FURTHER OBSERVATIONS ON APRAXIA.*

By W. MAYER-GROSS, M.D.

(From the Maudsley Hospital, University of London.)

IN dealing with the question of visual impairment in cases of so-called constructional apraxia in a previous paper, I had occasion to discuss arguments put forward by Erich Feuchtwanger, who had proposed to abandon the term "apraxia" for this condition and to call the disturbance "agnosia". My conclusion was in favour of the original concept of Kleist, who had put the ailment among the apractic syndromes. This, however, makes a detailed analysis of the motor activities and their disturbance in constructional apraxia necessary in order to define its place among the known kinds of apraxia.

In his analysis of the components of a constructional performance, which I quoted in the paper referred to, Feuchtwanger calls the activity here "voluntary and non-automatic"; otherwise he speaks of the "technique of movements" as undisturbed. Even so, the special nature of motor behaviour in constructional apraxia seems worthy of further investigation. His reference to the "non-automatic" character of the activity opens a way of approach. The problem of automatism is of course not limited to the constructional form of apraxia. Therefore, not only the clinical but also the psychopathological relationship between constructional and other forms of apraxia has to be considered.

The analysis of movements from the point of view of automatism must be psychological, because discrimination of automatic from non-automatic is entirely dependent on psychological, or more precisely, introspective data. Even neurologists, like C. and O. Vogt, have admitted that psychology is the only possible way of making such a distinction, and have complained of the regrettable absence of physiological criteria. Although one realizes the limits of psychology within such a field, one should utilise it as far as one possibly can.

Non-automatic voluntary activity is characterized by certain conscious psychic events which precede innervation: (1) the awareness of the limb to be used, (2) images of the spatial relations of the limb and the objects involved, and (3) the awareness of the temporal order and sequence of the movements. Behind all this must be (4) the knowledge of the aim of the activity. The activity itself is accompanied by (5) a feeling of effort. If consciousness contains nothing of these experiences which precede or accompany the movements (with exception of the aim) one speaks of automatisms. These are

* With the support of the Rockefeller Foundation.

https://doi.org/10.1192/bjp.82.341.744 Published online by Cambridge University Press

called " primary " if such a consciousness has always been absent as far as one remembers (e.g., correlated movements of the arms in walking, reflex movements of every sort, expressive movements like laughing, crying, etc.). One speaks of " secondary " automatisms if, while the activity was being acquired, there were such conscious events which later on disappeared (e.g., all learned abilities like writing, skating, etc.). Under disturbing or morbid circumstances the awareness can reappear in these secondary automatisms. Zutt has described this in analysing the subjective experiences of a musician who had tried to play the violin using the opposite hands to that usually employed; the activity then became non-automatic again and the musician returned to the learning stage.

It is doubtful if the distinction between primary and secondary automatisms —so striking at first glance—holds good in every respect. Liepmann, however, especially emphasized the difference in acquiring the two kinds of automatic activities: with the primary automatism, he explains, only latent abilities are disclosed and regulated; nothing is taken up from outside. In acquiring the secondary, one receives something from other persons or from objects. Only the latter, in Liepmann's opinion, is " learning " in a strict sense, and contributes something new to the stock of memory. " Paralysis, spasms, ataxia, etc., are suspensions or disturbances of innate or, at least, preformed movements. Apraxia is suspension or disturbance of movements learned by experience, example or tuition, i.e., of something definitely mnestic." Thus the discrimination of two kinds of automatisms was used by Liepmann for the delimitation of apraxia from lower kinds of motor impairment. Still this definition hardly suffices to cover the range of observations considered as apraxia to-day, and neither does another which is generally quoted in text-books, viz., disturbance of *purposive* activities, although the apparatus of the limbs is unaffected. Liepmann made use of both definitions, notwithstanding that they apparently do not coincide. Unfortunately one cannot entirely dispense with the concept of " purposive " activities for a rough characterization of the activities of daily life which apraxia often disturbs. But one should not forget the logical traps contained in the word " purposive "; does it refer to an objective purpose, or to the subjective awareness of any purpose? Furthermore, any activity can be considered purposive; all depends on the question, purposive in what respect?

This paper does not aspire to make a new definition of apraxia—a difficult and perhaps not very essential task at the moment.

Jackson's principle of " reduction to a more automatic condition " in cerebral lesions has already revealed the importance of the problem of automatism in apraxia. It is also expressed by him in the sentence quoted by Kinnier Wilson: " He (patient) had lost power to execute, not all movements, but those movements which are most artificial." The movement which

https://doi.org/10.1192/bjp.82.341.744 Published online by Cambridge University Press

the patient cannot perform in a non-automatic way he can easily perform automatically. Here again the decisive role played by inner psychic experiences is evident, especially with regard to the question: what is difficult and what easy for the apraxic patient? The tests used by Liepmann are in accordance with this. For revealing slight apraxic impairment he chose activities which most people can easily perform in a non-automatic way: "purposeful" activities containing a sequence of smaller activities each of which asks for non-automatic release: e.g., closing and sealing a letter or pouring water out of a closed bottle into a glass, etc. Alternatively he deprived simple automatic movements like "knocking at a door", "turning a key", of their automatic character by making them "purposeless", or, otherwise expressed, by changing the spatial relations of limb and object: the patients are asked to *pretend* to make such movements *without* the *objects* involved. Liepmann emphasizes the value of the latter test, especially in his last comprehensive article. Furthermore he mentions—although not in these words—the influence of the "test situation" on the result of the test, (also remarked on by Jackson): the patient makes spontaneous use of his handkerchief, but is unable to do so when asked by the examiner to blow his nose.

Among the eleven cases of constructional apraxia observed, I found several showing slight signs of Liepmann's ideokinetic apraxia. Two most striking observations seem worth recording in this connection: both mild cases of otherwise pure constructional disturbances exhibited difficulties in pretending movements, e.g., using scissors, counting money, but had not the slightest difficulty with sequences of activity making use of an object, e.g., sealing a letter. As they showed no impairment of visual imagination, the failure of these patients in pretending may have been due to the fact that this task is psychologically akin to constructional tests. Here again there is need of an analysis of construction from the viewpoint of automatization to clarify the field.

If one takes as typical constructional performances, the arrangement of matches, coloured mosaics or bricks in accordance with a given pattern or on verbal request, one finds five points of psychological significance for differentiating them from an activity like lighting a candle or posting a letter:

1. Constructional tests have not been practised or rendered automatic in any respect.

2. By such a test the patient is removed from the sphere of daily life and its purposes. The employment of matches quite apart from their usual purpose illustrates the change of sphere.

3. It may be objected that the tests are strange, too far from daily life and therefore not suitable to patients with brain damage. This is, however, not justified; by the material given the patient is transferred into a situation familiar to every one—the situation of playing. One could regard, e.g.,

https://doi.org/10.1192/bjp.82.341.744 Published online by Cambridge University Press

the test of lighting a candle in daylight as much stranger and more artificial. The patient behaves like a normal person solving a jigsaw puzzle, or a layman putting together a complicated machine which he had taken to pieces out of curiosity. He uses the method of trial and error, holds the parts in different positions, corrects mistakes, and starts anew when the result does not satisfy him.

4. Stressing the similarity between playing and constructional tasks does not mean that the patients do not take them seriously. On the contrary the patients show an astonishing earnestness and eagerness in doing the tests, perhaps because—as Goldstein has pointed out—patients with brain damage have often lost the easy attitude of playing. The patients' behaviour can also be compared with learning any sport, like skating or playing golf: here the likeness to playing comes in again. This attitude of learning deserves special attention with regard to the problem of automatism. Constructional tests, being entirely unpractised, as it were, evoke the learning attitude in the same way as intelligence- or performance-tests often do.

5. Finally in all constructional tests the visible work on its way to completion influences psychologically the process of this completion. In respect of this to-and-fro effect, constructing is closer to artistic activity, and is thereby distinguished once more from the activities of daily life.

All this holds true also with regard to the *drawings* of patients. Drawing is as a rule not practised; it is something remote from the purposes of daily life; it is done in the playing attitude of trial and error and at the same time with a learning tendency, especially if the examinee is asked to copy a pattern.

Drawing occupies an exceptional position, in so far as writing, a highly automatic ability, is acquired by way of drawing or copying. By applying Jackson's principle it is not difficult to understand that a brain damage disturbs the non-automatic activity of drawing, while writing, an automatic activity, is well preserved, as it is in some cases of parietal syndrome.

Closer examination of special cases, however, makes it doubtful whether the principle is generally applicable. The following case of an artist, already cursorily quoted in a former paper, is here given in full as an unusually interesting contribution to the psychopathology of writing and drawing.

K. P—, æt. 50, a well-known artist in stained glass, showed numerous neurotic traits in childhood, and was always a hypersensitive, worrying and very impulsive person. He was well read, had himself written poetry and was very successful in his artistic career. He had for a long time suffered from attacks of migrainous headaches with giddiness and sickness. In April, 1932, two years before admission, he had a fainting attack while working; his arms and legs suddenly felt weak, he could not open his paint tube. He called his wife, who found him lying on the floor, but not unconscious. He moved slowly, and from then on he complained of intermittent blindness in one eye, coming on with migrainous attacks lasting about one hour. He again became energetic and active. Seven weeks before admission to hospital he suddenly felt unable to continue his work. He could

https://doi.org/10.1192/bjp.82.341.744 Published online by Cambridge University Press

hold his pencil, but fine movements were impossible. He misjudged distances when putting his teacup in the saucer or pouring salt on his plate. When he had picked up anything with his hand he seemed unable to let it go. His left leg began to feel numb below the knee, his foot dragged and felt cold. A fortnight before admission disturbances of memory and speech were observed. He would stop in the middle of a sentence ; he himself complained of being confused and hazy and could not tell the time.

On admission to the Maudsley Hospital as an in-patient (July 17, 1934) the main *neurological findings*, which remained relatively constant up to the final stage, were as follows. (A detailed description of the sensory disturbance is given later.)

Pupils were unequal and dilated but showed normal reactions ; fundi were normal and all the cranial nerves intact. Lip reflex very active. Slight spastic paresis left arm. If he held out his arms, the left slowly dropped. Left-hand Meyer's reflex absent ; deep reflexes all very brisk ; sometimes left ankle clonus and doubtful extensor left side. No ataxia. Wassermann reaction was negative in blood and cerebro-spinal fluid. The latter showed no abnormal reactions.

During the two and a half months of the observation his mental state was rather variable. A prominent feature was his lack of spontaneity, especially in speech. He never uttered anything spontaneously, although he apparently took some interest in his surroundings and could be lively if visited by his relations. When examined he was co-operative and quite willing to do the tests, especially during the first period. Later on he often seemed drowsy and sleepy, or distracted by bodily complaints due to thrombosis of the legs. Sometimes his efforts varied from day to day, so much so that his behaviour might have been thought to be hysterical, especially as his attitude was rather self-pitying. He was always conscious of his mistakes, got easily depressed if he failed, and worried a long time, afterwards becoming unable to do anything more.

A fortnight after admission he developed thrombosis of the left leg, and at the end of August both legs were affected. He gradually became weaker. The pulse was rapid at times and the drowsiness increased. He was only accessible for a few hours of the day. He complained of pains and stiffness of the neck, which improved after a lumbar puncture in September. At the end of this month he had epileptiform seizures, in which he turned his head and eyes towards the left. Finally the seizures occurred every two to three hours, spasmodic jerks of both sides were observed and variable Babinski on either side. He became unconscious and died on September 30.

Macroscopic findings in the brain.—The brain was hardened in 10% formalin. Coronal dissection into slices of about 1·5 cm. thickness disclosed the following distribution of softenings : On the back of the slice which just showed the beginning of the anterior horn, a softening of the cortex of the left first frontal convolution, which extended also into the white matter of this and the second frontal convolution.

One and a half cm. further back the lesion was still visible near the medial surface, but was here more or less confined to the cortex.

Another considerable district of softening was localized within the cortex and white matter of the right paracentral and the upper part of postcentral region. The corresponding left hemisphere contained a small softening of about 2 mm. diameter situated on the top of the postcentral gyrus near the medial surface.

Both superior parietal lobes showed extensive softenings near the medial surface. On the left side this lesion was in connection with a large district of irregularly limited softenings, which left intact the superior parietal lobe further backwards. They involved the inferior parietal lobe, both the supra-marginal and angular convolution (cortex and white matter), also the cortex and white matter of the first temporal lobe. The white-matter lesion of the parietal lobe extended approximately to the " keel " of the posterior horn.

On the right side there was besides the softening in the superior parietal lobe further backwards a lesion of the white matter of the inferior parietal lobe, the cortex of which was intact. The parietal lobe on this side was, as a whole, much less involved than that of the left.

https://doi.org/10.1192/bjp.82.341.744 Published online by Cambridge University Press

The occipital lobe was intact throughout on both sides.

The corpus callosum was intact, except for a very small part of the splenium, histologically identified as a softening.

Psychological findings.—The following survey contains an abstract of numerous daily examinations in which are recorded in greater detail the special features relevant to the point under discussion.

Shortly after admission the patient gave a scanty account of his domestic and professional life and his illness; he was very uncertain about dates. His memory for past events remained incomplete, but on many occasions he proved that he could recollect numerous details of special events. Retention was always bad, especially for numbers. In repeating a story he gave only a rather fragmentary account. He was hardly able to do any arithmetic, and failed even in the simple oral tables. Written arithmetic was still worse. Simple counting was unaffected, but he was entirely unable to handle money.

Speech perception was entirely normal. P— himself emphasized that he understood everything. He had, however, great difficulty in finding words. This varied, but was always present if he had to name or to express something unusual. He rarely spoke spontaneously; his answers were mostly short, and given with much hesitation; but this taciturnity was certainly not caused by any kind of motor aphasia or anarthria.

Sensorium: Eyesight was normal, and so were the visual fields, which could only be tested grossly. There was certainly no hemianopsia, no hemilateral difference in optokinetic nystagmus; normal blinking reflex on both sides. Perception of colours was entirely undisturbed, he sorted correctly different shades of one named colour without hesitation. Colour names were affected to approximately the same extent as other words. He recognized pictures of single objects without difficulty. In choosing named objects from a number, he had some difficulty in looking over the lot, and this disturbance in visual attention was more marked if larger and more complicated pictures were shown to him. He either picked out numerous details without giving an account of the whole, or correctly recognized the meaning of the whole picture and was unable to find out details. Reading of words and numbers was normal, but he lost the line easily in reading sentences. No difficulty in spelling. When one gave him words with single misspelt letters, he usually recognized the word and saw, if questioned, that there was something wrong, but he never found out which letter was misspelt. He had great difficulty in telling the time by the clock. Sometimes he gave the correct hour, but always failed in giving the minutes.

Hearing and auditory perceptions were undisturbed. P— recognized the usual objects, e.g., matches or keys, by their sounds promptly; also the tunes of popular songs. One could not get him to produce any tune himself. He localized auditory stimuli with some difficulty, but without gross mistakes.

Skin sensibility was normal in all qualities, but there was some difficulty in localizing stimuli to the left hand. P— had difficulties in recognizing numbers written on the skin, but he did not fail entirely. Deep sensibility was undisturbed. Stereognosis was entirely normal without any lateral differences. No anosmia.

Motility.—Facial expression was stiff and generally somewhat mask-like. There was, however, no apraxia of facial movements or expression. P— said on several occasions that he felt his right hand different from the left, but was not able to explain this except by calling it weaker. In spite of the spastic signs in the left hand, and although the patient was originally right-handed, he definitely preferred to use his left hand. The right hand and arm was markedly akinetic, the muscles hypertonic; sometimes slight tremor could be observed. Right adiadochokinesis marked.

To some extent the difference between the two hands influenced their co-operation in purposeful activities in which both hands had to be used. In striking a match, lighting a cigarette or a candle, pouring water out of a bottle into a glass, P— usually grasped the object at first with the left and tried to do everything

https://doi.org/10.1192/bjp.82.341.744 Published online by Cambridge University Press

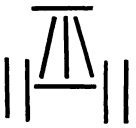
using the left hand alone. If he had to employ both hands the result was often less prompt and correct. If one forced him (by fixing his left) to use his right hand the activity was performed more slowly, but with approximately the same accuracy as before. P— seldom failed in these activities; e.g., he was able to cut a sheet of paper correctly in two equal halves with scissors; but in combing his hair with one hand and holding the mirror with the other, he manipulated the comb at first towards the mirror instead of on his head; but after having at last got the comb away from the mirror, he did it perfectly, combing equally well with either hand. In posting a letter he folded the letter with great deliberation with both hands and put it slowly and correctly into the envelope, always using his left hand by preference. It was, however, not possible to establish a clear difference between the two hands with regard to the slight disturbances in praxia. His performances in carrying out pretended activities (such as military salute, beckoning, catching a fly, counting money, etc.) were equally bad in both hands. No difference in the number or kind of mistakes could be established on repeated examination; he was never able to correct mistakes of the one hand by using the other.

There was marked *finger agnosia*. P— could neither name the fingers pointed at by the examiner, nor show or move the fingers named. If he was asked to move the finger of one hand corresponding to that which the examiner had touched on the other, he did it with many mistakes when it was the right hand that had been touched, but failed always when the reverse order was used. He imitated given finger postures equally badly with each hand.

Pointing at different objects within the room was done without difficulty, so was pointing to parts of his own body provided that the question of lateralization did not interfere. When a cardboard box was held in front of him he could point to the top, the bottom, the back, the front and the sides of it; he was, however, uncertain as to the left or right side. He also looked upwards, downwards and sideways when asked. But when asked to point to the directions horizontal and vertical he failed; he moved the right index finger horizontally towards his body for horizontal, and horizontally across his body from right to left for vertical.

P— had great difficulty with *right and left*, and some correct answers seemed to be pure guesswork. He could not mark the position of Ireland after a rough sketch of England had been made on paper by the examiner. He was unable to show the points of the compass on this map; even after marking north and south, he wrote the word "west" on the southern coast.

Constructional ability, tested with matches, bricks and coloured mosaics was severely affected. P— was sometimes unable to copy a simple rectangular figure containing only four matches, although he tried hard. When asked to make a house with matches without pattern, he did it like this:



He could not copy the usual pattern of a square with a triangle on top. His copies of mosaic patterns were, if there was any similarity at all, reversed in direction or with wrong lateralization of the colours. He was entirely unable to do the ship-test (Pintner and Paterson). He put the parts in the frame, but could not arrange them in the right order.

In view of his profession P—'s *drawing* was of special interest. In a former paper I have reproduced some examples which illustrated both the general decline and his special inability in spatial disposal. I called attention to some of the fixed schemata which he used occasionally, and in which the professional hand was disclosed. Only very few such automatically produced schemata could be discovered. Even the most simple things, like a cube, an arrow, a flower, a star,

https://doi.org/10.1192/bjp.82.341.744 Published online by Cambridge University Press

a key, etc., were drawn in an uncertain and child-like manner without any skill or sign of routine. The famous glass painter was as helpless as any unskilled layman. It was impossible to get him to sketch the contours of a gothic or Roman window. The problem of visual imagination of course arises in connection with those failures. It was not easy to judge how far visual imagination was impaired because of his lack of spontaneity in oral description and his difficulty in finding words. P— gave correctly by gesture the size of different animals, and described his studio and the furniture and tools in it, though poorly. When asked a direct question on the point he would state that he had no difficulty in picturing anything he remembered, e.g., the appearance of his daughter or the last window he had painted. Moreover the result of his drawing was no better when he tried to sketch an object placed before him: one had to press him to do this, and his attempt would sometimes end in dejection and tears.

The procedure of drawing was always slow and hesitant. The only difference between the two hands was that the left seemed more uncertain and shaky in drawing the single lines. There was a striking tendency to draw everything in an equally small size without regard to the available space, and to put the single drawings close together within a narrow space even if they were of quite different kind ("closing-in" symptom). Some failures were due to marked perseveration. Occasionally P—'s first reaction, when asked to draw something, was to write the respective word in block letters before he began to draw.

In *writing* P— used block letters almost exclusively. He wrote in this manner approximately with equal correctness with either hand. On a few occasions he showed a tendency to mirror-writing with the left. Single letters were entirely correct; there were few mistakes in spelling in larger words. But these mistakes increased, and made the whole word unrecognizable when he tried to write in cursive script. He could never write his signature in cursive style, and always copied written words in block letters. He was unable to keep the line, and the arrangement of his writing on the sheet was disturbed in the same way as in his drawing.

Arranging of wooden letters in order to form words was generally worse than writing. His performance of this test varied; he usually came slowly to the right result after numerous trials if one gave him time enough. He always put the single letters right way up, corrected them promptly if they were upside down, etc.; but he had great difficulty in finding out the right order.

This case of slowly progressing cerebral arteriopathy with multiple softenings and hæmorrhages shows several symptoms worth discussing in full. The combination of a right-sided akinesia (probably of frontal origin), with ideokinetic and constructional apraxia equally in both hands, reveals many interesting problems as to the combination and interplay of apraxic disturbances with lower motor anomalies.

I shall confine myself, however, to looking at the observation from the point of view referred to earlier, i.e., with special regard to the patient's writing and drawing.

Handwriting, an unquestionable automatic activity in a person of P—'s education, was most disturbed when he performed it most automatically. Even his signature, usually preserved in such cases, was impaired. It was however well preserved if done in the non-automatic way with block letters. P—himself took refuge in this kind of writing when he found it difficult to draw (like other patients in my series who escaped into cursive writing under the same condition). The objection that P— might have always preferred to

https://doi.org/10.1192/bjp.82.341.744 Published online by Cambridge University Press

write in block letters as some artists do was refuted by information from relatives.

Expressed in general terms this observation shows that the patient preferred less automatic activity to automatic ones, i.e., the opposite to the behaviour one would have expected according to Jackson's principle, as it is, e.g., expressed in his sentence: " (dissolution) is a ' taking to pieces ' in the order from the least organized, from the most complex and most voluntary towards the most organized, most single and most automatic." Such an isolated observation would not mean very much, were there not similar observations in the psychopathology of other cerebral lesions. To take aphasia for example, one certainly finds that Pitres' rule, viz., that polyglots preserve their mother tongue better than later acquired languages, is in conformity with Jackson's principle. Many authors have described exceptions from Pitres' rule, and have eagerly tried to find out the various causes which might have interfered with the rule in each case. Whatever one might think of their far-fetched and rather speculative explanations, the observation itself remains incontestable. Another limitation of Jackson's principle is contained in his identifying the developmentally earlier functions with the more automatic. Applying this to P—'s case, one might assume that block letters might have been earlier acquired, but they were afterwards not automatized like cursive writing. Consequently the time factor of acquisition seems more decisive than the degree of automatism. At a any rate this patient's writing disturbance justifies a reconsideration of Jackson's principle and its complications in the field of writing and drawing.

With regard to the latter, similar difficulties are obvious in P—'s case. His drawing was undoubtedly a highly practised faculty, and one could call it automatized with regard to his occupation. The influence of his professional training and practice on his performance now that his brain was damaged was astonishingly small. Some poor schemata (house, leaves of a tree, parts of a chair, a head, outline of a boat) were all that he could do. Other objects, like an arrow, an engine, flowers, cube, etc., were drawn in a most unskilful and childlike manner, without even a trace of former training. There was no noticeable difference between P—'s performance of mosaic tests—which were certainly to him of the same remote and play-like character as to everyone else—and his drawing which had been part of his professional work all his life.

It is, however, remarkable that some fixed schemata of designing had been excepted from the destruction, and could still be reproduced in a more or less automatic way. Reduction of automatisms takes place, not gradually, but in parts; there are preserved islands, so to speak, which are no longer of use because the connecting bridges have decayed. It was astonishing how little help these preserved automatized fragments really gave to the patient's drawing. On the contrary, one got the impression that, if present at all,

https://doi.org/10.1192/bjp.82.341.744 Published online by Cambridge University Press

they rather hampered his production. The mixture of automatic with non-automatic elements of activity seemed especially difficult to him. This recalls analogous observations in aphasics, who may relearn their disturbed speech by way of a language or a dialect which was never much used and not automatized before (as in cases described by Bychowski and Minkowski).

Furthermore, new light is cast on the psychology of Liepmann's "pretending" test. This test is so difficult for the patients because it is a mixture of automatic with non-automatic activities. More exactly expressed, automatic movements like knocking a door, hammering a nail, etc., are withdrawn from their natural situation and from normal objects and transformed into the non-automatic set of pretending them; hence the value of the tests as indicators of slight apraxic disturbances of every sort. Even in constructional apraxia, a disturbance which only concerns the non-automatic sphere, such a "mixture" may be failed, as happened in my two cases previously mentioned (p. 746).

But these considerations can also explain why the opposite conclusion would be wrong, that is to say, cases of apraxia showing difficulties in pretending, can still construct. The patient presently to be described, for instance, showed a left-sided ideokinetic apraxia, but had no constructional disturbances. There are not many cases of apraxia described in the literature in which constructional abilities were preserved. A detailed record of the case seems, therefore, worth publishing:

Sophia T—, æt. 35. Nothing noteworthy until three years ago. Four days after the birth of her third child (June, 1931) she had a "turn" in which she made guttural noises; the husband found her with bulging eyes, she was conscious, tried to speak, but was unable to do so for a few minutes. She did not recollect this turn afterwards. Later in the same year she developed a "sort of stammer"; "she could not get the words out", chiefly when she was worried. The following year epileptiform fits began, in which she fell, mostly towards the right side, her face twitched and sometimes she damaged herself. Afterwards she would be sleepy and complain of headache. A fourth child was born in March, 1933. About a year later her right arm began to get weaker. The fits continued, and in August, 1934, she began to drag her right leg. There was some deterioration of memory and judgment.

On admission to the Maudsley Hospital (September 28, 1934) she had all the signs of spastic hemiparesis of the right side, including a slight facial palsy; there was a tic-like twitching on the left side of the face. There was papillœdema with hæmorrhages on both sides.

Psychic state after admission.—She was unable to give an account of her illness, answered very slowly, in single words or short sentences. She was often absent-minded, easily tired and then unwilling to co-operate. If she failed a test she began to cry; occasionally she laughed fatuously. She was orientated about her own identity and knew the place, but was not orientated in time. She seemed always distant and remote; was sometimes very distractible and showed an increased responsiveness to stimuli of every kind. There was perseveration in nearly all performances. She obviously had some feeling of her disabilities, but no clear insight.

She had no difficulty in understanding speech; she could read, and at first did not show any motor speech disturbance. She had, however, typical difficulties in

https://doi.org/10.1192/bjp.82.341.744 Published online by Cambridge University Press

finding words, especially nouns. She was able to pick out the right word if similar words were offered. Beyond the difficulty caused by the right-sided paralysis, there was disturbance of writing with the left hand too. In putting together wooden letters, she failed to form words of more than three letters. There was a severe arithmetic disturbance, and in oral arithmetic sometimes she could not do the simplest test; on other occasions she could solve simple problems of additions and multiplications using money, etc. She wrote single figures correctly. Counting was possible, and so was optic counting of dots of dominoes. She had no seizures here, but the signs of increased cranial pressure: Cerebro-spinal fluid was under high pressure, protein slightly increased. Wassermann reaction was negative. X-ray of the skull disclosed erosion of the posterior clinoid process. On October 24, 1934, a decompression in the left subtemporal region extending forward to the frontal region was done by Mr. C. P. G. Wakeley. No tumour was found in the course of an extensive exploration. After the operation the patient developed a transient motor aphasia, and the right-sided hemiplegia became worse. Papill-œdema and sight, however, improved temporarily. In December she received deep X-ray therapy without much benefit. A large cerebral hernia developed.

At this time a striking apraxia of the face and the left arm was observed, which will be described below.

The further course of the illness was unfortunately one of slow decline. The papillœdema became slowly worse; new hæmorrhages of the retina appeared. The motor aphasia improved a little. The patient showed little concern about herself for several months. She complained of headache from time to time when the cerebral hernia was more tense and the pulse-rate low. In April she had attacks of pain with nausea and slight twitching of both arms. She became irritable and called out because of pains. Optic atrophy developed. She became noisy at night, was almost stuporose during the day and had difficulty in swallowing. She died on July 10, 1935.

Macroscopical Findings in the Brain: The prolapse involved the medial and posterior parts of the second and third left frontal convolutions, extending also to the temporal pole. Towards the medial surface of the convexity the prolapse passed over into a cavity of softening, which extended nearly to the edge of the medial surface. Chiefly, the first frontal convolution was destroyed by the softening, which stopped, as far as the surface was concerned, at the beginning of the precentral region. Coronal dissection showed that the cavity was localized above the lateral ventricle, which was enlarged particularly in a frontal direction. Backwards, the fibres of the corpus callosum passing into the temporal lobe were involved. Within the white matter the softening extended above the lateral ventricle to a coronal plane which went through the tuber cinereum.

Histologically the tumour was a glioblastoma multiforme.

Psychological examination.—During December, 1934, and January, 1935, Mrs. T— was relatively accessible and co-operative when examined. The motor aphasia was gradually improving; she understood everything perfectly. Writing was better than before: she wrote single words with her left hand slowly; no mirror-writing. There was a marked *facial apraxia*: she was unable to nod "yes" or "no", could not lick her upper lip on request or imitate such a movement. She failed in whistling, clicking the tongue, pouting, etc. Shutting of the eyes and putting out the tongue were the only activities done correctly. On one occasion she was unable to lick her upper lip on request, but when asked to remove a pretended bit of food from her upper lip she carried out the movement correctly. This apraxia extended to the left arm and hand. Although she handled single objects and tools without difficulty (scissors, matches and matchbox, hammer, needle, pencil, key, fork, etc.), she made gross mistakes when she pretended to make such movements. Although she seemed quite willing and able to picture the objects, her movements were awkward and diffuse and perseveration was

https://doi.org/10.1192/bjp.82.341.744 Published online by Cambridge University Press

extreme. She was similarly bad in making gestures with her left hand (*e. g.* a military salute, threatening, beckoning, waving farewell, throwing a kiss), which she also imitated very unskilfully.

In striking contrast to this concomitant dyspraxia (" sympathische Dyspraxie "), she had not the slightest difficulty in copying patterns of mosaics, building with bricks or matches ; she did not show any of the typical failures in constructional tests. She even drew a little man correctly and quite well considering that she did it with her left hand.

The apraxia exhibited by this patient after the operation was rather severe within the facial region ; it was relatively slight in the left arm and only demonstrable in pretending tests. The patient, however, approached the constructional tests with an entirely different attitude compared with her hesitation and uneasiness in doing the facial or pretending movements. She did not show the slightest inhibition in constructing, and apparently enjoyed it. The purely non-automatic character of the test was apparently facilitated by its liberation from routine and usage. One can compare this with P—'s preference for block letter-writing. This explanation, however, is, as in P—'s case, more or less conjecture—all the more since the second patient herself was quite unable to give any information about her behaviour. Judging from behaviour only, the observation of Mrs. T— also demonstrates the special non-automatic type of performance which constructional tests reveal.

What holds true with regard to Jackson's principle is that the distinctions it established are of great importance in destruction of motor functions. But the result of such a destruction can be of either kind—abolition of the non-automatic and preservation of the automatic activities or vice versa. We do not know the decisive factors which determine conformity or non-conformity with the principle in the single case. Beyond that the borderline between automatic and non-automatic is a fluctuant one—a point especially stressed by Sittig.

With the case of Mrs. T— the problem has been touched on how far the different forms of Liepmann's apraxia interfere with construction. The following observation of a case of limb-kinetic apraxia will be described as a further contribution to this problem. The existence of limb-kinetic apraxia or innervation apraxia (Kleist) was until recently rather a theoretical possibility, demanded by Liepmann's conception of apraxia, than a fact of observation (Sittig). But the increased knowledge of brain injuries provided by the Great War has proved that cases exist which represent " something in between paresis and mnestic disturbance of activity "—as Kleist has put it.

The following patient had this limb-kinetic apraxia in both hands, but the left side was much more affected than the right.

Jesse T—, a welder, æt. 59, had an accident with head injury when he was 40. He was unconscious for a short time and off work for a month. Otherwise his history did not contain anything of interest. Three years ago the patient became very forgetful, and in November, 1935, his employer sent him on holiday. He resumed his job as an acetylene welder, which he continued up to the spring

https://doi.org/10.1192/bjp.82.341.744 Published online by Cambridge University Press

of 1935, when the men with whom he was working did not feel safe any more. He was given a light job, which he also had to give up in July, 1935, because of increasing forgetfulness. He was then already disorientated in time and had great difficulty in writing his name. He had attacks of headache with pallor and loss of speech for a few moments. After about a fortnight these attacks ceased; later on a few attacks of giddiness were observed, after which his memory became noticeably worse.

From August, 1935, T— attended the Out-Patient Department of the Maudsley Hospital, and was admitted as an in-patient on December 16, 1935. His state did not change during about one month's observation.

T— was a stout and well-built man, who looked somewhat older than his age and had marked arcus senilis. Pupils and discs normal; optokinetic nystagmus normal both sides; very active lip and jaw reflexes accompanied by flexion of hands; right slightly stronger than left; no reflex differences otherwise. No spastic signs, no clonus, no tremor, no ataxia, no marked paresis. On one occasion a slight weakness of the right arm was observed; once the right plantar seemed to be extensor. "Stützreaction" present in all limbs, more marked in arms than in legs, easier to release on the right than the left side. Some swaying in walking; no deviation towards one side; no Rombergism. Posture and righting reflexes normal. In Bárány's test he showed an outward deviation in both sides. Blood-pressure 120/80. Wassermann reaction in blood and cerebro-spinal fluid negative; the latter normal in every respect.

In the ward, if left to himself, the patient seemed interested in what was going on around him. He talked very little spontaneously, but was often restless, out of bed, searching for things he had not lost. If questioned he answered to the point, was cheerful and amenable. He often gave the impression that he did not take in what was said to him and seemed somewhat deaf. This was due to a kind of sensory inaccessibility, which will be referred to below. He took his food, dressed himself, was always clean and slept without sedatives. His spirits were chiefly good, and he was inclined to make jovial remarks, especially with regard to the female nursing staff. Sometimes he was rather shameless in exhibiting his genitals, on other occasions over-anxious not to do so. He was often extremely irritable, had outbursts of anger, and at times scornfully refused to go on with the tests. His adaptability to the situation of being tested was rather limited. He often seemed annoyed at the "childish" character of some tests, or was suspicious that one might not take his efforts seriously enough. He seldom had the usual attitude of the patient who tries to do his best in an easy way: his efforts were always exaggerated to the utmost.

He was disorientated in time and space, and remained so to such an extent that he could not find his bed after three weeks' stay in hospital.

His *retention* was similarly poor in all other respects. *Memory* was much better for past events, excluding, however, the last three years. He had an astonishingly rich *vocabulary* at his disposal, e.g., if asked to name different tools, or vegetables or quadrupeds. The usual questions of general knowledge were answered less completely. All dates were given rather badly.

Arithmetic was very poor. So was counting, but this seemed almost entirely due to his lack of retention. He always knew how to proceed with the given test, but got muddled by forgetting what he had done before. He began, e.g., by forming smaller groups in order to count a larger number of buttons; he correctly added some of these groups, but was soon lost because of failures in recollection. He counted a small number of coins and the dots of dominoes without difficulty. His retention was much less impaired if he had to deal with other visual material. He recognized, named or chose pictures of single objects, and arranged them in groups as flowers, animals, etc.; he dealt with pictured scenes in a normal way, perceiving the main figures and giving the prominent facts in few suitable words (no "comprehension-disturbance"). His handling and reading of a map was almost normal.

T—'s *speech* was rather rough without much modulation. There were sometimes

https://doi.org/10.1192/bjp.82.341.744 Published online by Cambridge University Press

difficulties in articulation and a kind of stammering; otherwise no signs of motor aphasia. Grammatical or syntactic expression was not interfered with, nor was any difficulty in finding words. No paraphasia.

However, his *accessibility* to spoken language and to other auditory stimuli was hampered, as in cases of sensory aphasia. He reacted extremely slowly if questioned. He became especially angry when the question was loudly repeated and emphasized that he was not deaf. He seemed, on the one hand, inaccessible to sudden alarming noises, and did not twitch when, e.g., a play pistol was fired near his ear. On the other hand, T— was often rather distracted by relatively small noises coming from outside the room. This behaviour, especially the inaccessibility, was also observed towards visual stimuli, whereas the tactile sphere was unimpaired on the whole. His attention could easily be roused by a touch. Stereognosis was intact. There were only failures in localization of stimuli if applied to the hands and forearms. Finally, there was difficulty in distinguishing colours of green and brown shades.

This unusual and most interesting picture, showing a disturbance of sensory perceptive attention, graduated between the different senses, will not be dealt with here in detail because it would lead us too far from the main topic.

As regards T—'s *motor* behaviour, the clumsiness and stiffness of all his manual movements was most striking in both hands. He preferred to do everything with his right hand, using the left hand only when the right hand was fixed by the examiner. The left showed the same disturbance even more markedly. This could already be demonstrated in testing diadochokinesis, which was almost normal in the right, much worse in the left hand, which he moved very clumsily, and never without concomitant movements of the right hand. Similar results were found with the finger-nose test: right correct; left dysmetrically, with hardly any braking, nearly hurting his face. In finger-finger test he always tried to use the right hand alone, and did it correctly when he was allowed to do so. When the right hand was fixed, T— made the greatest effort to move it towards the middle; he only succeeded with the left very slowly. There were no signs of ataxia; the direction was always well kept.

The performance of purposeful movements was not very much interfered with. T— lit a cigarette, wrapped a book in brown paper and put a string round it, etc. He made gestures like beckoning, threatening, throwing a kiss, clumsily but correctly with each hand. The same result was given by pretending movements like catching a fly, sharpening a pencil, imitating certain boxing movements, etc. Some difficulties of the left were here, however, obvious. They were increased in imitating piano or violin-playing movements, which were correct in crude design but not precise in detail.

The disturbance was still more revealed by purposeless movements of single joints or fingers. T— failed entirely when asked to stretch or bend a single finger, to move the wrist only, to spread out the fingers; each time he set in motion the whole limb. Sometimes he gradually succeeded in restricting the movement to the required part, but only in the case of the right hand. With the left only mass movements were possible; these were mostly accompanied by synkinesis of the right hand. Frequently concomitant movements of the mouth were observed. Especially when he opened and closed the left fist, corresponding movements of the mouth appeared regularly. Rhythmic movements of the tongue had also a tendency to involve the jaw, but never extended towards the hands. Although T— was able to whistle, to clack the tongue, to blow, to lick the upper lip, to smile and to sigh, all more complicated facial expressions became a kind of uniform mass movement, i.e., a grimace of the mouth.

T— was unable to repeat single *rhythms* by knocking on the table. There was, furthermore, a tendency to transfer the place of knocking laterally (both hands, *cf.* Bárány's test).

In spite of the inability to move the fingers separately, *finger-agnosia* was not present. *Left and right* were distinguished almost without mistake; he pointed to all parts of his body with correct lateralization, using mostly the right hand.

https://doi.org/10.1192/bjp.82.341.744 Published online by Cambridge University Press

The *constructional ability* was interfered with in a characteristic way. T— was not very co-operative in these tests, often destroying by his clumsy movements the given pattern or the mosaics he had begun to arrange himself. He could do the very simplest pattern of two or three mosaics or matches, but often failed in the more complicated, which he usually began correctly, but was unable to finish. He never exhibited the typical spatial mistakes of constructional apraxia, although the performance was very poor.

His *drawing* was similarly impaired; simple figures like triangle, cross, square were copied correctly. In drawing a man or a house he perseverated, and could not finish correctly. He copied a figure like this, , correctly.

Writing however, was, much more disturbed. Although T— read letters, single words and short sentences without difficulty (he took at once to the titles of pictures if there were such), he only wrote his signature, and this often incorrectly with some perseveration. On one occasion he wrote "London" when asked for his address. He copied block letters, but in longer words never without mistake. There was no difficulty in putting together simple words from wooden letters. He wrote single numbers, the sequence of numbers up to 9, but then was handicapped by extreme perseveration. Numbers of two and three figures were sometimes correctly written, but there were often typical failures—insertion of o after the hundred, etc.

With regard to the kind of apraxia represented by this case, Kleist's own remarks might be quoted: "One can doubt if it (the disturbance) should be called apraxia at all. But it is something different from paresis. The power of movements is not weakened, or if so, only very little; and this weakness does not explain the disturbances found. Special functions of a higher level than innervation are lacking or impaired; i.e., the ability to connect or isolate single innervations." The picture is entirely different from ataxia; co-ordination of agonists and antagonists is intact. At any rate this is apparently the lowest possible form of apraxia, combined in the case of T— with a disturbance of perceptive attention which, however, is not an essential combination, according to the findings of other observers.

The disturbance here is not dependent on or related to the degree of automatization obtained by practice, but closely connected to the "mechanics" of movements. The more refined and differentiated the movements are, the more evident becomes the defect. T— could pretend to catch a fly or to throw a stone, but playing the piano and similar differentiated movements were disturbed. One experiment was especially striking: T— was asked to press the button of an electric contact and to stop pressing it at special signals. Even after long and patient trials to condition these movements, he remained entirely unable to do them. He pressed with his whole power, using the whole hand and arm, and was unable to relax; he grasped at the electric light instead of pressing the button, etc., etc.

One can understand how this form of apraxia must interfere with constructional tests in the way it did in T—'s case. He really failed because of his purely technical inability to perform the fine movements required by constructional tests. Here Feuchtwanger's definition of apraxia as a disturbance of the pure "technique of movements" appears apt, whereas in all higher forms

https://doi.org/10.1192/bjp.82.341.744 Published online by Cambridge University Press

of apraxia such a definition seems too crude. I should like to leave it an open question whether T—'s failure in construction can be entirely explained by this technical incapacity for refined movements. It will be necessary to compare the findings here with other cases of the same kind. Such a proviso is especially needed with regard to the severe disturbance in writing which was exhibited by T—, and cannot be derived from his "innervation apraxia". Pure cases of this kind have—according to Kleist—no agraphia.

The observation as a whole might also be considered with respect to the problem of defining apraxia as mentioned above (p. 745). Sittig's conception of an uninterrupted sequence of transitional forms from paralysis to the highest types of apraxia seems better adapted to facts than that of Liepmann when we deal with cases like that of T—.

Returning to the special characters of constructional tests, their peculiar qualities might be developed in different directions, e.g., one might increase their aloofness from daily life and play-like quality. This could be done by giving the patient the mosaics and bricks without any detailed request or any pattern to be imitated, asking him to arrange them as he likes. Thus the attitude of learning is eliminated, and the test situation comes still nearer to a play situation.

It is certainly impossible to foretell if this "free construction" means facilitating the task or increasing its difficulty for the apraxic patient. In a case of typical parietal syndrome whom I tested with mosaics in this manner, there was no tendency to make reasonable use of the manifold forms and colours spread out on the table. The patient slowly arranged groups of two or three mosaics, sometimes alike in colour, often without regard to equal shapes or length of sides; then she began again with two other pieces and so on. She did not continue the groups she arranged before, and neglected or destroyed them while building the next one. She showed no tendency to arrange symmetrical forms, nor build rows of equal or alternating colours or shapes; in short, the performance clearly exhibited defective capacity for spatial arrangements, even of a rather loose kind.

In contrast to this, the behaviour of the following patient seems of special interest:

John O—, æt. 60, was healthy until three years ago. Then he began to be forgetful in his work as a grocer. The deterioration was progressive, and a year ago he became restless at night and unable to care for himself. He was untidy, did everything "automatically" that he was used to do, but was unable to do something that was not habitual. His forgetfulness increased so much that he often shaved four times a day. Memory for early years was relatively unimpaired. His behaviour suggested visual hallucinations, especially at night, and vague delusions of persecution were uttered from time to time. He seemed unable to express himself clearly during the last few months and tried to help himself out with gesture. He complained of headache, and had frequent hot flushes with palpitation.

On admission to the Maudsley Hospital (February 22, 1936) the bodily findings

https://doi.org/10.1192/bjp.82.341.744 Published online by Cambridge University Press

were as follows: Eyesight normal in the left eye; in the right very poor owing to long-standing cataract. Slight signs of arterio-sclerosis in left disc. Pupillary reactions normal. No hemianopsia. Optokinetic nystagmus present, equal both sides; after a short test, complaint of giddiness. All deep reflexes were present, knee- and ankle-jerks exaggerated on both sides. Patellar clonus present and equal on both sides, ankle clonus only on the right. No Babinski's sign. Movements and muscular power were normal; there was no ataxia. Gait rather shuffling; no disturbance of equilibrium. No gross sensory disturbance. Blood-pressure 165/110. Wassermann reaction negative in blood.

The general behaviour of the patient during the month he stayed in hospital was of the familiar senile type. He was always pleasant and courteous, often cheerful, made nice polite remarks and did everything required as far as it was in his usual routine. At night he often got out of bed and seemed entirely lost. If talked to, he answered in general habitual phrases often widely off the mark, sometimes beside the point, very seldom exact. When pressed in any respect he got easily bewildered; used all kinds of subterfuges which were all very well phrased. He was absolutely disorientated in time and space, but spoke of doctors and nurses and showed striking insight into his disabilities.

There was no aphasia of any special kind, but great difficulty in finding nouns and names of everything that was not quite in his daily routine. He recognized objects, gave their use by gestures, if he did not find the word, sorted colours of the main shades and exhibited no signs of apraxia in purposeful movements. He repeated rhythms knocked on the table without failure. He was able to *read* words and short sentences without perseveration. On one occasion he read a small paragraph in the paper, leaving out some of the smaller words, but he understood the idea of the whole and repeated afterwards the main points. Otherwise his *retention* was extremely poor: he could repeat no more than four digits. If one could get him into a special situation of his past life, he recalled it well and gave quite a detailed account. There was something left of his school knowledge, even in *arithmetic*, which otherwise was extremely poor, both orally and written. Writing of numbers was correct up to three figures, but beyond that there was some tendency to write the figures as words. The writing of single letters was intact; in dictated words he sometimes exhibited perseveration of letters. He copied printed words in cursive script relatively correctly. Signature and address were unaffected.

O— was entirely unable to draw anything; he failed to copy a right-angled cross. He moved his pencil into the pattern or wrote down a word when he should draw, e.g., the word " copy " or " house " or his signature. He was quite good at tracing and coloured a given space skilfully, though even then he sometimes slipped into writing.

There was, however, no disturbance of the distinction of right and left and no severe finger-agnosia: thumb and little finger were always correctly recognized. Finger postures were seldom correctly imitated, whereas he imitated movements and postures of other parts of the body without failure.

In *constructional* tests O— was as helpless as in drawing. He tried, e.g., to copy a simple brick building of an arch built from three large bricks without any success. He put one brick on the top of the other, building a tower as very young children do. When one brick was put upright in front of him and the two others were given to him, he could not complete the arch. Only when two upright bricks were put in front of him did he finish the arch correctly. A tower of bricks of different shapes was not correctly copied. O— always built in his own way, although he seemed to try hard to copy and was anxious to please the examiner. This inability was still more marked with mosaics. When a pattern was given, he began at once to arrange the mosaics, but without regard to the pattern he was asked to copy. His behaviour was different from what one sees usually in cases of constructional apraxia, in so far as after a relatively short time O— paid no more attention to the pattern. He used the given mosaics as a starting-point for his own pattern.

https://doi.org/10.1192/bjp.82.341.744 Published online by Cambridge University Press

When the mosaics were spread out on the table *without any pattern*, he began at once to arrange them. He chose mosaics of the same form or of the same colour or of both, and put them together always in closed groups, often of rectangular form. On one occasion, e.g., he took three blue squares and one yellow, arranged a larger square with them, then grasped all red lozenges and put them on one side close to the square, carefully fitting the lozenges on to another with suitable sides, etc. Sometimes he arranged small piles of mosaics of the same size and colour. He readily and willingly resumed this kind of play each time the mosaics were on the table and seemed to enjoy putting them in order. He never repeated the same pattern and never copied his own former arrangement, not even when he was asked to do so.

The special position of " free constructing " as against constructing after a pattern seems to be proved by a patient like this who clearly showed constructional apraxia if tested in the usual way, but did extremely well in spontaneous construction. O— performed everything else " automatically ", as his relatives expressed it ; his speech production was a continuous repetition of well-worn sentences, entirely habitual and automatized. Within these limits he showed some pliability. When asked to do something non-automatic, like constructing, he could only do it provided the activity was absolutely non-automatic, and made no demand on his capacity to acquire something which might lead towards new automatization. Only spontaneous construction seemed to be free enough from such demand. Every activity which contained some automatic element in it, like drawing or colouring, made him slip back towards his own automatisms, e.g., writing. Here again a field in between automatic and non-automatic movements was inaccessible to the patient, although purely automatic and purely non-automatic performances were preserved.

There are other possible interpretations of O—'s behaviour, to take, e.g., the definition of *intelligence* as given by Piéron—" the variability of behaviour which is adopted to the complex of circumstances of the moment and which profits by the acquisition of experience " (*cf.* similar definitions of Auguste Comte, Ebbinghaus and others). If such a definition sufficed in pathological cases like O—, he would have to be regarded as a case of total loss of intelligence. This obviously would not reveal anything of the real nature of his disturbances. Thus an interesting side-light is thrown on the fallacies of the use of " intelligence " (and intelligence tests) in cases of acquired " dementia ".

One might furthermore compare O—'s failure with the inability of a certain type of aphasic who cannot repeat spoken language although spontaneous speaking and understanding are preserved—" Leitungsaphasie ". One would then in his case assume a " konstruktive Leitungsapraxie " : an apraxia affecting the direct connections between the sensory and motor functions involved in constructive activities.

Finally the careful spontaneous constructional activity of O— can be regarded as the result of a " general disturbance ", i.e., Goldstein's organic orderliness, which is in contrast with the " organic slovenliness " of the patient

https://doi.org/10.1192/bjp.82.341.744 Published online by Cambridge University Press

T—, described above. In a former paper (with E. Guttmann) the tendency of a presbyophrenic patient to arrange all objects in regular groups was mentioned as illustrating this morbid orderliness. O— did not exhibit the symptom in such an extreme degree, but may be regarded from this point of view.

The problem of the relation between constructional apraxia, on the one side "organic orderliness and slovenliness", and other forms of general disturbances, especially those affecting motor activity, on the other, will be the object of a further paper.

Summary.

This paper gives in rough outline a psychological analysis of motor behaviour in relation to the problem of automatism. An attempt is made to apply Jackson's principle of "reduction to a more automatic condition" in cerebral lesions to cases of apraxia of different kinds. A psychological analysis of constructional tests is given, and the relation of constructional apraxia to other forms of apraxia is illustrated by cases and discussed. The special test of "free construction", in contrast to constructing with a given pattern, is described and its psychological significance is analysed.

I gratefully acknowledge my thanks to Dr. Edward Mapother, Medical Superintendent of the Maudsley Hospital, for permission to make use of the clinical material, and to Dr. Alfred Meyer for his kind help in the preparation and interpretation of the pathological material.

References.—Bychowski, Z., "Ueber die Restitution der nach einem Schädelschuss verlorengegangenen Sprache bei einem Polyglotten", *Monats. f. Psychiat.*, 1919, xlv, p. 183.—Feuchtwanger, E., "Ueber optisch-konstruktive Agnosie", *Zeitschr. f. d. ges. Neurol.*, 1934, cli, p. 469.—Goldstein, K., *Der Aufbau des Organismus*, The Hague, 1934.—Jackson, J. H., *Selected Writings*, London, 1932, ii, p. 46.—Kleist, K., *Kriegsverletzungen des Gehirns*, Leipzig, 1934.—Liepmann, H., "Apraxie", *Ergebn. d, gesamt. Medizin*, 1, Berlin, 1920.—Mayer-Gross, W., "Some Observations on Apraxia", *Proc. Roy. Soc. Med.*, 1935, xxviii, p. 63.—*Idem*, "The Question of Visual Impairment in Constructional Apraxia", *ibid.* 1936, xxix, p. 1396.—*Idem* and Guttmann, E., "The Problem of General as Against Focal Symptoms", *Journ. Ment. Sci.*, May, 1936.—Minkowski, M., "Klin. Beitrag zur Aphasie d. Polyglotten", *Schweiz. Arch. f. Neur. u. Psychiat.*, 1927, xxi, p. 43.—Piéron, H., "Principles of Exper. Psychol., London., 1929, p. 29.—Pitres, A., "Étude sur l'aphasie chez les polyglottes", *Rev. de Med.*, 1895, ii, p. 877.—Sittig, O., *Ueber Apraxie*, Berlin, 1931.—Wilson, Kinnier, "A Contribution to the Study of Apraxia", *Brain*, 1908, xxxi, p. 165.—Vogt, C. and O., "Zur Lehre von den Erkrankungen des striären Systems", *Journ. f. Psych. u. Neur.*, 1920, xxv, Ergänzungsheft 3.—Zutt, Z., "Rechts-Linksstörung, konstruktive Apraxie und reine Agraphie", *Monats. f. Psychiat.*, 1932, lxxxii, pp. 253, 355.

https://doi.org/10.1192/bjp.82.341.744 Published online by Cambridge University Press