bearing half the body weight. It has been shown above that the breadth of the foot in walking is never greater than this, that in fact the foot becomes narrowed as the heel is raised from the ground. The difference in breadth between the foot bearing no weight and that bearing the full body weight is about ten per cent. Considerably more than half of this increase in breadth occurs when the foot bears half the body weight. The difference in breadth between the foot bearing the whole weight and that bearing half the weight is thus but slight.

If with such shoes there is still a tendency to pronation, it may be overcome by building up about a quarter of an inch the inner side of the heel and sole, opposing the eversion in this way. This measure is particularly applicable with children.

Next in importance to placing the muscles at a mechanical advantage, come measures directed to increasing the muscular strength. Bathing, rubbing and exercise are necessary, together with any proper constitutional treatment. Certain exercises are of particular value, and should be practised at frequent intervals for a few moments at a time. Springing onto the toes and at the same time separating the heels, walking on tip-toe, and adducting the foot against resistance are among the simplest and most efficient exercises. Bicycle riding is a most useful exercise, strengthening the muscles which support the arch while placing but little weight upon it.

In those cases in which the arch has yielded, or is yielding, these milder measures are often not sufficient. Some form of mechanical support is then necessary. Padding of saddler's felt is useful temporarily, while a pad sewed to a leather insole is rather more permanent. Any form of support, however, which presses upon the shank and inner side of the shoe is not satisfactory for any length of time.

Among the more permanent supports nothing has yet proved so generally satisfactory as the metal plate, either of steel or bronze, accurately fitted to the shape of the foot in a corrected position. The pattern of Whitman,⁷ or that described by Lovett,⁸ are in common use. The latter pattern is certainly better adapted for use in those cases of anterior metatarsalgia due to a lowering of the transverse arch, and frequently entirely relieved by raising the plate anteriorly, immediately behind the heads of the metatarsals to which the pain is referred. Whatever pattern is adopted, the plate must fit with accuracy. Where possible it should be fitted at the workshop. Otherwise it is best made on a plaster-of-Paris cast run in a mould made by placing the greased foot lightly in soft plaster. A plate which causes pain is not satisfactory, and any chafing or reddening or cutting of the skin is to be remedied at once by a change in shape. Bony prominences and sensitive points are not indicated in a cast. Recurrence of the old pain after a plate has been worn several weeks is probably due usually to an increase in the height of the arch, brought about by the advantageous position in which the muscles work. In such cases relief follows slight raising of the plate, in order to give the arch its accustomed support.

Limitation of motion, as seen in the rigid type of flat-foot, may be due to muscular spasm, muscular con-

traction, or inflammatory adhesions. From whatever cause arising, it must be overcome. Simple muscular spasm usually ceases as the pain and sensitiveness subside under the ordinary methods of treatment. Muscular contracture, however, requires systematic stretching. Contraction of the tendo-Achillis may be overcome by manipulation and exercises which dorsiflex the foot when the knee is fully extended. A limitation of adduction has been shown to be more important than a limitation of dorsal flexion. It must also be overcome by persistent exercise and manipulation. The Shaffer shoe is not usually within the reach of the general practitioner.

In cases in which inflammatory adhesions have formed, two courses are open. The most prompt and satisfactory method is to etherize the patient, break up the adhesions fully, and hold the foot at rest in plaster for several weeks in an over-corrected position. A foot thus treated always requires a supporting plate before any weight whatever is borne upon it.

When circumstances make this radical treatment impossible, the resistance of the adhesions may be gradually overcome by manipulation and exercise, combined with a gradual building up of the inner side of the shoe, and of the arch by means of pads or plates gradually raised. In such cases treatment should not cease until the full range of normal mobility has been attained.

As in the causation of flat-foot muscular inefficiency, either absolute or relative, is the most important factor, so any treatment which is satisfactory must aim principally to strengthen the muscles. In helping the muscles to regain their tone plates are very efficient. Any treatment, however, which makes necessary the permanent use of plates or other form of support is in so far inefficient and unsatisfactory. The aim should always be to restore the normal muscular support.

In conclusion, I wish to acknowledge my indebtedness to the works of Lovett, Whitman, Bradford and Dane, and to thank Dr. S. W. Ellsworth for kind assistance.

MENTAL AUTOMATISM IN EPILEPSY: A PSYCHOLOGICAL STUDY.

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THE presence of mental automatism in epilepsy and kindred disorders of reduction in consciousness is common and frequent, and is thereby rendered a subject of great interest for close investigation by the neurologist, psychologist, alienist and medico-legal expert. Its very frequency and the protean forms in which it manifests itself necessitates careful study in order to estimate the degree of responsibility of the individual as a volitional agent. That automatism which manifests itself in epilepsy is intimately associated or dependent upon the disorder of consciousness is an hypothesis which has long since been ably defended by various writers, and especially by Hughlings Jackson in his well-known writings upon epilepsy.

It is still a matter susceptible of two different interpretations as to just what this disorder of consciousness may be: first, that in the presence of mental

⁷ Study of the Weak Foot.

⁸ Lovett and Dane: Affections of the Arch of the Foot commonly classified as Flat-foot, New York Medical Journal, March 7, 1896.

automatism, no consciousness exists; second, that during the automatic state consciousness exists, but in such an attenuated and disordinated form as to be incapable of registering acts with any degree of permanency — thus a temporary or permanent amnesia of the automatic acts persists on the return to normal consciousness. If the presence or absence of amnesia is to be a test whether or not consciousness exists in the automatism, we are forced to accept both theories as an explanation in order that we may cover all phenomena. It is comparatively easy to see how these two theories would blend and give us an explanation of all the various motor and psychical phenomena present in this interesting condition of epilepsy.

Certain epileptics have an accurate knowledge of their acts which were performed while subject to automatism; others have no recollection of the occurrence of such acts, although it must be said that the majority of this latter class are open to suggestion and quickly incorporate any facts which may be told them of their previous disordered state of consciousness. Whether these epileptics are particularly open to hypnotic suggestion because of their peculiar mental make-up, which may have given origin to their epilepsy and its sequent mental automatism, or, whether a detailed statement of their former acts served to revivify the but faintly impressed images received while consciousness was in a disordered state, are both questions which it would be of great interest to ascertain by future study.

It is worthy of remark, that the acute mental disturbance caused by and found in epilepsy partakes more of the nature of mental automatism accompanied by acute delirium than any other form of insanity.

These periods of automatism usually follow convulsive seizures in epilepsy; so it is essential that we should examine these attacks and ascertain, if possible, their nature and influence upon this disordered state. That the condition generally follows *petit mal* rather than *grand mal* is a matter of record, although the cases which will be presented in this article were all of *grand-mal* type and in only one case, after a single attack of *petit mal*, did automatism ensue.

The question naturally arises, Why should this condition be a more frequent sequela to an epileptic seizure than to all other disorders of consciousness, which occur in other pathological conditions? While recognizing that the essential basic constituent of an epileptic attack is a disorder in consciousness, which may or may not be associated with a convulsion, yet the structural change in the so-called substratum of consciousness which underlies this disorder must be carefully investigated in order to obtain an accurate conception of the relationship. It is undoubtedly proven that the sum total of nervous action is essential to the correct concept of consciousness. This being the case, any great disorder in the cerebral activity must necessarily influence the complex state or better states of consciousness.

Todd, Robertson, Jackson and Gowers have shown how sudden, excessive and persistent nervous discharge of one or all of the cortical brain centres may be followed by temporary paralysis which may be either local or general; local, if the cortical exhaustion of inhibition were local, and general, if the disturbance of the cortex were general or diffuse. While we do not contend that consciousness has such a materialistic basis, which to be true would be ideal, yet it

is probable that an analogous condition obtains in all such reductions and attenuations in subject-consciousness, such as mental automatism appears to be. The character and degree of mental disturbance attending the epilepsy is probably the greatest factor in deciding the absence or presence of automatism in any single case. The cases which have recently come under observation have all been those more or less addicted to the use of alcoholic stimulants, and present a fairly distinct and uniform mental type. They are all nervous and excitable, and subject to periods of extreme irritability which is most noticeable in the inter-paroxysmal state.

Notwithstanding the automatic acts performed in the post-convulsive state are usually described as of a simple character, yet the relative simplicity of such mechanical acts is determined by the degree of intelligence of the subject, as well as the character of the seizures and their severity in the higher realms of mental activity. While one may perform such simple acts as to walk about assuming a studied and anxious expression of countenance, another more intelligent and in whom a like mental disturbance has taken place, may perform such complex acts as to write letters to his friends which are very well expressed (as Case III). Again (as Case II), he may perform difficult arithmetical problems. These last-named acts are undoubtedly of a high intellectual order, and seem to prove that the change in consciousness in all cases was not of a horizontal reduction, but certain areas of the brain remain as foci undisturbed and are still capable of giving direction to intelligent thought and action.

The ordinary manifestations of automatism may be easily diagnosed. To the careful observer the patient may be seen performing a number of contending, purposeless acts, in which there is marked incoherence in words, sentences and continuity of thought. His association of ideas is broken. His remarks pour forth in a disjointed, fragmentary mass, and no special idea remains long enough to make its impress upon consciousness and so remain fixed and permanent in the normal state. All power of inhibiting ideas which do not follow the laws of association is completely lost, and attention is attenuated to a marked degree. There is no tendency toward a unity of consciousness, which is imperatively necessary for the existence of attention. While the foregoing description holds for the typical case, there are many more atypical conditions which are extremely difficult to understand and recognize.

When we compare the two disordered states of consciousness, somnambulism and automatism, we recognize that they are antipodal states and cannot exist at the same time, but may be found in the same case at different times. It is as common to see a case of somnambulism perform relatively complex acts while in the disordered state, as it is rare to observe the same degree of complex acts performed in automatism. But that they have some association is well proven by the fact that a great number of epileptics who are afflicted with mental automatism have been, in earlier life, somnambulists. In Case I given here, this state of somnambulism still persists in a mild form; and at these times, when he is apparently automatic without any seizure having preceded it, he is doubtless somnambulant. In short, while somnambulism might properly be defined as a tendency towards a unity of consciousness in which the subject is possessed of a fixed

idea which he endeavors to accomplish or realize, automatism, on the other hand, may be described as the condition in which many states of consciousness have equal tendencies to present themselves at the same time, and the inhibition of higher centres, such as the will may call into action, are withdrawn or lost. There are varying degrees of the disordered state of consciousness, ranging all the way from the performance of simple physical acts to those of very complex mental ones. Therefore, the milder forms of automatism may approximate a unity of consciousness, and in this way resemble or shade off into true somnambulism.

The writer will present several cases of automatism which have come under his observation very recently.

CASE I. Male, thirty-eight years of age, a merchant by occupation. His epilepsy has been in existence for three years. The assigned cause was alcoholism. A maternal grandmother had epilepsy, and patient's father died of "brain fever." The majority of his attacks are of the *grand-mal* type and occur about once a week, generally at night or in the early morning hours. His attacks have never been preceded by an aura. He had three slight attacks of mental automatism prior to his admission to Craig Colony. One was of a somnambulant character; while in this state, he left the house in a partially disrobed condition and walked about the grounds for ten minutes, apparently in search of something, but as he did not find it, he returned to the house, and remained in a sound sleep for six hours. At other times, during attacks of epileptic automatism, patient walks about and does various purposive acts, such as cleaning the lavatories and making beds. During these times, if he is at all molested, he is liable to be very irritable and pugnacious. There is a general muscular rigidity attending all purposive acts, and these are performed more rapidly than normal movements in every-day action. He rarely converses with any one at these times, unless he is spoken to, and then his replies are intelligent and direct. During one of the attacks he carried a patient, who slept in an adjoining bed, about the room and acted foolishly and simple. Following these periods of sleep-walk, which last from fifteen minutes to two or three hours, he generally returns to his bed and sleeps soundly. He has no knowledge of these attacks the next morning, and would not know that they had taken place were it not for a slight feeling of "weariness." Occasionally during the day following a regular attack of epilepsy, he will perform for a few moments these same automatic movements; but if left alone and made to lie down, he quickly recovers from them without doing any personal violence. Whenever opposition has been made to his performing work which he desired to do while in this disordered state, he has shown great personal violence. An illustration of this is given in the following:

After a seizure which occurred while patient was coming to the colony, he assaulted two brakemen and smashed a car window and a seat as a result of a brakeman's interference when he attempted to raise the car window. He had had a slight epileptic attack a few minutes before, and was automatic. He is very strong and muscular, but displays more strength during these periods of automatism than in normal muscular action. He is clear mentally, and quite capable of performing good labor, if not interfered

with and made to do differently than he does in this abnormal cycle which rehabilitates normal consciousness. After one of his recent attacks, the patient sat up in bed and stared about him in a bewildered manner; he arose quickly and began to run about the house performing all sorts of automatic acts such as searching for imaginary objects under the beds, in the attic and lavatories. Occasionally, he has had periods of sleep-walk without having had a seizure; he is likewise unconscious in the morning of having had such an attack. This last-mentioned phenomena is especially noticeable when he has not received his regular dose of sleeping medicine at night.

CASE II. Male, thirty-two years of age, a printer by occupation. Epilepsy has been existent for thirteen years. Cause was unknown. No neurotic family history was obtainable. General character of attacks is *grand mal*. His attacks are generally nocturnal, occurring in the early morning hours, and they are not preceded by an aura. At the time of admission, patient presented some of the typical mental characteristics of the epileptic, the most noticeable being his extreme irritability and amnesia which preceded and followed his attacks. He was unable to carry on prolonged or sustained mental labor. The patient was placed upon Flechsig treatment, and for three months after he had no attacks; the morning after this period of immunity he had a severe convulsion. He arose, dressed himself immediately after the attack, and conversed in a rational and intelligent manner with those about him. After breakfast, he was absent from the house for an hour or so, during which time it was afterward learned that he visited the shop where he was accustomed to work, but what he did there is not positively known. He returned to the house, lay down, and soon fell asleep, and remained asleep for three hours. On awaking he was perfectly oblivious of what had occurred, and was very much surprised to find that it was morning, that he was dressed and had apparently been out to work. He had no recollection of what he had done during this interim, and persistent effort to recall what had happened was also unsuccessful. In describing this occurrence, which is altogether unexplainable to the patient, he uses the expression, "I must have done so and so." The attack preceding this period of automatism was of the typical *grand-mal* character; general muscular convulsion of clonic spasm lasting for two minutes ensued. Heretofore the patient has always had a prolonged sleep-stage following his regular attacks. This time the sleep-stage did not follow, and had the automatism not followed the attack, the seizure would not have been especially noteworthy.

CASE III. Male, thirty-one years of age, a clerk by occupation. Cause of his epilepsy is unknown. No neurotic history. Patient's attacks are of *grand-mal* type, and occur every two or three weeks, both by day and by night, generally in the early morning hours. Preceding his convulsive seizures there is a tonic spasm of the forearm and arm of the right side. When this is especially severe, the extensors of the forearm are sufficiently active to cause the patient to drop whatever he may be holding at the time. This is generally attended by slight inspiratory movement, causing a quick closure of the epiglottis. Patient is entirely unconscious of the significance of this muscular movement, which may last two or three hours before the general convulsion takes place. After one

of his severe attacks had occurred and the sleep-stage had been omitted, the patient engaged in his daily work, which was to care for one of the offices and act as messenger. There was but little change noticeable in the patient, except that he seemed to be slightly incapable of understanding any question addressed to him. He performed his duties with alacrity, and during the day carried messages about the colony and distributed packages as he was ordered. He conversed upon almost any subject suggested, and did so in a rational manner; yet there was an unnatural appearance about the eyes and facial expression which at once, to the careful observer, would indicate that he was not in a rational state. During the day he made but one mistake in carrying messages and packages. The same day he received some papers and letters from his friends; the following morning he was entirely oblivious of their receipt and of all the other occurrences of the previous day.

In another case, the period of automatism makes its appearance without a convulsion having taken place, although what might be termed a very slight attack of *petit mal* may supervene. The patient will whistle and sing odd bits of song, and at the same time almost falls upon his hands and knees, but quickly recovers himself and runs about the house, laughing boisterously and doing various foolish acts suggestive of a mild state of intoxication. After such attacks the patient has no recollection of anything that has occurred during the fit and the automatic state following.

In all cases a family history of somnambulism was obtainable, and in all cases which have come to the attention of the writer no aura was found to precede the attacks. It seems probable that the so-called psychological attacks of epilepsy are really periods of automatism.

In one case, the patient, while in one of the mild forms of *petit mal*, would converse with any one, but, as she afterwards stated, she was hardly conscious of what she said and did at those times, and was very apt to express ideas antithetical to those which she really entertained, both at the time and previous to the attack. Such attacks last for two or three minutes; and in the normal consciousness which immediately follows, the patient remembers what she has said during the period of automatism, and often makes an effort to correct the wrong ideas which were expressed.

In a case which has recently come under the writer's observation, a description of the mental automatism is as follows: The first attack occurred about five years ago, and followed a severe convulsion. The patient was taken to the police station and placed in restraint for two days, then he was removed to the hospital and placed in restraint for six weeks. During this time he was incoherent, and showed considerable violence in his manner, but did not attempt any assault. The return to normal consciousness was sudden and absolute. Three years after this first attack, while on his way home from work as railroad engineer, he stopped in a way station, threw out both operators, and sent a message by telegraph to the central station and received the reply. After having done so, he locked the door of the station and proceeded on his way home. He only became aware of what he had done by the fact that he found the key of the station in his pocket the next morning. The

messages were carefully sent and received during this attack of automatism. He himself was somewhat surprised that he was able to send a message with so few mistakes. Upon return to normal consciousness, which is always sudden, patient is unable to recall any of his past acts performed while in the automatic state.

To show the length of time that automatism may be present after an attack of epilepsy the following case is presented: M. B., female. She had a severe attack the night before admission to Craig Colony. After three weeks of automatism patient became conscious of where she was, and partially conscious of what had occurred since her admission to the colony. It was extremely difficult at the time of her admission to tell whether this case was in the automatic state, or whether she was suffering from a certain degree of mental impairment as a consequence of her epilepsy, although it is now obvious that the former condition was her true state, as evidenced by her return to normal consciousness and her performing daily work in an acceptable manner.

Slight attacks of epileptic automatism occur frequently, but they are diagnosed with difficulty, and occasionally disappear before one can say positively that they have really been present. The ability to decide the degree of responsibility in such epileptics becomes extremely difficult.

The close relationship which all disorders of consciousness sustain to one another, especially when automatism is present, is manifest when such conditions are studied closely. Somnambulism was present in Case III from early life, and the habit was also found in his family history long before his epilepsy began.

Just what mental condition predisposes one case of epilepsy to mental automatism more than another, it is impossible at present to state. However, it is probable that certain subjects would not suffer from mental automatism if they did not have epilepsy or some other disease which materially interferes with cerebral activity, resulting in marked disturbance or reduction in subject-consciousness.

REMARKS ON MATERNAL IMPRESSIONS.¹

BY W. T. COUNCILMAN, M.D., BOSTON.

I SHALL not confine myself strictly to the subject of maternal impressions, but shall make some general remarks on the subject of malformations and the theories concerning their causes.

By malformations is understood a marked departure in structure from the type of the species. There is no sharp line of separation between malformations and the slight departures from the normal type which are known as variations, and which when advantageous for the species may be continued and rendered permanent by natural selection. The most pronounced malformations in which there is an extreme departure from the normal type are known as monstrosities.

The beginning of our knowledge of malformations really dates from the foundation of embryology by Wolff in 1759. Previous to this time they had more of the theological than scientific interest. The principal question regarding them was whether they were pre-

¹ Remarks before the Obstetrical Society of Boston, November 17, 1896.