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Patients with narcolepsy have more psychiatric symptoms than normal controls as measured by psychometric tests. However, it is unclear whether these findings are specific to narcolepsy, as some studies have suggested, or related to excessive daytime sleepiness (EDS) or to chronic illness. We compared a group of 56 narcoleptics to age- and sex-matched controls with EDS. A group of 48 individuals with normal sleep architecture was also used as an additional control group. Both the narcoleptic group and the EDS-control group had significantly greater scores on Minnesota Multiphasic Personality Inventory scales but were not different from each other. Our data suggest that the psychopathology associated with narcolepsy is not specific and may be generalized among patients with disorders of excessive sleepiness. (Henry Ford Hosp Med J 1990;38:219-22)

Narcolepsy was first formally described by Gelineau (1) in 1880 as a rare syndrome characterized by a sudden undeniable urge to sleep. For many years the disorder was thought to be psychogenic, probably because of the unusual nature of the symptoms. Cataplexy, hypnogogic hallucinations, sleep paralysis, and automatic behaviors often produced peculiar histories which lent credence to the view of a psychological etiology of narcolepsy. Cataplexy is particularly intriguing in this regard because of the role of emotional factors in precipitating cataplectic attacks. Narcolepsy is now accepted to be caused by central nervous system (CNS) pathology, although the specific site or mechanism has not been established.

While psychological abnormalities continue to be noted in patients with narcolepsy, the significance of these abnormalities is unclear. For this reason, many researchers have studied the prevalence of psychopathology in patients with narcolepsy. Some studies have reported on the presence of specific psychiatric symptoms, while others have focused on the prevalence of psychiatric disorders (2-6). The central and most crucial problem of these studies is that narcolepsy was not well defined. Objective tests of sleepiness and diagnostic procedures to detect rapid eye movement (REM) sleep abnormalities were not performed. Many of the studies likely used heterogeneous groups of patients with various psychiatric and neurological disorders who would not meet currently accepted diagnostic criteria for narcolepsy (7).

Only two studies measuring psychopathology have used sleep-onset REM periods as a criterion to define narcolepsy. Zarcone and Fuchs (8) described a group of 130 narcoleptics with cataplexy and documented sleep-onset REM periods. Of this group, 18 (14%) patients had diagnosable psychiatric disorders, but five of these patients had disorders secondary to treatment with amphetamines. The remaining patients were diagnosed as having depressive neurosis (6%) or personality disorders (4%). These authors concluded that the incidence of psychiatric disorders in narcoleptics is not significantly greater than in the general population.

The other study to evaluate psychopathology in patients with documented sleep-onset REM periods used Minnesota Multiphasic Personality Inventory (MMPI) scale scores rather than the prevalence of disorders (9). These authors compared the profiles of a large sample of narcoleptics (N = 192) to a group of patients diagnosed as having idiopathic CNS hypersomnia (N = 62). The narcoleptic group differed from the idiopathic hypersomnia group on several parameters studied. One confounding factor in this study is that the narcoleptics were significantly sleepier than the idiopathic CNS hypersomnia group both for each individual nap and overall. This disparity is consistent with previous findings that the level of sleepiness in groups of patients varies according to the etiology of the excessive daytime sleepiness (EDS) (10).

Another study diagnosed narcolepsy in part of the subject population by demonstrating REM-onset sleep from the Multiple Sleep Latency Test (MSLT) (11). This study comparing narcoleptics to patients with sleep apnea found differences only in the degree of social introversion.

The present study attempts to clarify the nature of the relation between psychopathology and narcolepsy. This was achieved by comparing a group of narcoleptics to a group of nonnarcolep-

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Table 1
Age and Sex Distribution of Subject Groups

	Narcoleptic	EDS Controls	Normal Controls
Age			
Mean	50.8	52.6	51.9
SD	11.4	12.9	11.8
Sex (M/F)	36/20	36/20	32/16

tic EDS patients matched for level of sleepiness, as well as to a group of normal controls.

Methods

Subjects

Three groups were studied: clinically diagnosed narcoleptics, normal controls, and nonnarcoleptic EDS controls. All EDS subjects were patients who had been evaluated with polysomnography and a MSLT at a sleep disorders center. Subjects in the normal control group were recruited by a newspaper advertisement. Criteria for inclusion in the narcolepsy group were a presenting complaint of EDS, two sleep-onset REM periods given five opportunities (one night and four naps), and an average MSLT sleep latency < 6 minutes. The EDS controls were selected on the basis of a presenting complaint of EDS, no REM-onset sleep periods given five opportunities (one night and four naps), no history of cataplexy, and an average MSLT sleep latency < 6 minutes. This group of patients with disorders of excessive somnolence (DOES) included diagnoses of chronically insufficient sleep, idiopathic CNS hypersomnolence, and DOES secondary to medical, toxic, or environmental conditions. The three groups were matched for age and sex, and the two EDS groups were matched for level of sleepiness (Table 1). All matching was done on a frequency basis.

Procedures

All subjects were monitored continuously for one night of polysomnography. The recording included two channels of EEG electrodes from the C3 and Oz positions. Standard placements were used to record eye movements with electrooculograms (EOGs) (left and right orbits), chin and leg electromyograms (EMGs), and an ECG (leads V5-A2). Nasal/oral airflow was measured with a thermistor.

The following day subjects were given the MSLT using a four-nap protocol with naps at 10 AM, 12 PM, 2 PM, and 4 PM. For all latency tests, subjects were monitored with central and occipital EEG leads, EOG, and EMG leads from the nocturnal recording. All electrode impedances were less than 10,000 ohms. Subjects stayed in their rooms and were kept awake in between latency tests. For all latency tests, subjects were placed in beds and instructed to close their eyes and try to fall asleep. Their rooms were kept dark and quiet. The latency tests were concluded following 20 minutes of wakefulness, three consecutive epochs (30 sec/epoch) of stage 1 sleep, or one epoch of any other sleep stage as determined by criteria provided by Rechtschaffen and Kales (12). At the conclusion of the latency test, all subjects arose from bed.

Table 2
Sleep Parameters

	Narcoleptics (N = 56)	EDS Controls (N = 56)	Normal Controls (N = 48)
TST	440.3	478.0	416.6
	(52.2)	(67)	(40.1)
WDS	73.7	43.4	38.3
	(38.7)	(41.2)	(28.9)
% Stage 1	23.4	16.8	18.2
	(9.2)	(10.1)	(10.9)
% Stage 2	48.3	55.7	54.3
	(10.8)	(9.1)	(8.1)
% Stage 3/4	4.7	7.3	7.2
	(6.0)	(8.1)	(7.0)
% Stage REM	18.9	19.5	20.2
	(5.7)	(4.8)	(5.0)
LAT REM	46.0	77.4	84.4
	(54.5)	(22.8)	(40.2)
LAT 1	5.2	8.6	13.6
	(8.6)	(10.1)	(13.3)

Note: Data are presented as means with standard deviations in parentheses.
TST = total sleep time, WDS = wake during sleep, LAT REM = latency to stage REM, LAT 1 = latency to stage 1.
Significant differences: TST: EDS > Narc > Norm; WDS: Narc > EDS = Norm; Stage 1: Narc > Norm = EDS; Stage 2: EDS = Norm > Narc; LAT REM: EDS = Norm > Narc; LAT 1: Norm > EDS = Narc.

The MMPI and the Cornell Medical Index (CMI) (13) were administered between nap tests. Four subjects in both the narcoleptic and EDS-control groups and three subjects from the normal group produced invalid profiles on the MMPI. Profiles which yielded an F-K (Fake Bad–Correction) score of less than –21 or which had F scale scores greater than a T-score of 90 were considered invalid. Psychometric data from these subjects were not included in the analyses.

Results

Analyses

The various dependent measures were subjected to a one-factor analysis of variance using the Statistical Analysis System Institute general linear model analysis. The between-group post-hoc analyses were made with the Duncan test. A significance level of $P = 0.05$ was used for all tests.

Sleep parameters

Comparison of sleep parameters demonstrated significant differences between the three groups (Table 2). Narcoleptics exhibited greater sleep fragmentation than both the EDS controls and normals as evidenced by significantly more wake during sleep and stage 1 sleep and less stage 2 sleep. In terms of REM sleep parameters, the narcoleptic group had a significantly shorter REM onset latency than the two control groups, but REM sleep percentage was not different. The narcoleptics and the EDS controls both had significantly shorter latencies to stage 1 sleep than normals, but were not different from each other. Differences in total sleep time were found among all three groups. The EDS

Table 3
MMPI Scale Scores

	Narcoleptics (N = 52)	EDS Controls (N = 52)	Normal Controls (N = 45)
Lie	51.4 (6.7)	55.0 (8.0)	52.6 (7.4)
Frequency	55.0 (7.5)	57.0 (8.7)	52.6 (6.0)
Defensiveness	56.1 (7.8)	55.7 (9.4)	57.4 (8.4)
Hypochondriasis	63.2 (11.4)	65.6 (10.9)	52.5 (7.6)
Depression	62.5 (12.9)	67.5 (13.0)	53.1 (9.6)
Hysteria	(65.1) (9.1)	64.6 (9.6)	56.4 (8.3)
Psychopathic deviance	58.9 (10.0)	60.1 (10.7)	61.3 (10.3)
Paranoia	55.3 (8.2)	56.1 (8.6)	54.4 (7.8)
Psychasthenia (anxiety)	60.5 (11.4)	62.4 (11.8)	52.4 (7.8)
Schizophrenia	62.2 (10.8)	63.2 (11.5)	55.6 (8.4)
Mania	57.7 (11.5)	54.8 (10.0)	55.8 (11.4)
Number of elevated scales (T > 70)	1.29 (1.89)	1.81 (1.74)	0.54 (1.07)

Note: Data are presented as means with standard deviations in parentheses.

controls slept significantly longer than the narcoleptics, who in turn slept significantly longer than the normals.

Daytime sleepiness

The mean MSLT latency was 2.9 minutes (± 1.95) for the group of narcoleptics. This was not significantly different from the EDS control group mean latency of 3.2 minutes (± 0.91). The normal group had a mean MSLT latency of 12.6 minutes (±4.63).

Psychometric tests

On the MMPI, both EDS groups showed significantly higher scores on scales for hypochondriasis (Hs), depression (D), hysteria (Hy), psychasthenia (Pt), and schizophrenia (Sc) compared to the normal group (Table 3). The only significant difference between the narcoleptic and nonnarcoleptic EDS groups was that the EDS controls scored significantly higher on scale D (T-score of 68 versus 63).

Further analysis revealed a similar pattern of elevations in the two EDS groups. The scales most often elevated in the narcoleptics' profiles were (from highest to lowest) D, Hs, Hy, Pt, and Sc. On the EDS profiles they were D, Hy, Hs, Pt, and Sc. Two-scale code types were similar for both groups: the highest two scales of each group were among Hs, D, and Hy scales.

Analysis of the CMI also showed that both EDS groups scored significantly higher than normals on both the physical and emotional subscales, but not significantly different from each other (Table 4).

Table 4
Scores from the Cornell Medical Index

	Narcoleptics (N = 52)	EDS Controls (N = 52)	Normal Controls (N = 45)
Physical	24.4 (13.4)	28.0 (18.2)	14.5 (10.0)
Emotional	9.9 (10.0)	9.7 (8.8)	3.7 (5.6)

Note: Data are presented as means with standard deviations in parentheses.

Discussion

These data indicate that narcoleptic patients have more psychopathology compared to normals, but the severity and pattern of psychological abnormalities is not significantly different from that found in nonnarcoleptic patients with EDS. Both patient groups are expressing much more distress than the normal group. This distress is characterized by a preoccupation with somatic complaints, tension, depression, and anxiety.

A recent study of 50 narcoleptics with sleep attacks and cataplexy reported significantly higher scores on six MMPI scales compared to normal controls (14). The authors hypothesized that these abnormalities occur because narcoleptics attempt to contain their emotions to prevent a narcoleptic or cataplectic attack. Our results do not support this view as these personality differences are not specific to patients with narcolepsy but represent a response to a more general condition.

To evaluate the possible incidence of severe psychopathology in narcoleptics, two items from the CMI were analyzed separately. These items asked whether the patient or a member of his/her family had ever been hospitalized for psychiatric treatment. There were no significant differences between groups in the incidence of psychiatric hospitalization.

The findings from the present study are at variance with an earlier study which reported that narcoleptic patients had significantly higher MMPI scores than did patients with idiopathic CNS hypersomnia (9). The scores for the narcoleptic groups from both studies are similar. However, MMPI scores for the two groups of EDS patients are different; in our study the EDS controls had the higher scores. Very probably, it is not sleepiness itself but the disability associated with extreme sleepiness that leads to elevated MMPI scores. Living with a chronic illness which is difficult to treat effectively contributes to the stress (15). All subjects in the present study shared the diagnosis of a sleep disorder which interfered with their job performance, family relationships, and social lives.

These results do not diminish the importance of psychiatric evaluation in symptomatic patients with narcolepsy. Psychiatric or psychological intervention may help many narcoleptic patients to cope with their illness.

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