c*) dress, (*d*) put out tongue, (*e*) imitate person playing piano, (*f*) make bed, lay table.

Signs. He may have great difficulty in doing these to order and when he is forced to think about the acts, but if not under the strain imposed by the test, he may be observed to carry them all out quite correctly (i.e. at an automatic instead of a voluntary level).

(2) The subject is asked to copy the first few designs of the Kohs blocks or of the W.A.I.S. block construction test.

Signs. Failures are often seen on the very simplest tasks (commonly within the ability of a 9-year-old child) and consist of building blocks on top of one another, building them on top of the designs to be copied, etc.

(3) Goldstein–Scheerer stick test (see Chapter 1, p. 35).

(4) Drawing—the subject is asked to copy the Bender–Gestalt designs, or to draw some common objects from memory—e.g. flower, man, house, cube, bicycle.

Signs. The most distinctive organic signs are a catastrophic failure, perseveration of loops and missing out of left side. General fractionation and the failure to co-ordinate or join lines may occur also in psychotic states, and is not very significant.

CHAPTER 6

THE FUTURE OF CLINICAL PSYCHOLOGY

FROM what has been said in the previous chapters, it will be clear that the clinical psychologist who is engaged in diagnostic testing has an exacting job. The psychological interview is not on a par with a blood-count, an X-ray or an E.E.G. The psychologist who does his work properly must accept his patient's trust, his confidence and his friendship. He must be prepared to devote an hour or more of sympathetic attention and of whole-hearted concentration on another person's problems, and while doing this he cannot fail to share these problems to some extent. The same situation may present different stresses to different individuals. An event which seems trivial to one, and can be brushed off with a laugh, may be enough to shake the entire mental equilibrium of another. To find out what is really making the patient suffer, the psychologist must be alert to the patient's every mood and reaction. He must learn to know him as intimately as he would his greatest friend, but he must do this in the shortest possible time, against every unconscious resistance that the patient may put up, and without becoming so involved in these problems that he loses his own powers of judgement.

It is not surprising that at the end of such an interview, the psychologist is anxious to see his patient helped, is interested in following his progress, and is too exhausted to repeat the process with another person straight away.

Clinical psychologists use a number of different strategies to keep themselves sane and their enthusiasm alive. Some practise psychotherapy. This enables them to limit the number of different contacts to an emotionally manageable number, and follow through a relationship to some sort of outcome. Others shut themselves off at

the outset of an interview from any emotional involvement with their subjects, and administer the tests as would a machine. By doing this they may be able to interview three or four different individuals each day, but at the sacrifice of any deep interest in any one. A third group tries to combine the scientific and humanitarian approaches by limiting the diagnostic sessions, and spending the rest of the time striving to alleviate mental sickness in a less personal way, through research.

Because of their training in scientific method, this last would appear to be the solution which clinical psychologists should adopt. The fact that few have done so may be due to either:

(1) lack of co-operation and encouragement (often financial) on the part of the people who employ them;
(2) over-involvement on the part of the psychologists with individual problems; or
(3) inability to identify those problems which are really amenable to research in the clinical field.

The absence of worth-while research resulting from clinical psychology is most often blamed on the first of the above alternatives—the lack of encouragement, of funds, of personnel or of time allotted to research as opposed to service. But this is probably too superficial an explanation. Elaborate teams and expensive projects may confirm, expose or tidy up hypotheses and mould them into working theories, from which new areas can be seen and plotted, but these amenities have seldom in themselves bred new ideas. The stagnation which in the past has characterised clinical psychology seems to have come much more from the topics studied than from outside pressures.

In the past, research in the clinical field has had only two ends, test construction, and sampling. The latter consists in the application of tests to a wide variety of subjects or to a few subjects under a wide variety of different conditions (e.g. drug trials). Hours of routine work have been spent by droves of technicians repeating questions, sifting responses, and calculating probabilities. The vast majority of the tests devised have eventually proved to have little application in the clinical field since, being based on the activity of healthy minds, they are not scaled to measure the changes or abnormalities which occur in mental illness. Nevertheless, the construction and standardisation of tests has been an important phase. Now that these fields

have been covered, where is the clinical psychologist to look for his next sphere of interest?

It was probably Freud who was first to point out that analysis of the mechanisms seen in mental illness may throw light on those which occur in the normal mind. The technique which he used, and his manner of presenting his findings, were not such as to encourage professional scientists to follow his example, but much recent work seems to be pointing to the truth of this principle. When memory, speech and perception break down in clinical situations, they do not produce new phenomena, but only accentuate difficulties which the healthy mind may deal with so quickly and effectively that the way in which it does so passes unobserved. Clinical breakdown can thus be used as a slow-motion camera, to photograph the processes involved in normal mental acts.

Hitherto mental derangement has seemed, perhaps, to contain so many imponderable complexities that the approach of the experimental scientist has not been attempted. But that the field is not entirely closed to the technique of scientific experiment has been shown by a number of papers quoted in the previous chapters, and by others which are reaching the press every day.

Further extension of such work is badly needed, and it seems to the present author that a study of the conditions influencing mental activity in the abnormal mind along the lines of classical scientific experiment, but always bearing in mind the problems of the clinic, may well produce the inspiration of the future.

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