

breathed spontaneously. The carbon dioxide tension rose with the onset of mechanical ventilation from 5.5 to 6.5 kPa in the most severely hypoxic patient (case 1). This man was known to be chronically hypercapnic. The ventilation of such patients is driven by the severity of hypoxaemia and circulatory failure when they are nearing death and so the carbon dioxide tension falls but rises once more if recovery can be secured.

Endotracheal intubation and mechanical ventilation remain the preferred treatment in most cases of severe acute respiratory failure, especially if other systems are deranged at the same time. Continuous positive airway pressure provides relief of dyspnoea and an improvement in oxygenation in a proportion of patients, particularly those in whom hypoxaemia exists without hypercapnia.<sup>6</sup> Nasal intermittent positive pressure ventilation is feasible in patients with acute or chronic respiratory failure characterised by both hypoxaemia and hypercapnia in whom intubation is considered in-

appropriate, difficulties with weaning are anticipated, or long term ventilatory support might be needed. Admission to an intensive care unit can be avoided in some instances at least, and, if intubation does prove necessary, the technique may be useful as a means of helping the return of spontaneous breathing.

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## Sleepwalking, night terrors, and consciousness

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### Abstract

**Objective**—To determine some personality and psychoneurotic characteristics of adults who have the sleepwalking-night terrors syndrome.

**Design**—Prospective assessment of two groups of consecutive patients with a firm diagnosis of either of two specific sleep disorders as established clinically and by polysomnography.

**Setting**—Outpatient sleep disorders clinic and sleep laboratory in a tertiary referral centre.

**Patients**—12 Patients referred consecutively to the clinic in whom a diagnosis of sleepwalking (six) or night terrors (six) was confirmed.

**Main outcome measures**—Psychological characteristics as measured at the time of clinical assessment by means of the Eysenck personality questionnaire, the hostility and direction of hostility questionnaire, and the Crown-Crisp experiential index.

**Results**—Both groups scored exceptionally highly on the hysteria scale of the Crown-Crisp experiential index and the night terrors group also scored highly on the anxiety scale. The patients with sleepwalking also scored highly on a measure of externally directed hostility.

**Conclusions**—The physiological and psychological features identified in these patients, possibly reflecting different expressions of a constitutional cerebral characteristic, may be explored in terms of hysterical dissociation. The findings contribute to the debate concerning the nature of sleepwalking, in particular with and without the forensic aspects.

### Introduction

The popular notion of sleepwalking is of a trance-like state. The subject usually has open eyes, a blank expression, awareness of but indifference to the environment, and sometimes clumsiness. He or she may waken "fully" before returning to bed and to sleep. There is subsequent amnesia for the event. The term itself implies that walking occurs within sleep. But the question remains: Is the person asleep, awake, conscious, or in some other state of mind? This has special relevance when there is violence with forensic consequences and the issue of responsibility for the

act.<sup>1-3</sup> Controversy continues over whether the disorder is akin to functionally generated hysterical fugue states, underwritten by a process of dissociation within wakefulness,<sup>4,6</sup> or whether it is an automatism precipitated by an abnormal sleep process and unrelated to the processes of the waking mind. Dissociation is defined as a defect of mental integration whereby one or more groups of mental processes become separated off from normal consciousness and, thus separated, function as a whole.<sup>7</sup>

Kales *et al.*,<sup>8</sup> Broughton,<sup>9</sup> and Fisher *et al.*<sup>10</sup> agreed that both sleepwalking and night terrors typically erupt out of stage 4, non-rapid eye movement (deep) sleep. Kales *et al.* identified subsequent persistence of slow waves for a short while, which they suggested might reflect brain immaturity.<sup>8</sup> They postulated the relevance of both organic and functional factors. Broughton, reporting in English on his earlier work with Gastaut, found the episodes to be associated with high amplitude  $\alpha$  rhythm, similar to that prompted in normal subjects wakened from deep sleep, and he considered the patients to be suffering from a disorder of arousal.<sup>9</sup> Fisher *et al.* reported similar findings in the electroencephalogram and concluded that night terrors arise because of a breach in the subject's ability to control anxiety.<sup>10</sup>

More recently Oswald and Evans have come down emphatically on the side of sleepwalking being exclusively a disorder of sleep.<sup>3</sup> They described violent behaviour during sleepwalking in three subjects as being out of character and claimed that the subjects behaved automatically during the events and were subsequently amnesic for them.

We contribute to the debate with the following study of patients who attended our sleep disorders clinic with the sleepwalking and night terrors syndromes.

### Methods of assessment and definitions

Patients attend the sleep disorders clinic for a wide variety of sleep disorders. They are assessed clinically during an initial two to three hour long consultation, during which information is obtained both from them and from witnesses—for example, the spouse. All patients also complete certain psychological tests

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before the assessment. These yield information about aspects of psychological make up which are universal (and for which normative data are available in each instance) but which may be quantitatively abnormal and hard to detect clinically in those with some sleep disorders. The tests are the Eysenck personality questionnaire, which gives scores on neuroticism, extraversion, and psychoticism<sup>11</sup>; the Foulds hostility and direction of hostility questionnaire, providing a measure of total hostility and its degrees of internal and external direction<sup>12</sup>; and the Crown-Crisp experiential index, a standardised self report inventory of psychoneurotic state providing scores on six scales (each comprising eight items, allowing scores of 0, 1, or 2 on each item)—namely, anxiety, phobic, obsessional, psychosomatic, depression, and hysteria.<sup>13</sup> The normative data for the Crown-Crisp experiential index are age related.

Patients are also investigated polysomnographically in the sleep laboratory if this is likely to aid diagnosis and if they are willing. Normally they spend one adaption night followed by one study night in the laboratory. The polysomnogram provides two electro-oculographic tracings recording eye movements, an electroencephalographic tracing, and an electromyographic tracing recording muscle tone. These are subsequently categorised in terms of the variety of waveforms, which allows a classification into wakefulness, movements, rapid eye movement sleep, and non-rapid eye movement sleep with its four stages (ranging from light to deep slow wave sleep).<sup>14</sup>

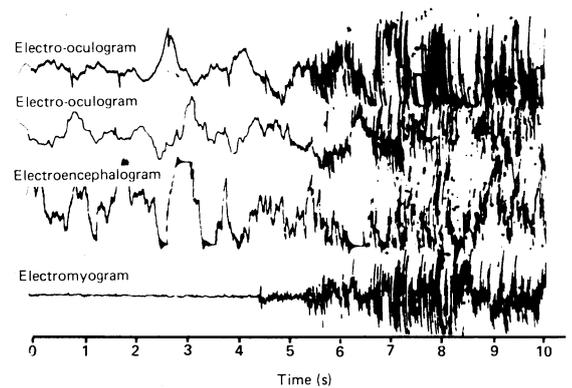
The clinical criteria that we used for the diagnoses of the night terrors syndrome and the sleepwalking syndrome were those laid down within the report by the Association of Sleep Disorders Centers and the Association for the Psychophysiological Study of Sleep on the diagnostic classification of sleep and arousal disorders.<sup>15</sup> *Night terrors* are defined as an arousal in the first third of the night, almost invariably inaugurated by a piercing scream or cry, and accompanied by behavioural manifestations of intense anxiety bordering on panic. Return to sleep may occur without achieving full waking consciousness, and morning amnesia for the whole event is the rule. A night terror may progress to *sleepwalking*, but sleepwalking can arise abruptly from apparent deep sleep without affective distress. It is often uncoordinated, may also terminate with a return to sleep without the subject appearing to waken fully, and also is not remembered in the morning. Night terrors should be distinguished from hypnagogic hallucinosis and from nightmares. These conditions have different clinical features and respectively erupt at the onset of sleep and in the last third of the night and usually from rapid eye movement sleep.

### Present series and results

During 1985-7 six patients were firmly diagnosed as having the sleepwalking syndrome (five men, one woman; mean age 28.4 (SD 7.8) years) and six firmly diagnosed as having the night terrors syndrome (four men, two women; mean age 26.5 (SD 4.8) years). The diagnoses were initially established clinically at the consultation. Psychometry was routinely undertaken as described above, scale scores being derived after the consultation and clinical diagnosis. All the patients and witnesses to the attacks reported their occurrence with varying frequency over several years but with them currently being frequent. Ten of the 12 patients were also studied polysomnographically.

Of the five sleepwalkers studied in the sleep laboratory, four showed a shift from stage 4 sleep to arousal, and two of these had signs recorded on video. Five of the six patients with night terrors were studied in the

laboratory, and three showed a shift from stage 4 sleep to arousal; two displayed signs on the night. The figure shows a typical polysomnogram (from a sleepwalker). In the two subjects not studied polysomnographically the clinical diagnosis was beyond reasonable doubt.



Polysomnographic tracing of sudden intense arousal out of stage 4 slow wave sleep

The psychometric data obtained were compared between the two groups and with relevant normative data. The Wilcoxon two sample test with normal approximation was used to test for differences between groups.

### EYSENCK PERSONALITY QUESTIONNAIRE

Results with the Eysenck personality questionnaire showed no significant differences between the two groups or when compared with normal people. There was, however, a tendency at the 7% probability level for the sleepwalkers to be more extraverted than normal (mean score 16.8 (SD 4.2) compared with 12.8 (4.9)).

### HOSTILITY AND DIRECTION OF HOSTILITY QUESTIONNAIRE

Patients with night terrors scored similarly to normal people on the hostility and direction of hostility questionnaire, but the sleepwalkers' score suggested a significantly higher level of hostility (19.2 (SD 11.2) compared with 12.4 (6.3);  $p < 0.05$ ), which was significantly outwardly directed (-5.2 (8.4) compared with 0.2 (5.5);  $p < 0.05$ ).

### CROWN-CRISP EXPERIENTIAL INDEX

Table I shows the scores of the two patient groups on the Crown-Crisp experiential index compared with those derived from a normal population aged 17 to 44 (mean 30.8 (SD 8) years).<sup>16</sup> The sleepwalking group scored significantly highly ( $p < 0.01$ ) on the hysteria scale. The night terror group scored significantly highly on the hysteria scale ( $p < 0.01$ ) and the anxiety scale ( $p < 0.01$ ). In all other respects the psychological profiles were normal.

The hysteria scale comprises eight items, and these were examined for content and for individual scores.

TABLE I—Crown-Crisp experiential index scores of the two groups of patients and of normal group comparable in age from general population. Values are means (SD in parentheses)

Scales	Sleepwalkers (n=6)	Patients with night terrors (n=6)	Normal population (n=352)
Anxiety	4.2 (3.8)	8.7 (2.7)**	4.6 (3.8)
Phobic	3.0 (2.8)	5.0 (2.7)	4.0 (2.9)
Obsession	7.5 (1.9)	5.5 (3.4)	6.3 (3.1)
Somatic	3.5 (2.3)	5.3 (3.6)	3.5 (2.9)
Depression	3.8 (3.9)	4.5 (3.4)	2.8 (2.6)
Hysteria	9.2 (2.3)**	8.2 (1.6)**	3.9 (3.1)

\*\* $p < 0.01$  Compared with normal population.

TABLE II—The eight questions of Crown-Crisp experiential index hysteria scale and patients' responses to them ranked according to number of positive responses

	Sleepwalkers			Patients with night terrors		
	Rank	Score	No	Rank	Score	No
Do you enjoy being the centre of attention?	1	2	5	1	2	4
Have you at any time in your life enjoyed acting?	2	2	4	5	2	3
Do you enjoy dramatic situations?	2	2	4	1	2	4
Do you sometimes find yourself posing and pretending?	2	2	4	1	2	4
Do you find that you take advantage of circumstances for your own ends?	5	1	5	6	1	5
Do you often spend a lot of money on clothes?	6	2	3	7	2	2
Are your opinions easily influenced?	7	2	2	8	2	1
Are you normally an excessively emotional person?	7	2	2	1	2	4

The items are ranked in table II, firstly, according to the numbers of sleepwalkers who scored positively on each of them. The first item seems to relate to attention seeking behaviour and narcissism. The next three questions relate to the issue of play acting. The last four questions might be thought to be aimed at manipulateness, narcissism, suggestibility, and emotionality respectively. The different rankings for positive responses by patients with night terrors are noteworthy, emotionality being ranked equal first with three other items.

### Discussion

The subjects in this study scored very highly on the hysteria scale of the Crown-Crisp experiential index, particularly on items sometimes described as reflecting features of the hysterical personality and the capacity to dissociate. In the past scores on this scale have been highest among normal teenagers<sup>13</sup> but still substantially lower than those produced by our population. The patients with night terrors were appropriately also characterised by having high anxiety scores on the Crown-Crisp experiential index. Interestingly, all other scores except those for hysteria were normal, whereas patients with psychoneurotic disorders in general score highly on all scales of the index except hysteria.<sup>17</sup> Our finding is therefore highly specific. The sleepwalkers, who did not show high anxiety levels, showed instead high levels of outwardly directed hostility. Possibly hostility may more readily be expressed behaviourally within sleep in these patients, thereby contributing to the forensic aspects of this syndrome.

It may be argued that our patients were a highly selected group. Nevertheless, they comprised a consecutive series of referrals; they and witnesses always reported classic and frequent "attacks"; and the patients were carefully diagnosed as suffering from one or other syndrome independently of the psychometric data.

We speculate whether the physiological features reported by others as characterising these two syndromes and found also in our patients are related to mechanisms which may underlie the hysterical state. Several possibilities exist. The massive denial of feelings that such patients can exhibit may be breached when deep sleep shifts abruptly to wakefulness associated with intense distress. This possibility was suggested by Fisher *et al*<sup>10</sup> and is also consistent with

Broughton's view that the episode is one of intense arousal.<sup>9</sup> This might account for the syndrome of night terrors. Such sudden, intense arousal leading immediately to distress or sleepwalking, or both, might owe something to the predisposed patient's current circumstances—that is, the strains in life—as suggested by other investigators at the psychophysiological level.<sup>8,10</sup> The rapid arousal that heralds the syndrome may be linked to these subjects' capacity for dissociation when awake.

Finally, some of us are personally familiar with transitory disorientation that occurs when waking abruptly and which de Maraceine found to be greatest in young and immature subjects.<sup>5</sup> People with the characteristics described above may use such a state to protect themselves from distress. In some of these patients we may be able to observe a range from the unconscious to the conscious adoption of this mechanism. The question whether a person is then responsible for such behaviour, which erupts out of sleep, is vexed. Sleep seems to be a largely anabolic process in which we are active internally but oblivious to the external world. It seems to encompass cognitive activity and emotions and may even provide a forum for conflict and possibly problem solving. Our mental activity within sleep, however, is not normally associated with immediate social actions. The questions remain: Are sleepwalkers awake and are they "conscious"? We suggest that they are awake but in a state of major mental dissociation that can sometimes lead to socially unacceptable but meaningful behaviour.

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## ONE HUNDRED YEARS AGO

Timely attention is called by one of the surgical staff of St. Bartholomew's Hospital to what he deems the appalling number of sufferers by tram accidents brought to the institution with which he is connected, and others of a similar kind, a number out of all proportion to the tramway part of street traffic. The immediate cause of his remonstrance is the death of a child, 4 years old, who was run over by a car and died in two hours. As a

preventive of these sad occurrences, it is suggested that the tramway companies should affix in front of the wheels a projecting guard, which would push aside any object in the way until the car could be stopped. In the case of a bus or cab, the driver can always manage to swerve the horse should anyone accidentally get in its way, and thus mitigate to some extent the danger; but with a tramcar this is impossible, as it must run straight with its rails. The suggestion is one which the tram companies, and, failing them, the properly constituted authorities, would do well to consider.

(*British Medical Journal* 1890;ii:195)