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Daytime Alertness in Relation to Mood, Performance, and Nocturnal Sleep in Chronic Insomniacs and Noncomplaining Sleepers

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Summary: Nocturnal sleep was recorded prior to daytime testing that included the Multiple Sleep Latency Test, profile of mood states, card sorting, and Stanford Sleepiness Scale in 138 volunteers with the complaint of chronic insomnia and 89 noncomplaining sleepers ("normals"). In both groups daytime sleep tendency had no significant linear correlation either with any Minnesota Multiphasic Personality Inventory scale or with tension/anxiety and other moods assessed in the morning. In normals, speed of card sorting but not subjective sleepiness tended to correlate with sleep tendency. Given that physiological sleepiness is the most predictable consequence of sleep deprivation in normals, it is particularly interesting that 14% of the insomniac group are chronic insomniacs with no measurable daytime sleep tendency. Despite this lack of sleep tendency during the day, their nocturnal sleep was just as poor as insomniacs with greater daytime sleep tendency. The lack of daytime sleepiness seen in this subgroup may reflect a basic pathophysiological aspect of their insomnia. **Key Words:** Insomnia—Sleep—Sleep disorders—Task performance—Personality.

A persistent feeling of sleepiness or drowsiness is the most predictable consequence of sleep loss in normal sleepers. Objective measurement of this elemental phenomenon using performance tests, however, has presented numerous difficulties, even after administration of sedative/hypnotics (1,2). The Multiple Sleep Latency Test (MSLT) (3,4) provides a unique approach to the assessment of daytime function by directly measuring electroencephalographic (EEG) changes associated with reduced alertness. This technique has been validated in a wide variety of experimental and clinical conditions known to affect alertness (5–11). In particular, the MSLT appears to be sensitive to changes in total sleep time as small as 1 h (3).

With this tool, we began 6 years ago to investigate the daytime sleepiness in volunteers with the complaint of chronic insomnia. From our preliminary data, it appeared that poor sleep in these insomniacs did not necessarily result in subsequent daytime sleepiness as

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compared with noncomplaining "normal" sleepers (12). This is all the more surprising since there is a cumulative effect of partial sleep loss in normals (8).

Our purpose in this paper is to report on the current state of our knowledge of daytime sleepiness in these insomniacs, using a database that includes mood, performance testing, and personality measures, and taking into account time of day and additional nocturnal sleep parameters. We have also included a comparison group of noncomplaining sleepers with 24 h sleep/wake measures taken under nearly identical conditions.

METHODS

Subjects

Two groups of subjects are described and compared here, volunteers with a complaint of chronic insomnia and noncomplaining "normal" sleepers. A total of 138 persons complaining of chronic insomnia [43 men aged 57, standard deviation (SD) 17 years, and 95 women aged 52, SD 16 years] were screened and in most cases subsequently participated in studies of sleeping medications. In the screening process individuals responding to advertisements for volunteers with serious and persistent sleep disturbance were interviewed by telephone. More than 3,000 were excluded at this stage, including persons with personal schedule constraints or a lack of chronic (at least 3 months) sleep complaint; persons who were simply short sleepers, suffering the boredom of being awake at night but having no daytime complaint whatsoever; and persons with a history of recent or prolonged shift-work, drug abuse, chronic illness, or pain.

Those remaining had polysomnography to rule out sleep apnea and to aid classification; the volunteer was then examined, interviewed by a physician of the Stanford Sleep Disorders Center, administered the Minnesota Multiphasic Personality Inventory (MMPI) (for some studies), and classified according to the criteria of the Association of Sleep Disorders Centers (ASDC) (13). Patients who received 24 h testing included only those in good health and with a diagnosis of persistent psychophysiological insomnia (A1b) (n = 87); insomnia complaint with no objective findings (A9b) (n = 19); insomnia associated with nocturnal myoclonus of varying degrees of severity (A5) (n = 32); and insomnia with psychiatric disorders (A2a) (n = 9). This last category was not included in this analysis in the interest of greater homogeneity; their number is small because such volunteers were usually deemed unlikely to comply with the rigorous demands of a sleep study. Thus, the chronic insomniac group here is comprised of only three ASDC diagnostic categories.

A total of 89 subjects (49 men aged 26, SD 4.8 years, and 40 women aged 27, SD 5.5 years) with no sleep complaint were screened in a manner similar to that detailed above for participation in medication studies using noncomplaining sleepers.

All subjects agreed not to take any psychoactive medications for 2 weeks before participating in a study; in most cases compliance was confirmed by chemical examination of blood plasma or urine.

There is no overlap between the subjects included in this report and the 122 insomniacs that were part of an earlier study from the Stanford Sleep Disorders Center (14).

Procedures

These data were gathered over a 6 year period in a single laboratory under the direct supervision of the same person (WFS). In general, we are reporting baseline data from clinical trials of several different hypnotic compounds. Results of individual treatments are or will be reported elsewhere (15–17). Typically, subjects slept in the laboratory 1–4 nights for the premedication baseline condition (with or without single-blind placebo) and daytime testing occurred the day following the final baseline night.

The data used in this paper are always taken from one 24 h period in which a polysomnogram precedes the MSLT. If more than one baseline 24 h test session were available for a patient, the first one following an adaptation night was employed in this analysis.

All subjects were recorded in individual, darkened, sound-attenuated, temperature-controlled bedrooms. Lights out and total recording time (TRT) for insomniacs approximated their habitual times; fixed hours in bed (usually midnight to 0800 h) were used for noncomplaining subjects. All-night recordings were scored according to the standard method (18) and always included monopolar EEG (recorded from a standard placement), eye movements (electrooculogram, EOG), and chin electromyogram.

The profile of mood states questionnaire (19) and a subjective assessment of sleep were requested each morning prior to daytime testing. The objective daytime testing had two parts: performance testing in the morning and afternoon and the MSLT. Of the various performance tests used during these studies, a four-part card-sorting task (9) was the most frequently used and is included here to represent daytime performance.

The MSLT protocol involved at least five 20 min opportunities to fall asleep per day (every 2 h). The starting hour for the MSLT varied between studies, ranging from 0800 to 1000 h (usually 0900 h). Thus, insomniacs with earlier arising times generally had a longer wait to their first sleep latency test (this variable "delay" is discussed below). For each 20 min test, subjects were lying in bed and were asked to close their eyes, to relax, and to try to fall asleep, while monopolar EEG (central and occipital) and EOG were recorded. A sleep latency test (SLT) was terminated after 2 min of sleep or after 20 min if no sleep was observed. Each SLT was scored from lights out to the first 30 s epoch of any sleep stage or was scored as 20 if no sleep occurred. Immediately before each SLT, the subject self-rated sleepiness at that moment on the 7-point Stanford Sleepiness Scale (SSS), in which 1 = most alert (20). The mean value of the first five sleep latency tests and the mean of the first five SSS summarize these two measures for each subject.

RESULTS

Because the insomniac group differed in mean age and sex composition from the noncomplaining group, a subset from each group was matched for age (29, SD 5 years) and sex (39.5% male). Overall mean values for both groups and subgroups are compared in Tables 1–3. Statistical comparisons were computed for the matched groups only. To partially control for repeated comparisons, we used 0.01 as the level of statistical significance. Table 4 gives Spearman rank correlations between the mean daytime sleep latency and certain other variables of interest.

Daytime sleepiness (Table 1)

The insomniac group had no greater daytime sleep tendency than normal sleepers when matched for age and sex. Of special interest are those persons with no measurable daytime sleep tendency (MSLT mean = 20 min), who comprise 14% of the insomniac group but only 2% of the normal group. When compared with insomniacs whose MSLT mean fell in the range of 5–17 min, these "nonsleepy" insomniacs evidenced no significant differences in nocturnal sleep, performance, subjective sleepiness, morning mood, or MMPI measures (all $p > 0.05$, *t* tests). Also, the distribution of ASDC categories in this group is closely similar to that of the entire group.

TABLE 1. *Measures of daytime function—means and standard deviations (SD)*

	Chronic insomniac volunteers						Noncomplaining subjects					
	Complete group			Matched subgroup			Matched subgroup			Complete group		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
SLT 1	138	13.8	6.4	38	13.4	7.0	38	15.5	6.0	89	13.3	6.6
2	138	12.7	6.5	38	12.4	6.6	38	13.7	6.7	89	11.1	6.5
3	138	11.5	6.5	38	11.5	6.0	38	12.5	6.7	89	10.7	6.2
4	138	11.1	7.0	38	12.4	6.8	38	10.6	6.7	89	8.4	6.1
5	138	12.9	7.0	38	13.8	6.8	38	12.1	6.8	89	10.9	6.5
Mean daily MSLT	138	12.4	5.4	38	12.7	5.2	38	12.9	5.3	89	10.9	5.0
SSS 1	137	3.4	1.5	38	3.7	1.3	37	3.1	1.3	78	3.3	1.3
2	137	3.1	1.4	38	3.1	1.3	37	3.0	1.4	80	3.1	1.3
3	137	3.0	1.4	38	3.3	1.5	37	2.6	1.2	80	2.7	1.2
4	136	3.1	1.3	38	3.3	1.1	37	3.1	1.5	80	3.3	1.5
5	137	3.1	1.4	38	3.3	1.3	37	2.8	1.5	76	2.9	1.4
Mean daily SSS	137	3.2	1.3	38	3.3	0.8	37	2.9	1.1	80	3.1	1.1
Card-sorting speed (s)												
Sort by suit (a.m.)	105	34.2	7.0	38	31.8	5.8	36	30.2	6.3	78	31.0	6.1
Sort by value (a.m.)	105	43.3	10.2	38	39.6	8.1	36	35.6	5.4	78	37.5	6.9
Deal 4 piles (a.m.)	105	21.6	4.9	38	20.5	4.0	36	19.6	3.2	78	19.9	3.5
Deal 10 piles (a.m.)	105	22.6	4.7	38	21.6	4.1	36	20.0	2.9	78	20.6	3.7
Sort by suit (p.m.)	105	34.1	7.9	38	31.2	7.0	36	29.3	6.1	79	30.5	6.5
Sort by value (p.m.)	105	43.4	10.6	38	38.2	8.2	36	34.7	6.2	79	37.1	8.0
Deal 4 piles (p.m.)	105	21.3	5.0	38	19.8	4.1	36	18.6	2.8	79	19.1	3.4
Deal 10 piles (p.m.)	105	22.0	4.8	38	20.6	3.9	36	19.1	2.4	79	19.7	3.2

MSLT, Multiple Sleep Latency Test; SLT, sleep latency test; SSS, Stanford Sleepiness Scale.
For matched subgroups, all comparisons are nonsignificant ($p > 0.01$, 2-tailed t test).

The greatest sleep tendency occurred in the midafternoon tests for both insomniacs [F (4,132) = 3.67, $p < 0.01$] and normals [F (4,83) = 6.61, $p < 0.0001$). Sleep tendency did not significantly vary between the three diagnostic subgroups of insomniacs.

Subjective sleepiness did not parallel the MSLT. Indeed, across the five sleep latency tests, both the between-subject and the average within-subject Spearman correlation of objective sleep latency and subjective sleepiness was not significantly different from zero for both groups.

Performance (Table 1)

The most difficult part of the card-sorting task was sorting by value. For normal subjects (but not insomniacs), slower card sorting on this part of the task was associated with shorter daytime sleep latencies (Table 4)—these correlations being greatest for the sleep latency tests closest in time to the card-sorting task.

Mood and personality (Table 2)

Generally, insomniacs reported slightly greater mood disturbance in the morning Profile of Mood States (POMS) and evidenced slightly more psychopathology on two scales of

TABLE 2. *Measures of personality and morning mood*

	Chronic insomniac volunteers						Noncomplaining subjects					
	Complete group			Matched subgroup			Matched subgroup			Complete group		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
POMS (a.m.)												
Fatigue	113	6.2	6.7	36	6.6	6.2	37	3.9	4.5	80	3.7	4.2
Depression	113	3.1	5.6	36	2.3	3.6	37	1.2	1.9	80	1.3	2.1
Anger/hostility	113	2.1	4.7	36	3.2	5.9	37	1.2	2.2	80	1.4	2.5
Tension/anxiety	113	0.9	3.9	36	1.1	3.8	37	−0.7	2.8	80	−0.6	2.7
Vigor	113	12.7	7.7	36	9.5	6.5	37	11.7	7.8	80	13.6	7.2
Total mood disturbance	113	0.8	23.0	36	5.2	19.3	37	−5.9	16.9	80	−8.0	15.0
MMPI scales												
L	52	49.3	8.1	29	48.1	7.8	27	45.5	5.7	45	44.6	5.9
F	52	56.1	8.4	29	56.5	8.7	27	53.8	10.2	45	52.2	9.0
K	52	55.1	7.8	29	54.3	8.1	27	56.5	8.8	45	56.8	8.0
Hypochondriasis	52	54.1	9.0	29	53.3	7.6	27	47.8	9.2	45	48.9	8.9
Depression	52	58.4	10.4	29	56.8	9.8	27	53.0	8.1	45	51.6	7.7
Hysteria	52	59.5	7.8	29	59.2	7.2	27	55.5	8.5	45	56.4	7.5
Psychopathic deviate	52	59.8	8.6	29	61.1	8.0	27	59.7	8.8	45	58.2	10.4
Paranoia	52	59.9	9.1	29	61.1	6.7	27	57.7	6.8	45	57.6	6.2
Psychasthenia	52	58.8	9.1	29	59.9	7.7	27	55.1	6.8	45	55.0	7.8
Schizophrenia	52	57.1	8.7	29	57.4	7.4	27	58.1	8.7	45	57.6	9.4
Hypomania	52	61.7	11.8	29	65.2	10.7	27	61.6	11.1	45	61.3	10.2
Number of scales > 70	52	1.1	1.5	29	1.0	1.1	27	0.8	1.5	45	0.7	1.5

For matched subgroups, all comparisons are nonsignificant ($p > 0.01$, 2-tailed t test).
MMPI, Minnesota Multiphasic Personality Inventory; POMS, Profile of Mood States.

the MMPI, but none of these differences reached the 0.01 level of significance. Neither mood nor personality variables correlated with the MSLT. Of note, especially, was the lack of correlation for both insomniacs and normals between the morning POMS tension/anxiety scale and subsequent SLT.

Nocturnal sleep (Table 3)

Insomniacs generally slept worse than normals. As these data include only a single night per subject, conclusions about "typical" sleep for insomniacs are not warranted. However, the discrepancy between subjective and objective total sleep time was similar to that reported by Carskadon et al. (14), and, as they also reported, the lower the reported total sleep time, the greater the magnitude of the discrepancy (rho = -0.68, $p < 0.0001$). Surprisingly, better sleep efficiency was associated with *greater* daytime sleep tendency in both groups (Table 4).

Further analysis

The subgroup of insomniacs that was compared with normals differed considerably in age from the entire group. Therefore, the A9b group was selected as an alternative comparison group. Comparing this group (mean age = 41, SD 17 years, 16% male) with the combined A1b + A5 groups (mean age = 51, SD 16 years, 34% male), we found no significant differences on any measure of daytime sleepiness, mood, personality, performance, subjective assessments of sleep, or TRT (all $p > 0.05$, 2-tailed t tests). The A9b group slept better according to every objective polysomnographic variable listed in Table

TABLE 3. *Nocturnal sleep*

	Chronic insomniac volunteers						Noncomplaining subjects					
	Complete group			Matched subgroup			Matched subgroup			Complete group		
	n	Mean	SD	n	Mean	SD	n	Mean	SD	n	Mean	SD
Recording time[a]	137	489.6	49.9	38	465.7	38.6	38	489.9	27.2	82	487.2	21.4
Total sleep time[b]	137	401.8	60.0	38	402.8	50.5	38	445.8	42.4	82	448.9	35.3
Sleep efficiency	137	82.3	11.1	38	86.3	9.0	38	91.0	6.6	82	92.1	5.7
Stage 1 (%)	136	11.6	6.3	38	9.0	5.0	38	7.1	3.0	81	7.7	3.3
Stage 1 (min)	136	45.3	25.4	38	34.9	18.5	38	30.8	12.9	81	33.7	14.5
Number of awakenings	130	14.0	9.0	37	12.6	8.5	38	12.9	9.3	82	12.5	8.6
Stage 1 latency[a]	136	23.0	35.0	38	28.3	33.1	38	12.2	8.0	82	11.2	10.3
Stage 2 latency[a]	136	28.6	36.5	38	32.2	33.3	38	17.1	9.5	81	15.8	11.3
Subjective TST[b]	134	352.8	82.7	37	352.2	94.9	37	441.2	44.7	80	433.1	51.6
Subjective SL	135	52.6	56.5	38	54.4	77.0	37	33.5	38.2	80	28.1	31.3
Lights on to SLT 1	129	114.5	53.4	37	114.5	45.0	37	83.3	26.9	77	84.2	26.6
TST discrepancy	133	49.4	77.2	37	51.9	94.2	37	6.0	45.9	72	15.2	48.7
SL discrepancy	134	23.9	52.4	38	22.2	79.6	37	16.2	34.4	71	13.2	27.4

Times are given in minutes. Sleep efficiency, 100 × (total sleep/recording time); awakening, at least 15 s of wake interrupting sleep; SL, sleep latency; SL discrepancy, subjective SL − latency to stage 2; TST, total sleep time; TST discrepancy, objective TST − subjective TST.
For matched sample, [a]$p < 0.01$, [b]$p < 0.001$ (2-tailed *t* test).

3 ($p < 0.01$, 2-tailed *t* tests) except TRT. Key variables of the three groups are compared in Table 5.

DISCUSSION

The complaint of chronic poor sleep in insomniacs as a group was not generally associated with an increased tendency to fall asleep the next day, compared with either age- and sex-matched noncomplaining sleepers or the subgroup having no objective findings. Thus, despite the fact that insomniacs slept significantly worse than normals, sleep tendency during the day was about the same in both groups.

Our volunteers appear to have been selected in a manner comparable to the "insomniac" and "normal" groups reported on by Stepanski et al. (21), although on the average their normal subjects were older and their insomniac subjects were younger than our corresponding groups. Nonetheless, they also reported no significant differences in the mean MSLT scores of their insomniac volunteers and normals. Two other recent reports (22,23), although based on patient populations, also found that chronic insomniacs classified as either A1b or A9b or (in 22) A5 did not seem to have significantly elevated MMPI scales. This would appear to support the statement by Zorick et al. that "Although psychological evaluation is an important part of the workup of the patient with insomnia, overgeneralization from the psychological profiles of some patients with insomnia may lead to the erroneous conclusion that all people with the complaint of insomnia are psychologically distressed" (22).

Several findings are consistent with the idea that the MSLT allows the objective assessment of sleep tendency without significant bias due to subjective alertness and mood or personality traits. (a) In both groups daytime sleep tendency was not correlated either with the MMPI or with tension/anxiety and other moods assessed in the morning. The possibility of nonlinear correlations or a lack of sufficient variability in some of the measures (e.g., POMS tension/anxiety), however, leaves open to debate the extent to which mood affects objective sleep tendency. (b) In normals speed of card sorting was inversely correlated with

TABLE 4. *Spearman correlations of MSLT mean with other variables*

	Insomniacs		Noncomplaining	
Variable	rho	n	rho	n
SSS mean	–0.15	137	–0.02	78
Card sorting				
Sort by value (a.m.)	–0.01	105	–0.33[a]	78
Sort by value (p.m.)	0.01	105	–0.29[a]	78
POMS (a.m.)				
Fatigue	0.08	113	0.10	80
Depression	0.02	113	0.01	80
Anger/hostility	–0.01	113	0.01	80
Tension/anxiety	0.10	113	0.02	80
Vigor	–0.15	113	–0.04	80
Total mood disturbance	0.09	113	0.10	80
MMPI scales				
L	–0.06	52	0.08	45
F	0.05	52	0.14	45
K	0.03	52	0.26	45
Hypochondriasis	0.02	52	–0.01	45
Depression	0.10	52	0.23	45
Hysteria	0.03	52	0.15	45
Psychopathic deviate	0.12	52	0.21	45
Paranoia	–0.05	52	0.04	45
Psychasthenia	0.15	52	0.05	45
Schizophrenia	0.05	52	0.30	45
Hypomania	0.09	52	0.01	45
Nocturnal sleep				
Total recording time	0.17	137	0.02	81
Total sleep time	–0.07	137	–0.23[a]	81
Sleep efficiency	–0.25[a]	137	–0.29[a]	81
Total stage 1 (min)	–0.13	136	0.00	80
Total stage 1 (%)	–0.07	136	0.05	80
Number of awakenings > 15 s	0.01	130	0.09	81
Sleep latency to stage 1	0.36[b]	136	0.31[b]	80
Sleep latency to stage 2	0.31[b]	136	0.41[b]	80
Subjective sleep latency	0.25[a]	135	0.10	80
Subjective total sleep time	–0.10	134	0.06	80
Minutes from awakening to first sleep latency test	–0.18	129	–0.20	77
Age	0.02	137	0.28[a]	89

MMPI, Minnesota Multiphasic Personality Inventory; MSLT, Multiple Sleep Latency Test; POMS, Profile of Mood States; SSS, Stanford Sleepiness Scale.
[a] $p < 0.01$.
[b] $p < 0.001$.

sleep tendency. Although the relation between alertness (as measured by performance testing) and sleep tendency is not clearly understood, certainly sleep tendency would be expected to undermine performance, and one would expect this inverse correlation. Subjective sleepiness, however, which showed no correlation with MSLT for either group, is highly dependent on the context of various drives and behaviors present when it is assessed. (c) There is a reliable pattern for both groups to show greatest sleep tendency in the midafternoon. This well-known effect may indicate that the circadian rhythm of sleep tendency in humans is biphasic (24).

With respect to these findings, the most important aspect of the MSLT method is that sleep latency be measured in a quiet, dark, neutral situation, isolating it from other mo-

TABLE 5. *Comparison of ASDC insomnia subgroups*

	Insomnia classification								
	A5			A1b			A9b		
	n	Mean	SD	n	Mean	SD	n	Mean	SD
Mean daily MSLT	32	13.5	5.4	87	12.2	5.4	19	11.6	5.2
Mean daily SSS	32	3.0	1.3	86	3.3	1.0	19	2.9	1.0
POMS:									
Total mood disturbance	23	−7.7	18.7	71	3.6	24.5	19	0.7	20.1
MMPI: Number of scales > 70	7	0.9	0.9	34	1.1	1.6	11	1.0	1.8
Recording time in bed	32	494.7	43.9	86	488.6	50.6	19	485.5	57.3
Total sleep time	32	380.3	61.9	86	396.1	52.5	19	463.7	50.4
Sleep efficiency	32	77.0	11.2	86	81.3	10.0	19	95.4	2.5
Stage 1 (%)	32	14.6	6.8	85	11.4	5.9	19	7.1	4.2
Stage 1 (min)	32	54.9	27.1	85	44.4	24.8	19	32.9	19.5
Number of awakenings	31	17.8	9.7	80	13.8	8.7	19	8.3	6.2
Stage 1 latency	32	27.0	47.9	85	25.0	32.5	19	7.4	4.8
Stage 2 latency	32	34.3	49.4	85	30.2	33.9	19	11.7	8.1
TST discrepancy	31	46.8	67.8	84	44.1	70.4	18	78.8	113.3
SL discrepancy	31	26.3	46.0	84	18.8	31.8	19	42.5	107.7
Age (years)	32	58.1	9.7	87	48.9	16.9	19	41.5	17.3
Male (%)	32	43.8	50.4	87	29.9	46.0	19	15.8	37.5

See Table 3 for definitions of sleep variables.
ASDC, Association of Sleep Disorders Centers; MMPI, Minnesota Multiphasic Personality Inventory; MSLT, Multiple Sleep Latency Test; POMS, Profile of Mood States; SSS, Stanford Sleepiness Scale.

mentary drives and distractions. Thus, although manifest sleep tendency may be masked by concurrent drives and behavior, the underlying sleep tendency is unmasked in neutral or nondemanding situations.

A remarkable finding was that better sleep was associated with *greater* daytime sleep tendency in both groups, although this accounted for only approximately 6 and 9% of the variance. A methodological difficulty must be mentioned in this context. A shorter TRT tended to favor a higher sleep efficiency and to result in a longer "delay" from the time of awakening to the first SLT. Both of these factors may have influenced sleep tendency (Table 4), especially on the morning SLT. A partial correlation, however, between sleep efficiency and subsequent daytime sleep tendency—controlling for the morning "delay"—remained significant for both groups. The meaning of this between-subject correlation is difficult to assess without knowing comparable within-subject correlations but raises the possibility that sleep tendency has both "state" and "trait" aspects (12).

It is the consensus of researchers in this area that little progress can be made in understanding chronic insomnia until a reliable differential diagnostic procedure is available (25). This in turn presupposes reliable—preferably objective—measures of the circadian physiology of sleep. We have found that 14% of the chronic insomniac group have no sleep tendency during the day (MSLT mean = 20 min) even though their nocturnal sleep is just as poor as those insomniacs with greater daytime sleep tendency (e.g., total sleep = 403 versus 401 min). Possibly, these "nonsleepy" insomniacs are simply short sleepers who, for some reason, feel they need more sleep. Another possibility is that their lack of daytime sleepiness constitutes an abnormal response to chronic partial sleep loss and thus may reflect a basic pathophysiological aspect of their disorder. One test of this latter possibility would be to compare various control groups with nonsleepy chronic insomniacs during controlled sleep deprivation.

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