SLEEP-WALKING AND SLEEP ACTIVITIES.

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SLEEP-WALKING, which is a fairly frequent symptom in children, is less common in adults, and, though fascinating, this subject has not yet received as much attention as its importance deserves. In the *Text-Book of Medicine* edited by Price there is no mention of this symptom. In the medical and legal literature one often comes across the same case-histories quoted by successive writers, some of whom consider somnambulism a hysterical dissociated state, while others maintain that it is an epileptic phenomenon. A correct diagnosis is essential not only for the purpose of treatment, but also for assessing criminal responsibility. Unfortunately, the features stated to be characteristic of somnambulism would seem really to be due to more than one condition.

CLINICAL MATERIAL.

This paper is based on clinical observations and on investigations made from every practical aspect on 117 out of 1,853 male adults suffering from neurosis who were under my care during the war period. Sleep-walking and sleep activities were predominant symptoms in these 117 patients, whose ages ranged from 18½ to 37, the average age being 23·6. As they formed a highly selected material and did not represent a fair cross-section of the general population, and as circumstances which led to their admission were extraordinary, the conclusions recorded here should be considered as tentative.

TABLE I.—*Chief Findings.*

Diagnosis.			No.	No. with neurotic traits in childhood.	No. with history of sleep-walking in childhood.
1. Psychogenic causes	1. Anxiety state	(*a*) Acute	71	23 (30%)	7 (10%)
		(*b*) Chronic	18	18 (100%)	17 (94%)
	2. Hysterical dissociation		8	2 (25%)	*nil*
2. Physiogenic conditions	1. Post-epileptic		2	*nil*	,,
	2. Post-infective		9	2 (22%)	,,
3. Hystero-malingering states			9	1 (11%)	,,

Two striking features emerge from this Table: (1) That psychogenic causes are responsible for the majority of the cases of so-called sleep-walking, and (2) every one of those suffering from chronic anxiety admitted neurotic traits early in life, and 17 out of 18 admitted having walked in their sleep in childhood. In these patients it would seem as though sleep-walking was their pattern of reaction to stress.

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I. Psychogenic Causes.

1. *Anxiety states.*—Anxiety, either acute or chronic, is the most frequent cause of sleep-walking.

(a) *Acute.*—Exposure to sudden and severe stress may be followed by anxiety symptoms, including sleep disturbances and sleep-walking. Such acute anxiety symptoms were found among some of those men who had broken down after exposure to intense enemy action at Dunkirk, Normandy, Belgium and Holland. They would shout in their sleep, toss about, punch the walls, jump out of their beds, and seizing whatever they could get hold of, rush forwards to attack an imaginary enemy. N.C.O's. would shout orders to imaginary soldiers. They re-lived their battle experiences in their sleep, and psychomotor activities were prominent features in these nocturnal disturbances. A few who had gone home on compassionate leave caused considerable distress to the members of their families by their aggressive tendencies during sleep-walking. These disorders occurred almost every night, and more or less identical words or phrases were used by the same patient night after night. Some were more violent than others, but all were inclined to injure themselves by hitting the walls with their fists, knocking the lockers over, or falling through the windows.

Detailed examination was difficult while they were walking or running. From careful observations made by the nurses and myself it was found that some of them were sweating freely and appeared to be in a state of terror. The skeletal muscles were tense and rigid, the respiration rapid and shallow and eyes staring vacantly into space. The pupils were dilated, and reacted briskly to the light from a torch. The knee-jerks were present and the plantar reflex was flexor. The auditory perception was unimpaired as regards loud noises—the banging of a door or a plane flying over caused an immediate exacerbation of their activities or a marked panic reaction. Pin-prick was appreciated, as indicated by the withdrawal of the part touched. When simple questions were asked there was no reply in the majority of cases. The questions were either not heard or not understood. Incoherent speech, indistinct words and grunting noises were heard, but these appeared to be part of their battle experiences and irrelevant to the questions asked. To test their comprehension I made some remarks to the nurses in their hearing, but there was no response. The majority of these patients resisted our attempts to lead them back to their beds, and in a few instances this required considerable force (the help of two or three men).

During the day they showed somatic signs of acute anxiety, such as tenseness, tremor of the limbs and body, palmar sweating and frequency of micturition, and some admitted frankly that they were frightened at the prospect of facing enemy action again. All complained of lack of sufficient sleep and battle dreams, but they denied any knowledge of their sleep-walking. None was able to recall any of the remarks made in his hearing at night.

The prognosis as regards sleep-walking was good in these patients as they had been removed from the primary cause, i.e. the front line. Under con-

tinuous narcosis for three or four days, or heavy sedation (medinal gr. 10 at bedtime) for a week or longer their condition improved and sleep-walking subsided. Battle dreams and shouting in their sleep, however, continued for a longer period, especially in unstable persons, but finally responded to psychotherapy, including abreaction, discussion and so on.

(b) *Chronic anxiety.*—In adolescents and young adults of a nervous or unstable type chronic worry in connection with feelings of insecurity or with unsolved domestic or financial problems may result in insomnia and sleep-walking. These patients frequently talk or shout and only occasionally walk in their sleep—the intervals between sleep-walking varying anything from one to several months. A patient may get up from his bed, open the door and go out of the house without making any noise, or he may even endanger his life by falling out of a window, but he is not usually inclined to be violent towards others. The walking is purposeless, as no other activities are carried out, and occasionally he may walk even a mile or two before returning to his bed.

During the sleep-walking all the movements are slow, arms relaxed, and respiration quiet and regular in rhythm. Eyes are open, pupils moderately dilated, but react to light; knee-jerks are present and plantar reflexes are flexor. Pin-pricks are appreciated and auditory perception unimpaired. Conversation is difficult as the patient does not usually answer any questions, but he can easily be led back to his bed. The objective features are those of wakefulness rather than of sleep.

If questioned in the daytime he may admit he is worried about his personal problems and that he suffers from nightmares. He may give a long history of nervous instability and neurotic traits in childhood, e.g. stutter, enuresis, nail-biting, and especially of walking or talking in his sleep, and he may have suffered from nervous breakdowns. Each attack of sleep-walking is usually preceded by a week or two of disturbed nights and recurrent anxiety dreams. In these dreams he may see himself imprisoned in a small room without any doors or windows, and as the room gets smaller and smaller he tries to escape, or he is chased by someone and he tries to run away.

Treatment should be directed towards the removal of the sources of anxiety. Psychiatric social work may be necessary to solve the personal problems. Since each attack of sleep-walking is preceded by distressing dreams, two or more restless nights are indications for commencing a short three weeks' course of heavy sedation, e.g. medinal 10 gr. at bedtime for an adult. Prolonged medication is unnecessary and should be avoided. The following case-histories are representative of this group, and illustrate well that sleep-walking was their pattern of reaction to stress.

CASE 1.—Male, aged 22, was reported to have once fallen through a window, and on another occasion to have burnt his hands on a stove at night. His O.C. stated that he was a keen and efficient soldier. An attack was witnessed in hospital, and resembled the above description. Investigation revealed that he had walked in his sleep as a child, and that at the age of 17, after witnessing his mother's death, he had an attack when he walked half a mile along a road in his night attire. Since then, whenever he was worried over anything, he had recurring bouts of anxiety dreams for several nights, culminating in an attack of sleep-walking. The present bout was precipitated by psychological stress over frustration in connection with

his Army occupation. When this was explained to him and arrangements under the War Office "Annexure scheme" were made to employ him in his own trade, his sleep-walking stopped at once.

CASE 2.—Male, aged 37, His history showed that he had walked in his sleep until the age of 8, and had frequent attacks during six years' service in the Regular Army. While working in civil life for nearly nine years he was free from symptoms. After exposure to enemy action at Dunkirk he had recurrence of his sleep-walking. His present attack was due to chronic worry consequent on unsuitable employment in his unit. His O.C. gave him a good report. His sleep-walking ceased when he was recommended for employment in a suitable trade commensurate with his abilities.

2. *Hysterical dissociation or somnambulism.*—The Oxford dictionary defines somnambulism as "walking or performing other action during sleep, condition of brain inducing this." It would be better to restrict the use of this term to instances where there is apparent dissociation of personality—apparent because the more one studies hysteria the more one doubts whether such a thing as genuine dissociation can ever exist at all. However, it is better to bow to tradition and define somnambulism as a state of dissociation occurring during sleep, and characterized by general or local movements (and invariably by walking) of which the patient denies any knowledge on waking up. In these patients it would seem as though two distinct streams of thought existed side by side without meeting at any time (Janet, 1889). A desire which has been repressed during waking hours may dodge the personality and maintain an independent existence. During sleep, when the basic personality is in abeyance, the repressed desire strives to attain its goal without the full co-operation of the personality. On waking up the personality may deny any knowledge (Janet, 1904) of the nocturnal activities and may even repudiate them. For instance a religious and God-fearing man may, during somnambulism, indulge in sacrilegious and profane activities. Many such cases have been reported in the literature. A college student mentioned by Seashore (1916) used to walk down to the river, undress himself, and after a good swim return to his bed. Nielson (1936) reports a boy with a post-epileptic Parkinsonism who, during somnambulism, was seen walking without any rigidity or contracture. Instances such as these lend support to the theory of dissociation. But Graber (1934) stresses the role of the Oedipus complex. During somnambulism a person carefully avoids obstacles and is not likely to injure himself or others. He behaves as if he were doing some ordinary work in a familiar world of darkness. The attacks occur at infrequent intervals, but the activities indulged in may vary on each occasion. Usually the attacks are not preceded by dreams. If examined during an attack they may appear awake and at perfect ease. The eyes are open, pupils react to light, knee-jerks are present and the plantar reflexes are flexor. Sensations of pain, heat and cold are appreciated. The auditory perception is unimpaired and they may react to loud noises, although they usually do not reply to questions.

Roger (1932) has pointed out that during somnambulism the patient is suggestible and may be made to carry out orders, that he can answer questions correctly and that he exhibits flexibilitas cerea. We found these patients suggestible and they also carried out our instructions, but we were not able to enter into conversation with any of them, nor did we find flexibilitas cerea.

During somnambulism a heavy smoker was offered a packet of his favourite cigarettes, which were very scarce at this time, but there was not the slightest sign of recognition on his part. Even when a cigarette was inserted between his lips and a light was offered he failed to light it.

During waking hours these patients may not appear anxious and may deny any cause for anxiety. A history of neurotic traits in childhood may be absent, and to all outward appearances they may seem well adjusted to their environment. In the intervals between sleep-walking these patients may not complain of recurrent dreams or nightmares and they may not talk in their sleep.

Hypnosis is useful for this type of case both for discovering the motive and for the purpose of treatment. Sedatives are unnecessary and often fail, while treatment by hypnotic suggestion gives excellent results.

CASE 3.—Aged 29. Sleep-walking of three months' duration witnessed by the M.O. before referring him for investigation. His O.C.'s report—" very efficient, willing, hardworking, and his behaviour excellent." During an attack observed here he appeared completely dissociated—a different personality altogether.

Under hypnosis it was found that sleep-walking started while he was serving a term (for forgery) in a civil gaol. During his waking hours he was a respectable, law-abiding, conscientious citizen; while in the dissociated state he was an anti-social being, a rebel against society and against the Government.

II. PHYSIOGENIC CONDITIONS.

(1) *Post-epileptic*.—This is an extremely uncommon cause of sleep-walking, although it is often advanced as a plea by the defence in medico-legal cases where criminal responsibility has to be assessed. Sleep-walking may occur as part of an epileptic phenomenon either immediately following a seizure or without a fit. In the case of *grand mal* after the clonic stage, when the patient begins to emerge from a fit and before he has regained full consciousness he may carry out automatic movements without being aware of their object. These movements may vary in extent and duration, and may consist in smacking of the lips, chewing, swallowing, incoherent muttering, rambling talk or plucking movements of the fingers (Muskens, 1928), or in the repetition of every-day actions such as rearranging the bedclothes, dressing or undressing and so on. Wilson (1940) says as regards nocturnal fits the post-convulsive phase can at times be identified with somnambulism, during which the patient may dress and return to his bed, or wander about aimlessly or emerge from his house in night attire.

It is believed (Hughlings Jackson) that during an epileptic discharge the highest centres of the brain are rendered functionless, and that automatic activities take place before function is restored to these centres. From this it follows that automatism cannot last longer than two to three minutes, and it is understandable that on coming round the patients do not remember anything that happened during the automatic phase. These views have been confirmed by observations on patients who had received electrical convulsions in the course of treatment. Immediately after a fit and when the patient is still unconscious, he may indulge in automatic activities if not forcibly restrained.

For instance, he may try to jump out of the bed and rush towards the door, but such activities cease as soon as he regains full consciousness, which he usually does within about one to two minutes. A patient in this period must be considered to be without a *mens rea*.

Following a nocturnal fit a patient may jump out of his bed and almost immediately return to it without any fuss, or he may walk some distance before returning to the nearest bed ; or after walking some distance he may fall down and spend the rest of the night sleeping on the floor. He seldom walks more than a few yards and occasionally he may injure himself accidentally, but usually he does not harm others, although a chronic epileptic may become aggressive and even homicidal, especially if force is used to restrain him. In the majority of patients the automatic activities do not last longer than about two minutes. If the sleep-walking follows a major fit there may be evidence of tongue-biting, incontinence, etc., but these features may be absent. Sleep-walking with the above-mentioned features may take place without a seizure, in which case the fit should be regarded either as an abortive one or as a *petit mal* attack. As Gowers (1907) pointed out, "it is possible that the elements of an attack may sometimes be extended, drawn out, lengthened as it were, and thereby made less intense, though not less distressing."

Detailed examination may be difficult when the patient is walking, but if examined soon after he has fallen down the eyes may be found closed and the pupils contracted. The knee-jerks are always elicited, but the plantar reflexes are likely to be extensor for about five or more minutes. Auditory and visual perceptions are impaired and pain is not felt. It is possible to prick him with a pin or apply heat and cold without this being appreciated by him. The objective signs are those of unconsciousness or deep sleep, which lasts about one to two minutes. After this period he may come round or he can be roused, and in either case he may rub his eyes, recognize the surroundings and enter into conversation which may be perfectly rational. If he is not disturbed he may pass into slumber. There may be long intervals between attacks, which are not preceded by nightmares or talking in sleep.

Such a patient may not complain of any symptoms and may not have any cause for worry, and he may even deny a history of neurotic traits in childhood. But careful investigation may reveal a history of fits or fainting attacks in parents, siblings or near relatives. The EEG may show dysrhythmia, or the spike and wave pattern, but a single negative record does not exclude epilepsy. Untreated persons may later develop typical fits.

A patient had his first attack of sleep-walking at the age of 11 when he got out of his bed and got into that of his brother. Five years later, after walking as far as the door, he returned to his bed. The third attack occurred at the age of 18, when he woke up one morning and found himself lying on the floor about three yards from the bed. Two years later he had a major fit in the O.P. department of a hospital. More fits have occurred since, and the EEG has confirmed the epileptic nature of these.

Treatment.—If the patient's EEG is conclusive or if there is a family history of epilepsy epanutin should be given at bedtime, and in order to watch progress the EEG should be repeated at intervals of two to three years.

If the diagnosis is in doubt, epanutin should be withheld and some of the simple devices given a trial. As the automatic stage does not last longer than about two minutes, sleeping in a bag or tucking the bed-clothes well under the mattress and adjusting a leather strap across the bed at the level of the umbilicus may be effective in keeping the patient in bed without embarrassing his respiration. These methods will certainly fail if the sleep-walking is due to anxiety or to hysterical dissociation. Hypnotic suggestion would be useless.

(2) *Post-infective.*—Any infection of the brain may be followed by imperfect control of sleep. Among the sequelae of encephalitis lethargica von Economo (1931) mentioned reversal of the sleep rhythm and somnambulism. He explains that in these patients cerebral sleep and somatic sleep do not coincide in time and depth as they do in normal subjects. Sleep-walking may be a persistent residual symptom in some of the survivors of cerebrospinal fever (Pai, 1944, 1945). This may be due to cortical interference. Mayer (1921), Keeser and Keeser (1927), Davison and Denmuth (1945) have stressed the role of the cerebral cortex in regulating the sleep mechanism. Davison and Denmuth conclude that the cortex in the region of the hippocampal, angular, frontal, premotor and temporal convolutions may give rise to some of the fibres for the control of sleep.

Patients in this group may emerge from the house at night and wander about aimlessly, but as a rule they do not indulge in any other elaborate activities, although they may remain on their feet for two or more hours. They may injure themselves, but are not violent towards others. It is possible to converse with them, but in the majority of cases they may appear confused and disorientated as regards time and place. They are not suggestible, and do not exhibit flexibilitas cerea. Reflexes can easily be tested and they can easily be guided back to their beds. Those who go out of the house and are not brought back by relatives or nurses may walk for hours and may fall asleep towards the later hours of the morning wherever they may happen to be. Investigation of their early histories may not reveal any neurotic traits, but on physical examination residual signs and symptoms of the primary infection may be found.

The treatment depends on the cause if this can be discovered and tackled. The majority of the cases are resistant to treatment. Hypno-analysis may be useless and narco-analysis dangerous. Sedatives may be tried, and if found useful may be given for long periods.

III. Hystero-malingering States.

This type of sleep-walking occurs only in an adult who, in addition to walking, also indulges in various complicated and goal-directed activities requiring considerable skill and co-ordination. As these activities are impracticable without recalling old associations and without previous planning, it is obvious that all the higher processes associated with full consciousness are functioning efficiently, and it would be fair to assume that the patient is fully aware of his actions although he may deny all knowledge of this in the morning. While walking he may peer carefully into the darkness and feel his way about, avoiding obstacles. If the light from a torch is shone on his face he may

close his eyes tightly and resist attempts to open them. All the reflexes would be found intact. If he is asked questions he may reply angrily or in monosyllables, but his speech is always distinct. Auditory and visual stimuli are appreciated, and he may even show a startle reaction if he is surprised from behind.

CASE 4.—Aged 31, referred for investigation, ? epilepsy. It was reported that on one occasion he had stabbed a mate without any apparent reason, and on another occasion he had walked in his sleep and slaughtered some of his poultry. One night he had tried to strangle his wife, but next morning denied all knowledge of this. As a result of observation here, there were reasons for believing that he was fully conscious of his nocturnal activities. For instance, one night he stole a tin of jam from the ward kitchen and concealed it behind some bushes. On investigation it was found that his "wife" was a married woman (separated from her husband) whom he had recently suspected of being unfaithful to him. He had slaughtered the poultry (which belonged to her) out of spite, and his attempt to strangle her was premeditated.

Larceny, abnormal sexual practices, suspicions about marital fidelity and malingering were among the motives for so-called sleep-walking in other patients in this group. Neither the cortical characteristics of sleep such as loss of spontaneous activity and loss of elaborate reactions (Kleitman, 1939), nor the subthalamic and mesencephalic features of sleep such as loss of tone and loss of ability to move spontaneously, were present in these patients during their nocturnal activities. One may therefore reasonably assume that they were fully awake. Lady Macbeth's sleep-walking would come under this category.

The treatment of such cases is truly difficult, and they are the despair of the physician, who may well exclaim, "This disease is beyond my practice" (Macbeth, Act IV, Sc. III).

TABLE II.—*Differential Diagnosis.*

	Acute anxiety.	Chronic anxiety.	Hysterical dissociation.	Epilepsy.	Post-infective.	Hystero-malingering.
Family history of	Neurosis	Neurosis	+−	Epilepsy	−	−
Neurotic traits in childhood	+	+++	+	−	−	−
Sleep-walking in childhood	−	+++	−	−	−	−
Obvious cause for anxiety	+++	+	−	−	−	−
Dreams	++	+	+	−	−	−
Talking or shouting	++	+	−	−	−	−
Objective signs of sleep	−	−	−	++	−	−
Duration of activities	10–15 min.	10–30 min.	Up to 2 hrs.	1–2 min.	Up to some hrs.	Some min.
Motive	Pseudo-purposive	−	+	−	−	+++
Signs and symptoms during waking hours	Tremor − Tachycardia + Sweating −		−	−	Residual signs of primary illness	−
EEG	−	−	−	Dys-rhythmia	Abnor-mality	−

For several reasons a statistical evaluation of the results of treatment is not possible, but the immediate response to treatment could be summarized in a general way. The results were good in the case of acute anxiety, hysterical dissociation, epilepsy and chronic anxiety; not so good in post-infective conditions, and poor in hystero-malingering states.

Discussion.

From what has been stated already it would be seen that post-epileptic automatism is the only condition in which the patient may be said to be asleep. In all other cases of sleep-walking the persons are awake, although the extent and degree of awareness may vary in each patient. This would be understood if one considers sleep as a complex state of physio-psychic phenomena involving a dimming of consciousness, usually relaxation of skeletal muscles and temporary changes in sensory-motor functions. The symptoms depend on the degree and extent of dimming of consciousness and the cortical areas which are still active. The presence of dreams would indicate that the visual centres in the occipital lobes and in the angular gyri are awake; talking in sleep would be the result of the speech centre being active; movements of the body and limbs, tossing about or sitting up in bed would be evidence that the pre-Rolandic motor cortex is awake. If the motor cortex only is active one may expect only simple and automatic movements of which the patient has no recollection on waking up fully. If a person is able to remember some of his nocturnal activities it would indicate that besides the motor cortex, other areas especially those concerned with the higher psychic functions were also awake—in other words, that the person was not fully unconscious during his "sleep" activities. This is in line with the experience of Norwood East, who has rightly suggested that if a person remembers some details of an act (alleged to have been committed by that person) one should hesitate before attributing it to post-epileptic automatism. Elaborate actions would be evidence that almost the entire cortex is awake.

Criminal Responsibility.

Although a discussion of the legal aspects of antisocial acts performed during "sleep-walking" is outside the scope of this paper, it is fair to state that a person who performs a criminal action during the post-epileptic phase must be held to be without a *mens rea* and therefore cannot be held responsible for his actions. *Actus non facit reum nisi mens sit rea.* In the case of persons suffering from anxiety and post-infective conditions of the brain it is obvious that during "sleep" activities there is some temporary loss of function of the higher centres, especially those concerned with memory, discrimination, judgment and so on, although they may be awake. A plea of "diminished responsibility" (Law of Scotland) or a plea in mitigation of punishment appears justifiable in these cases (Smith and Cook, 1934). In the case of acts done during hystero-malingering states a person may be held responsible (R. v. Jackson, Liverpool Aut. Ass., 1837, Woodbridge, 1939).

Summary.

117 male adults who had complained of or who were alleged to have walked in their sleep were investigated.

In the majority of these cases the term sleep-walking was found to be a misnomer, as the clinical condition appeared to be one of incomplete sleep with varying degrees of consciousness.

The causes of walking and other activities during apparent sleep could be classified into three groups, e.g. psychogenic causes, physiogenic conditions and hystero-malingering states.

In the preparation of this paper case-notes of patients who were under my care at four hospitals have been utilized. My thanks are due to the Medical Superintendent, Mill Hill Emergency Hospital, and to the nurses, without whose help and resources many of the observations recorded here would not have been possible.

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