OBSERVATIONS ON EPILEPTIC AUTOMATISM IN A MENTAL HOSPITAL POPULATION.

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Introduction.

In recent years there has been renewed interest in correlating cerebral function with mental phenomena. For a time, with the advent of prefrontal leucotomy, interest in the frontal lobe reigned supreme. However, in recent years the temporal lobe has been coming to the fore, and is now beginning to rank with the frontal lobe in importance.

This study is presented not with the idea of producing something new, but merely to review present knowledge and underline the place temporal lobe disorder plays in mental hospital practice. With this aim in view, the epileptic population of this hospital was studied as a probable source of temporal lobe dysfunction.

Historical Review.

The psychical concomitants of epilepsy, at different times, have been known by various names such as psychic equivalents, epileptic equivalents, behavioural automatism and psychomotor epilepsy. This is an indication of the lack of a suitable term. In this paper the motor aspects are referred to as automatisms and the sensory aspects as dreamy states.

It appears that knowledge regarding the psychical phenomena of epilepsy has advanced in three main stages. The first stage was the clinical description and its correlation with pathological anatomy. Then, when the electroencephalogram was adapted for clinical use, a renewed interest in epilepsy occurred. This brought, initially, a desire to equate clinical types of epilepsy with wave patterns. However, this was impracticable, and the study of the origin of abnormal discharges has proved more fruitful.

Finally, the production of these psychical phenomena by direct stimulation of the exposed human temporal lobe at operation, and the relief from these symptoms following temporal lobectomy, has shown conclusively the great importance that this region of the brain plays in our adaptation to reality.

Jackson's belief was that the epileptic discharge was paroxysmal in nature, and consisted of an abrupt and excessive discharge in a localized area of cerebral grey matter. The spread of this discharge accounted for the motor manifestations which occur during a fit. He further stated that " strong epileptic discharges paralyse the nervous centre (or much of it) in which they begin or through which they spread."

Jackson, between 1875 and 1880, wrote a number of papers on temporary mental disorders after epileptic discharges. He firstly drew attention to the

fact that the behaviour is of a kind that not infrequently brings the patients in conflict with the law. Jackson divided the mental behaviour into motor and sensory phenomena. The motor aspect he labelled automatism, and the sensory phenomena the dreamy state. He believed that they were both due to release from higher centres paralysed as a result of the epileptic discharge. The behaviour varied in complexity from almost normal to violent raving, and he postulated that the slighter the preceding fit the more normal was the action. Unlike Falret (1860), who suggested that the abnormal behaviour may be an equivalent of a convulsive fit, Jackson believed all such action to be post-epileptic even though the preceding fit may be so slight as to escape recognition.

The dreamy state is a complex frame of mind, variously described, which precedes a fit and may early in the history of a case be the sole evidence of epilepsy.

Jackson drew attention to the double mental state that exists, namely, a defect of consciousness coupled with the dreamy state or automatic action. If automatic action follows a dreamy state, loss of consciousness always comes between them. The dream may be remembered, but not the actions.

At times crude sensations accompany the dreamy state. They are referred chiefly to the epigastrium or to the sensation of taste or smell. The sensation of taste may be followed by masticating or spitting movements. The epigastric sensation is often accompanied by the emotion of fear.

The association of a crude sensation of taste or smell, with an elaborate mental state, occurring on its own or preceding convulsions, and sometimes followed after slight attacks by elaborate movements and actions, was found to be due to involvement of the tempero-sphenoidal lobes (Sanders, 1874; McLane Hamilton, 1882; Anderson, 1887; Jackson, 1888; Jackson and Beevor, 1890; Jackson and Colman, 1898; Jackson and Stewart, 1899). The cases of McLane Hamilton and Jackson and Colman are worthy of special note, as the pathology in the former case consisted of cortical scarring and atrophy of the right uncinate gyrus, while in the latter a small patch of cystic softening in the left uncinate gyrus was found. In these cases the localized pathology is of more value than the more common tumours, where far-reaching invasiveness makes correlation of symptoms with localized disease of cortical areas impracticable.

Crichton-Browne (1895), in discussing dreamy states, noted that in epilepsy they were frequently accompanied by visceral disturbances and/or a feeling of fear and horror. They were especially liable to occur in patients when alone or falling off to sleep.

With the turn of the century a number of papers appeared on the tempero-sphenoidal syndrome, confirming the location of the lesion and the complex symptomatology. Clarke (1900), Buzzard (1906), Mills (1908) and Foster Kennedy (1911) may be mentioned. Foster Kennedy reviewed nine cases of tumour confined to the temporal lobe and pointed out the difficulty in diagnosis, especially on the right side, and the fact that the patient may be thought to be suffering from hysteria. In all the cases an aura of some kind was present. Major seizures usually precede, sometimes for years, the onset of psychic aurae.

Foster Kennedy likewise noted the double mental state of lowered objective consciousness and enhanced subjective consciousness in the so-called dreamy states, which were not infrequently accompanied by crude sensations of taste and smell or epigastric sensations accompanied by an intense sense of fear. The dreamy state was variously described, "everything has changed, yet different"; "a feeling of reminiscence as if everything had happened long, long ago." Often these mental states in cases of tumour are still further complicated by the appearance of actual hallucinations.

Kinnier Wilson (1928) classified the dreamy states in four main groups:—

1. The familiarity or *déjà vu* type.
2. Unfamiliarity, strangeness or unreality type.
3. The "Panoramic memory" type.
4. The incomplete or abortive type.

Wilson pointed out that the first three groups may well merge into each other and the combination of one or other of these groups with gustatory or olfactory hallucinations constitutes the uncinate fit. He felt, unlike Jackson, that these complex symptoms may be considered as an aura, as they bear the same relationship to a fit as any other aura.

Gibbs, Gibbs and Lennox (1937) introduced the term "psychomotor epilepsy" to cover the various psychical accompaniments of epilepsy on the basis of a distinct E.E.G. classification (*vide infra*).

Penfield and Erickson (1941) likewise stated that the dreamy state occurred during an actual epileptic discharge, and was not a release phenomenon, as Jackson suggested. They divided their dreamy states into—

1. Illusional seizures.
2. Hallucinatory seizures.

In the authors' experience the dreamy state is produced by epileptic discharge within the temporal lobe.

Automatism was considered to be either post-epileptic or possibly epileptic in origin. They described it as a state of complicated activity occurring in a person who is in a state of defective consciousness and most often seen after an epileptic fit. Understanding is grossly impaired, but the ability to move and act remains unimpaired.

Gibbs, Gibbs and Furster (1948) found that out of three hundred patients whose E.E.G. conformed to the psychomotor pattern, 90 per cent. had attacks of automatism or psychomotor epilepsy. They analysed the pattern of behaviour, and found that confusion was usual and that amnesia for actions invariably occurred, but consciousness was not usually lost. The movements appeared purposeful, but were poorly co-ordinated and were chiefly repetitive. During the automatism evidence of fear and rage may occur and be accompanied by screaming. They likened the whole performance to "a person acting out a bad dream."

Penfield (1949) showed that automatisms may be classified according to their origin as temporal or frontal. Temporal automatism is the most elaborate. In it the patient appears cut off from his previous experience and his attack is "psychoparetic" rather than "psychomotor."

Penfield and Flanigin (1950) and Jasper, Pertuisset and Flanigin (1951) found that automatism was present in less than half of their cases of temporal lobe seizures subjected to operation.

Penfield and Kristiansen (1951) and Penfield (1952) reviewed a series of 259 patients with focal epilepsy, and in 222 cases the localization of the initial discharge was determined. Temporal lobe foci formed a significant proportion and were frequently associated with automatism and dreamy state. Frontal automatism was characterized by stereotyped thinking or behaviour.

Gibbs (1951) and Bailey and Gibbs (1951) in a large number of cases emphasized the important relationship of the anterior temporal focus with automatic behaviour.

Magnus, Penfield and Jasper (1952) found automatism to be frequently associated with masticatory attacks. The fits were frequently preceded by an aura, and in about half of the cases turning of the head to the contralateral side occurred. This turning of the head to the opposite side was considered to be of diagnostic importance, as it is often the only clinical sign to indicate the side of the lesion. However, Paillas and Subivana (1950) in an excellent monograph on the temporal lobe found that rotation of the head may be to the ipsilateral side. Hill (1953), using basal electrodes, has been able to demonstrate a temporal focus very frequently in cases with automatism. In an earlier publication (Hill, 1949) temporal foci were found less frequently, probably owing to the less refined technique used at the time.

Hill and Watterson (1942) and Hill (1944) commented on a group of aggressive psychopaths who had E.E.G. abnormalities localized in the temporal areas, and Hill found that the most violent and aggressive psychopaths had E.E.G. foci in the right posterior temporal regions. The association of the difficult, anti-social personality known as the epileptic personality with the " psychomotor " type of epilepsy was noted by Belinson (1947) in an epileptic colony. This observation was confirmed by Gibbs *et al.* (1948) while Gibbs (1951) showed that control of the automatism by phenurone produced in those patients who had a difficult personality a severe disturbance reaching psychotic intensity.

Rey, Pond and Evans (1949) have reviewed the whole problem of personality disturbance associated with temporal lobe dysfunction. In addition they showed that in their " idiopathic " cases of temporal lobe epilepsy, irrespective of sex, the epileptic abnormality tends to be more common on the left than the right. However, even though the E.E.G. abnormality is more common on the left in both sexes, there are significantly more right-sided epileptic E.E.G.'s in males than females. Green, Duisberg and McGrath (1951) similarly found a higher incidence of left temporal foci as compared with the right, but their cases were chiefly due to acquired lesions. Gibbs *et al.* (1948) found that right-sided foci were more frequent than left. Gastaut (1950), although he found more cases with left-sided foci than right, felt that the difference was not significant. These latter authors do not discuss the etiology of their cases.

Gibbs, Gibbs and Lennox (1937, 1938*a* and *b*) stated that psychomotor epilepsy was associated with 4–6 cycles per second flat-topped waves. Jasper (1941) and Jasper and Kershman (1941) pointed out that this rhythm was

non-specific. However, 6 cycles per second slow waves commonly occur in psychomotor epilepsy. Both the character of the wave and the localization is of importance. Sharp waves localized in the temporal lobes in the inter-seizure record were frequently associated with visceral aurae and complex disturbances of thinking and behaviour. If the sharp waves were accompanied by 6 cycles per second waves automatism was prominent. The 6 cycles per second waves are probably caused by a deep-seated focus buried beneath the temporal lobe firing along corticothalamic pathways and then being relayed back to the cortex.

The pattern of psychomotor epilepsy or behavioural automatism is not, then, specific, but merely a form of focal epilepsy arising within the temporal lobe. Lennox and Brody (1946) showed that similar 6 cycles per second rhythm of psychomotor epilepsy may be caused by subcortical lesions occurring in the basal ganglia, thalamus and hypothalamus and even the cerebellum. Gibbs *et al.* (1948) investigated three hundred cases whose E.E.G. showed a psychomotor record, and found in all cases a spike focus in the anterior temporal area on one or both sides. They showed that this spike focus was best demonstrated during natural or induced sleep. Furster, Gibbs and Gibbs (1948) describe a method of inducing sleep by pentothal in order to bring out the sharp waves. Under normal waking conditions only 30 per cent. of their cases show such a focus.

Hill (1949) described the typical genesis of a psychomotor attack which may be either bi- or unilateral. After a transitory initial period of suppression 6 cycles per second low voltage waves appear. The amplitude of the waves increases while the rate drops to 2 cycles per second, before giving rise to slow, irregular waves of cerebral exhaustion. The bilateral cerebral discharge is associated with automatism, while the unilateral discharge is associated with the dreamy state.

Gastaut (1950) confirms these observations. Jasper *et al.* (1951) obtained similar results on their corticograms. In 75 per cent. of their cases localization was possible to one temporal lobe, while in the remaining 25 per cent. the E.E.G. revealed bilateral independent foci.

Localization of clear spike reversal in the E.E.G. using ordinary scalp leads is difficult, as frequently the focus is in the tip of the temporal pole or hippocampal formation or deep in the Island of Reil, and conduction through the brain causes the spikes to spread out to slow waves. MacLean and Arellano (1950) and MacLean (1950) emphasized the importance of basal leads in order to localize clearly the spike focus in the temporal lobe. They used pharyngeal and tympanic leads. Jones (1951) introduced needle electrodes inserted laterally between the zygoma and sigmoid notch of the mandible until they came to rest against the base of the skull, lateral to the foramen ovale.

Penfield and Erickson (1941), and more recently Penfield (1949) and Penfield and Rasmussen (1950), have described how electrical stimulation of the temporal cortex which has previously been sensitized by epileptic discharge may produce elaborate psychical states. The action progresses as in a dream until the stimulating electrode is withdrawn. The area of cortex producing the particular aura of which the patient complains may, by this technique, be

accurately delineated prior to excision. In addition, Penfield (1952) described automatism produced by stimulation of the temporal lobe.

The results of the surgical treatment over a 10-year period of 55 cases of atrophic lesions of the temporal lobe producing epilepsy, have been described by Penfield and Flanigin (1950) and Jasper *et al.* (1951). All the cases had previously failed to respond to medical treatment. The results were extremely good in 52 per cent. while a further 25 per cent. showed at least 50 per cent. improvement.

In the unilateral group as determined by pre-operative E.E.G. two out of three showed a decided improvement or cure, while in the shifting focus group the results were poor.

Green, Duisberg and McGrath (1951) operated on 23 cases with psychomotor epilepsy. Gross or microscopic pathology was found in 14 cases, and in general these cases benefited more from surgery than those who showed no pathology. Following operation 12 patients had no psychomotor seizures, and a further 9 patients showed a reduction in the number of attacks. They found that personality defect from operation was negligible. It tended to bring about a "tameness of personality."

In their pre-operative E.E.G.'s they found that the traumatic cases had slow activity mixed with spikes or slow waves, and spiking alone occurred in cases with no demonstrable pathology.

Bailey and Gibbs (1951) operated on 25 cases. The extent of excision ranged from gyrectomy to lobectomy. In general they found that the more radical excisions gave better results.

Method.

All the patients in the hospital, who, in an arbitrary period of a month, suffered from epilepsy, were noted. In all cases hospitalization ranged from months to years. They were then subjected to a full clinical and electroencephalographic examination.

The clinical examination included a careful history, objective where possible. This was not always possible, however, for a number of the patients had been transferred to this hospital from other institutions. A description of the form the fit takes in these patients was obtained from the nursing staff, but in a number of cases fits have been personally seen.

The electroencephalographic examination was carried out with the subject fasting and off medication for the previous forty-eight hours. A six-channel inkwriter Ediswan machine was used with a write-in analyser. If necessary, activation of a focus was obtained by sleep induced by seconal gr. iii orally. Scalp electrodes only were used.

Results.

In the hospital, at the time of the survey, there were 1,110 patients, composed of 419 males and 691 females. The number of epileptic patients was 47 (4·3 per cent.) made up of 25 males and 22 females.

These epileptics were then assessed clinically and found to fall into three distinct groups as judged by prominent concomitant features, which refer to

intelligence in two groups and behaviour in the remaining group. These criteria are thus not strictly comparable but the scheme was designed purely as a pragmatic means of classifying epileptics in mental hospitals.

The first group was composed of feeble-minded or imbeciles. Their fits had originated at a very early age, and so interfered with their lives that they were uneducable and never able to work ; and often, because of their uncertain behaviour, required hospitalization early in their life. This latter observation is particularly true of the males, but a number of the female patients were kept at home and looked after until either increasing age or death of the relatives made control impossible. This group is comprised of cases of mixed etiology such as Sturge-Weber syndrome, juvenile Tay-Sachs' disease and congenital syphilis. Often in these cases the epilepsy is of minor significance.

The second group comprises those patients whose post-epileptic automatisms made their admission imperative. Also, the so-called epileptic personality was prominent, and must have made them uncomfortable companions with whom to live. This group will be studied in more detail later.

The third and last group comprised those people who were admitted to hospital because organic dementia had commenced. They were no longer able to earn their living or care for themselves. Organic dementia was diagnosed by increasing forgetfulness ; a tendency to live in the past, often marked, and disorientation for time coupled with neglect of appearance. Many of these cases owe their admission to incipient arteriosclerosis or acquired disease rather than epilepsy. Even those who have had epilepsy for many years were able to adapt successfully until arteriosclerosis supervened.

TABLE I.

	Feeble-minded.	Automatism.	Dementia.	Total.
Male	9 (36%)	13 (52%)	3 (12%)	25
Female	9 (41%)	5 (23%)	8 (36%)	22
Total	18	18	11	47

It would appear from these figures that there is a sex differentiation between automatism and dementia. The size of the group is not sufficient to be certain of this finding.

The average age of the various groups is shown in Table II.

TABLE II.

		Feeble-minded.	Automatism.	Dementia.	Total.
Male	M.A.	38·2 yrs.	38·75 yrs.	54·3 yrs.	40·4 yrs.
	S.E.	3·2 ,,	4·58 ,,	6·4 ,,	2·9 ,,
Female	M.A.	50·6 ,,	53·4 ,,	65·8 ,,	56·8 ,,
	S.E.	3·4 ,,	6 ,,	2·6 ,,	2·7 ,,

M.A. = mean age. S.E. = standard error.

It may be seen from Table II that the average age of the male patients is significantly younger than the females, and this tendency derives directly from the subgroups.

Clinical Description of Epileptic Automatism.

All the cases which have been included in this category exhibit, at times more or less frequently, epileptic automatism. The automatism is probably post-epileptic. At some time or another a preceding fit, even though slight and transitory, has been observed in every case. Three types of preceding fit may be distinguished. *Grand mal* or typical major epilepsy occurs in three cases, two women and one man; "adversive" attacks in three men, and in ten cases minor seizures, consisting of blanching of face, staring ahead, going momentarily stiff and sometimes twitching of the mouth, precede the automatism. This latter group seems to conform to the type labelled "psychomotor epilepsy" by Gibbs *et al.* (1937). Lastly, two of the male patients have either *grand mal* or adversive attacks preceding their automatic behaviour. It should be noted that every fit is not necessarily followed by automatic behaviour, and all the patients have experienced attacks of *grand mal*. It is usual in our series for *grand mal* to have preceded the appearance of "psychomotor" epilepsy for several years, and when the patients were young this *grand mal* was frequently accompanied by *petit mal*. Even when "psychomotor" epilepsy is fully established occasional major fits still occur.

Prodromata are frequently observed by the nursing staff often one or two days before the fit manifests itself. They take the form of increasing restlessness and hostility. The patients suspect that the nurses are holding back food from them, that they are being put upon and made to do more work than their share. They quarrel with other patients and become the centre of violent arguments. Others sulk and shrug off any approach to them, and refuse to work and become withdrawn and unsociable.

In this group most of the patients, 15 out of 18, have a well-marked aura that precedes the fit. If the three cases, in which an aura did not occur, are examined, it is seen that two of these patients suffered from *grand mal*, while a third had adversive fits. Retrograde amnesia for an aura sometimes occurs, and knowledge of an aura is gleaned from the patients' behaviour. One patient would point and say "See them!" before the onset, while another would complain of a strange sensation in the stomach and ask for help, as he suddenly felt ill immediately before the turn. In two cases remembrance of an aura remained, but the contents of the thought could not be recollected. The descriptions of the aurae may be seen in Table III. It is impossible to classify them except broadly into psychic aurae and visceromotor groups. In the first group would be included the hallucinations (three cases); the remembered melody (one case); the forgotten ideas (two cases); the feeling of strangeness (one case) and the cephalic aurae (one case), giving a total of eight cases, while in the visceromotor group would be included the giddy sensation (three cases). The epigastric group (four cases) with sensations of intense terror in two, feeling very ill in one, and choking in the fourth, form a connecting link between the two groups, as this group has both visceral and psychic components. Not infrequently attacks, in which only the aura is experienced, occur especially before going to sleep. In these cases the aura is often hallucinatory or an epigastric sensation associated with terror. This latter aura is especially

TABLE III.

	Initial commencement of fit.	E.E.G. focus.	Etiology.
F. D. W—, 28 yrs.	Visual hallucination, major fits or turning head to left and jerking left arm	Right temporal	Childhood onset of fits.
W. J. W—, 60 yrs.	Epigastric sensation	,, ,,	Ditto.
T. P. L—, 36 yrs.	Epigastric sensation accompanied by intense terror.	Left and right temporal (independent). Left focus more prominent.	,,
F. J. P—, 47 yrs.	Head aura — something moves in the head	Left temporal	Severe head injury.
S. G. B—, 57 yrs.	Visual hallucination " Has a presentiment."	Left posterior temporal delta focus	Started 8 years ago. Cerebral tumour.
S. E—, 49 yrs.	Turns to right	Left temporal	Calcified haemangioma.
A. L. B—, 36 yrs.	Visual hallucination. Major fit	Right temporal	Childhood onset of fits.
R. B—, 21 yrs.	Thought impossible to remember. Jaw champing	,, ,,	Childhood onset
A. W. H—, 38 yrs.	Intense terror. Epigastric sensation. Jaw champing	,, ,,	,, ,,
I. T. L—, 59 yrs.	Dizzy feeling. Major and adversive to left	,, ,,	Shrapnel in right anterior temporal lobe.
J. H—, 48 yrs.	Feeling of strangeness	,, ,,	Severe head injury.
L. M. G—, 25 yrs.	Choking sensation in throat. Turning to left	,, ,,	Old temporal lobe abscess scar. Right side.
M. G—, 18 yrs.	Bells ringing or remembered melody. Turning to right	Left temporal	Severe head injury.
E. C. F—, 72 yrs.	Giddy sensation. Occasional jerking in right limbs	Left and right independent foci. Left focus most prominent	Started in childhood.
E. D. H—, 33 yrs.	Sensation that cannot be described. Jaw champing. Turning of head to right	Right temporal focus	Ditto.
A. D—, 64 yrs.	Giddy sensation	Right temporal	Calcified cyst over right anterior temporal lobe.
R. E. O—, 48 yrs.	*Grand mal*	,, ,,	Childhood onset.
M. W—, 37 yrs.	,,	,, ,,	Ditto.

unpleasant to the patients, one of whom remarked, " I'd rather have a hundred fits than that sensation," while another had contemplated suicide because of it. In none of our cases was any evidence of an aura of a strange smell or taste elicited, although in three cases of transitory preceding fits typical jaw champing and swallowing occurred sometimes. These masticating attacks followed rapidly after the appearance of pallor, and may be considered automatisms as suggested by Magnus, Penfield and Jasper (1952). In our cases there was likewise no remembrance of the actual chewing.

Following *grand mal* seizure the automatic actions are vague, poorly sustained and not at all elaborate. Immediately after the fit the patients lie still in a dazed fashion for a few minutes, and may even sleep during this period before the abnormal behaviour commences. These people are mostly violent and destructive, and sometimes this was so excessive that they actually became homicidal. This group comprises the so-called epileptic furor. If these patients are placed in a quiet side-room after an attack so that they are free from distraction they often remain quiet, but if someone enters they rise in a menacing fashion, and if one is careless they are liable to attack with blind fury.

In order to try and control the violence prefrontal leucotomy was performed on four of these patients in the past. In three of them it reduced the number of major fits and took the "bite" out of their automatisms. These leucotomised automatons became but "ghosts of their former selves"—truculent but not so hasty in action and less vicious and violent. The male patient who had both major and adversive attacks, now since leucotomy has chiefly the latter, and the furors that followed his major attacks have ceased. His automatic behaviour following his adversive attacks remains unchanged.

The "adversive" attacks come next in order of severity as regards initial discharge. In them consciousness appeared clouded from the start in all except one who could sometimes remember the turning of his head. Although consciousness was impaired the patient did not necessarily fall. In the attack the head and trunk were turned to one side and the arm on this side was abducted from the midline. The turn may cease at this tonic phase, or jerking of the arm and face may occur for a few moments. The whole attack is generally over within one or two minutes. Sometimes the full adversive attack may be replaced by turning of the head only and transient jerking of the arm and leg on the side to which the head turns. Occasionally a few jerks may later occur in the opposite arm. If the tonic movements increase in frequency the attack invariably passes into a major fit. The behaviour following upon these turns is more organized and purposeful than following on *grand mal*. Frequently this is the full extent of the attack, but when automatic behaviour occurs it falls midway in complexity between that following *grand mal* and the minor attacks.

Case 1.—F. D. W.—, 28 years. Went white, head turned to the left and left arm was abducted from the side. After five to ten seconds a few transitory jerks of left arm occurred. For a few seconds he remained lying quietly on the couch, and he then got up and looked round rather vaguely and examined his clothes. He was told to sit, which he did for a few seconds, and then got up and picked up the chair and said, "I must sit outside." He then made to leave the room with the chair. If the chair was taken from him he became abusive but returned to the self-same task of trying to take the chair outside. This perseveration of action persisted until the fit passed off after a few further minutes. Afterwards he was completely amnesic for the whole turn.

The salient points are the well co-ordinated actions which are in themselves purposeful but nevertheless rather absurd, and the purpose and tenacity with which the patient returned to the same task when he was separated from the chair. When prevented from carrying out this task he became verbally abusive but never physically violent, for his actions were directed solely to

carrying out his self-appointed task for a reason afterwards not known to himself. This case, although typical of this division, was purposely chosen, as he had had a leucotomy which had in no way changed this behaviour, although it had dealt successfully with the blind fury following on his major fits. It perhaps illustrates how leucotomy affects the emotional rather than the purposive aspect of behaviour.

This is a typical form of automatism following such an adversive attack.

Following the transient attacks the automatism is more in keeping with what the patient was doing immediately prior to the attack. In fact one of the patients (A. H—,Case 2) told the author that generally no one knew he had had a fit. He himself only knew afterwards because of some odd mistake he had made.

Case 2.—A. H—, 38 years. He was a clerk and would be adding up a column of figures when the attack would occur. To other people he would appear to carry on as if nothing had happened. When he came to he would discover that he had written in something irrelevant or the wrong figures. A fit was witnessed when he was reading a book. The book was laid down for a minute as he stared and a slight chewing of the mouth occurred. He immediately lifted the book up, but upside down, turned over the pages and looked puzzled, so he put the book down and walked to the window. When spoken to he was vague but answered courteously. The whole fit passed off within three minutes.

In this type of attack a usual course of action is for the patients to search diligently for some object that they feel they have lost. They are painstaking and thorough in their search. Perhaps it is that they are searching for the lost part of themselves.

The "adversive" attacks and the minor fits have one other point in common. At the start of the automatism they not infrequently finger their clothes and peer at themselves as if to assure themselves that they exist and have substance. During this phase they appear perplexed. Once they have done this they embark on their automatic actions. Perhaps the distinction between these two groups is arbitrary, but in the case of the behaviour following minor fits it appears easier to understand and more in keeping with previous activity; also their actions vary more and are richer in character.

Although induced sleep will often activate "spikes or sharp waves" in the E.E.G., the incidence of nocturnal fits in this group of patients was in no wise increased when compared with the other groups. Indeed, nocturnal automatism was excessively rare, which is an interesting contrast to somnambulism. However, the major seizures of these patients seem especially liable to arise during sleep.

The most frequent time for the "psychomotor" fits to occur is at the meal table. When this is the first manifestation it causes consternation in the family for it is seldom recognized for what it is. In the seizure the patient will suddenly start putting food into his pocket or help himself from the plate of someone else. Often the social effects are startling. One of the patients, while on a railway journey, was seated in a restaurant car when she got up in her seizure and started to clear her own and the neighbouring table in the middle of the meal. When restrained she became very abusive.

In all the cases, prior to admission, there was a failure of anti-epileptic drugs, either alone or in combination, to control their fits.

Reason for Admission.

Violent, uncontrollable behaviour is the prime cause of admission to a mental hospital. Eleven cases were so admitted, either direct from home or from an epileptic colony, and in three cases by direct police action.

When the typical "psychomotor" attacks are considered the reason for admission appears to be somewhat different. Three cases sought admission as voluntary patients because of the anxiety they had engendered in their relatives and in themselves by their sudden inexplicable behaviour.

A further four cases were admitted in an acute psychotic episode which seemed to follow the same pattern in each case. For a week or so prior to the onset of the acute episode there apparently occurred a progressive increase in the number of "psychomotor" seizures. This had the effect of making them dazed, and interfered considerably with their work. The deterioration of work in due course brought about a reprimand which caused a flare-up of acute paranoid feelings against their immediate superior. They then rapidly passed into an acute psychosis. One patient, at this stage, believed that his employer was trying to trap him and cast suspicion on him for some misdeed.

In the acute psychotic phase they are actively hallucinated and display increased activity, becoming extremely restless. They talk incessantly. Their mood swings between ecstasy and terror. In the ecstatic mood they see the crucifixion and are at one with the universe, while in the states of terror they cower away and strike out blindly. In this stage they see lizards, spiders or black beetles crawling over them. For the most part, however, an ecstatic euphoria reigns, so that they smile happily to themselves. In this episode they are completely disorientated for time and often for place, but they retain knowledge of their own identity. Bizarre ideas occur due to erroneous perceptions, as with the man who insisted on trying to open all the clocks, as he thought birds were imprisoned in them. Misidentification of people with the past occurs, and may be the cause of assaults on other patients. Throughout a strong element of suspicion is ever ready to crop up for brief periods. This chiefly happens when misidentification occurs. Afterwards there is a considerable amnesia for their conduct. However, a vivid recollection of the hallucinations, especially of the fearful ones, remains. This phase lasts for several days, improvement being gradual over a week or so.

Epileptic Personality.

The personality of the group showing behavioural automatism is abnormal. It is present to a much greater degree in this group than in the other two groups of epileptics previously described. The basis of the personality disturbance is aggressivity and hostility, which is a common factor and runs through this whole group. These patients may have, apart from this, totally different attitudes to life. Common amongst these are obsessional features, in which there is a need to write everything in a diary and keep everything in its right

order. Others are solitary and moody and keep to themselves, showing a much more schizoid temperament, while others are social and form little cliques among themselves. This latter group is often the greatest problem as they tend to "hunt in packs" and support each other in trouble, either with alibis or actual defence. They more readily verbalize their hostility, and form the hard core of querulous troublemakers.

All have in common a great self-regard and are quick to take offence, and imagine all references as personally directed against themselves. They hold grudges for long periods and are full of petty little tricks to annoy the ward routine. However, the greatest interest is in the liability to violent short-lived and unprovoked outbursts. They correspond closely to the severely aggressive psychopaths described by Hill (1944) and Hill and Watterson (1942), and in common have frequently a right temporal focus. Again the build-up of aggressivity before an attack with subsequent amelioration afterwards is in keeping with the antithesis suggested by Gibbs (1951) between epilepsy and personality disturbance in the temporal lobe dysfunction.

Ström-Olsen, Last and Brody (1943) and Ström-Olsen (1946) pointed out that prefrontal leucotomy made the aggressive epileptic patients more docile. By removing some of their initiative it has often quietened down their explosive outbursts so that it is easier to live with these people.

Treatment.

In hospital the various anti-epileptic drugs in various combinations have been tried. The drugs chiefly used are phenobarbitone, phenytoin, 'Mesontoin' and 'Mysoline.' In the behavioural automatism, effects, for the most part, are but transitory. Hospitalization in a protected environment seems perhaps to produce the best results.

The psychotic episodes rapidly settle down after admission, and a substantial proportion of the patients are able to be employed about the hospital. In fact, active employment is perhaps the most potent means of keeping the attacks at bay. If the attacks are not controlled by work or drugs a rapid deterioration occurs. These patients resemble more closely deteriorated schizophrenics. They become withdrawn, asocial and manneristic. Their speech becomes slurred and they are given to mumbling Following a fit they show a recrudence of activity, and for a while are abusive and exhibit purposeless activity.

When leave is granted to a supposedly stabilized patient a rapid deterioration generally occurs. The attacks are thus only controlled in a hospital environment. The prognosis, therefore, with the usual means of treatment, in these patients is poor. Surgery, in the form of temporal lobectomy, offers a more hopeful outlook. As yet it is too early to judge the lasting results of this form of therapy, but early results are hopeful.

Correlation of E.E.G. Findings and the Epileptic Groups.

The types of E.E.G. abnormalities obtained in the epileptic population of this hospital may be clearly seen in Table IV. As is to be expected, the feeble-minded and demented groups, which are clinically not of a pure composition,

TABLE IV.

E.E.G.	Feeble-minded.	Automatism.	Dementia.
Temporal focus	3	18	2
Other foci	—	—	2
Spike and wave	9	—	—
Other paroxysmal symmetrical rhythms	3	—	3
Asymmetrical abnormality	2	—	3
Non-specific	1	—	1
Total	18	18	11

showed diverse E.E.G. findings as compared with the automatism group. However, in the feeble-minded group spike and wave is a conspicuous concomitant, and is a constant finding in those whose epilepsy is the main cause for their backwardness. The heterogeneous etiology of the remainder accounts in large measure for the other E.E.G. abnormalities. In the dementia group there is no clear-cut specific E.E.G. abnormality. If all groups are considered together, then a temporal focus is the commonest E.E.G. abnormality; it is present in 50 per cent. of the patients, and in 78 per cent. of these cases is associated with automatism.

E.E.G. Findings in Automatism Group.

Focal activity was shown to be present in all of those patients who had epileptic automatism as a prominent symptom. A focus was deemed to be present when phase reversal of abnormal activity occurred about a common electrode. This abnormal activity was of "sharp wave" or spike discharge in all but two cases, where it was by slow wave of less than four cycles per second. These two cases had a gross pathology.

Twelve of the thirteen male patients in the automatism group all showed a constant unilateral temporal focus. This was anterior in all except one case, which was a posterior delta wave focus due to a cerebral tumour. In the female group four out of five patients showed a constant anterior temporal focus. The two remaining cases, comprising one male and one female, showed bilateral independent anterior temporal foci. The laterality of the foci are shown in Table V.

TABLE V.

	Right temporal focus.	Left temporal focus.	Bilateral independent foci.	Total.
Male	8	4	1	13
Female	4	0	1	5
Total	12	4	2	18

Analysis of sex and age in relationship to temporal laterality was unprofitable. Laterality in the five patients who had temporal foci in the feeble-minded and dementia groups was two on the right side and three on the left. There was no sex distinction.

In addition to the spike or sharp wave focus of the inter-seizure record, previously described, slow wave activity was also present. Its rate varied between

2–7 cycles per second, and although generalized it was maximal anteriorly in the frontal and anterior temporal regions. It often occurred for long periods in the record and was of moderate voltage. However, of interest was the fact that this disturbance was most obvious, and occurred most frequently on the side where the spike focus was found. This unilateral preponderance, apart from the focus, distinguishes clearly the cases in the behavioural automatism group from the other two groups, where similar slow waves occur but are more frequently symmetrical. So much is this so that it is felt to indicate strongly the possiblity of a focus, if this is not found on the recording.

Records of "psychomotor" seizures have been obtained, and confirm clearly the description of such an attack given by Hill (1949). One record shows clearly an apparently straightforward "psychomotor" attack suddenly passing over to a major seizure. Such a phenomenon may well account for the description of automatisms appearing to precede a major convulsion. A further record is of interest, in which a bilateral "psychomotor" seizure starts on one side, before becoming generalized. Initial suppression is clearly shown to occur on one side while normal rhythm continues unchanged on the other. During the period of unilateral discharge the head commenced to turn to the ipsilateral side, and this movement performed slowly and accompanied by nodding takes a minute to complete. This observation confirms that of Paillas and Subivana (1950). No records have been obtained in the psychotic episodes. In one case, however, in which automatic behaviour had been present for over thirty hours, a record was obtained which showed a continuous 5–6 cycles per second high voltage activity. This appears to be similar to the records obtained in "psychotic states" by Jasper (1941). In a resting record this case showed a well-marked focus in the left anterior temporal region.

Etiology of Automatism Group.

Known organic lesions were present in 8 patients (7 men and 1 woman) out of the 18 patients in the group. In 4 of these patients this pathology consisted of severe head injury prior to the onset of their fits, and in one of these cases a piece of shrapnel from the 1914–18 War was embedded in the anterior temporal lobe. In 3 cases (2 men and 1 woman) a cerebral tumour was present. The remaining case had had a temporal lobe abscess drained prior to the onset of his fits. In 4 of the cases the pathology was left-sided and accounted for the left temporal foci, and in the remaining 4 cases it was right-sided.

If "idiopathic" cases are considered, then it will be seen that 8 foci occur on the right side and none on the left, with 2 cases showing bilateral independent foci. However, in these last two cases the left focus, in each case, is by far the most prominent. The right anterior focus in each of these two cases occurs very infrequently.

Incidence of an Aura.

The history of an aura was obtained in 20 out of the total 47 epileptics in the hospital; of these 20 patients, 15 belonged to the epileptic automatism

group. Three of the remaining 5 patients who experience an aura prior to an attack were also found to have a temporal lobe focus in the E.E.G. In these cases the aura was a sensation of giddiness (2 cases) and a roaring noise (1 case.)

Thus it may be seen that 18 out of a total of 20 patients who have an aura have a temporal lobe focus.

Conclusions.

In this hospital population automatism occurs frequently among the epileptic patients. The observation of Jackson that the slighter the preceding fit the more purposeful the subsequent automatism is amply borne out by the present cases. Whenever an attack in entirety was accurately observed a fit always preceded the automatic behaviour, and it is felt that all automatism is probably post-epileptic in origin.

The association of automatism with a temporal lobe focus in the E.E.G. is confirmed. This temporal focus accounted for the E.E.G. abnormality in 50 per cent of the epileptic population, and is greater by far than the 1 in 5 patients with epilepsy found by Jasper *et al.* (1951). In addition, automatism occurred in 78 per cent. of the temporal lobe foci here, as compared with 46 per cent. of cases described by Jasper *et al.* (1952).

From this it would appear that temporal lobe epilepsy has a greater tendency to gravitate to a mental hospital than any other form. This is due to the poor response of these patients to drug therapy, and the antisocial behaviour that they exhibit subsequent to their attacks.

Further evidence of focal origin for the initial fits associated with automatism is afforded by the high incidence of an aura preceding the attacks. Indeed, as Jackson suggested, the aura frequently occurs on its own without any subsequent seizure.

Summary.

1. The history of temporal lobe epilepsy is reviewed.

2. The epileptic population of the hospital was investigated clinically and electro-encephalographically as a probable source of temporal lobe dysfunction.

3. A temporal lobe focus in the E.E.G. was found to occur in 50 per cent. of the epileptic population, and in 78 per cent. of patients was associated with clinical automatism.

4. Association of personality disturbances and automatism was noted.

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