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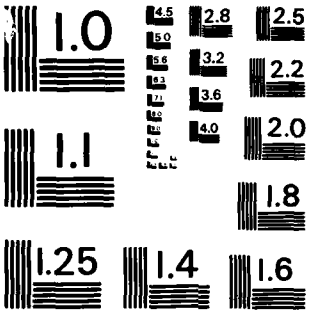

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"DISQUALIFIED" AND "QUALIFIED" POOR SLEEPERS: SUBJECTIVE AND OBJECTIVE VARIABLES

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"DISQUALIFIED" AND "QUALIFIED" POOR SLEEPERS: SUBJECTIVE AND OBJECTIVE VARIABLES

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SUMMARY

Sleep laboratory studies of patients complaining of insomnia have demonstrated discrepancies between subjective reports and EEG-recorded measures. In our research studies on sleeping aids, 60% of the self-described poor sleepers who reported usual sleep latencies of at least 45 minutes did not meet the laboratory qualification criterion of a 30-minute or longer sleep latency. To better predict who would qualify for our studies, we compared 30 laboratory-qualified poor sleepers (QPSs) with 30 laboratory-disqualified poor sleepers (DPSs) on subjective report, mood, and all-night sleep laboratory variables.

QPSs had significantly lower sleep efficiency and total sleep time in the laboratory, but these differences were due to the longer sleep latency (50.7±27.8 minutes versus 15.2±6.1 minutes) of the QPS group. QPSs and DPSs differed significantly in their morning estimate of their laboratory sleep latency: as a group, QPSs gave an accurate estimate (51.6±27.8 minutes), while DPSs were significantly more likely to exaggerate their sleep latency. While we did not identify ways of predicting which poor sleepers would show sleep onset insomnia in the sleep laboratory, we did find that in this young, healthy population, there are poor sleepers who give an accurate report of a rather severe sleep onset insomnia.

INTRODUCTION

Sleep-onset insomnia, having difficulty falling asleep, is a common sleep problem. In sleep laboratory studies, polysomnographic evaluations of patients complaining of insomnia have demonstrated discrepancies between subjective reports and EEG-recorded sleep measures. Self-described insomniacs have been found to overestimate sleep latency and underestimate total sleep time (1-4). Overall, good sleepers have been reported to estimate sleep latency more accurately (4,5), although some groups of normal sleepers have been shown both to overestimate (6,7) and underestimate (3) the time it takes to fall asleep. The generally accepted conclusion that insomniacs tend to exaggerate their sleep problem is a consideration in the clinical management of insomnia, especially when objective sleep data from polysomnographic evaluations are not available. The discrepancy between self-report and sleep laboratory measures may also raise subject selection questions in research studies on insomniacs.

In some cases, patients referred for sleep lab evaluation and treatment have a sleep complaint, "insomnia", but no sleep problem can be demonstrated by EEG recordings. In 1972, Dement (8) noted that as many as 50% of the primary insomniacs seen at the Stanford Sleep Disorders Center did not show prolonged sleep latencies and/or reduced total sleep time. Such patients have been referred to as "pseudoinsomniacs" as opposed to "idiopathic insomniacs" in whom a sleep problem of unknown origin can be documented (8). Other terms in the literature include the "experiential" insomniac versus the "objective" insomniac (9). The *Diagnostic Classification* of Sleep and Arousal Disorders (10) includes the Disorder of Initiating and Maintaining Sleep (DIMS) category A.9.b., "subjective DIMS complaint without objective findings". Not all self-reported insomniacs who sleep well in the sleep laboratory are pseudoinsomniacs, however: some patients, probably those having what was previously called "conditioned" or "learned" insomnia (11) and now referred to as A.1.b., "psychophysiological DIMS, persistent" (10), are known to sleep better in a novel environment, but these patients, unlike the subjective DIMS patients, are aware that their sleep quality has improved in the sleep lab.

In our previous research on sleeping aids (12,13), we utilized questionnaire responses and laboratory polysomnography to select sleep-onset insomniacs for participation. On the Naval Health Research Center (NHRC) Sleep Questionnaire, potential subjects identified themselves as "poor" or "very poor" sleepers, reported a usual sleep latency of at least 45 minutes, and indicated that they had "trouble falling asleep" for over 6 months. In the laboratory, only those subjects showing an EEG-recorded sleep latency of 30 minutes or longer "qualified" as sleep-onset insomniacs for our studies. Approximately 60% of our self-described poor sleepers did not meet the laboratory criterion. To better understand poor sleepers and predict who would qualify for participation in our

studies, we looked for differences between laboratory-qualified poor sleepers who took 30 minutes or more to fall asleep in the sleep laboratory and laboratory-disqualified poor sleepers, those taking less than 30 minutes to fall asleep in the sleep lab.

METHODS

Subjects were 30 laboratory-qualified poor sleepers (QPSs) (age 20.5±2.6) and 30 laboratory-disqualified poor sleepers (DPSs) (age 19.7±2.8). Subjects were male students at the Naval School of Health Sciences, San Diego. Subjects completed the NHRC Sleep Questionnaire, the Profile of Mood States (POMS), and a short Medical Screening Questionnaire prior to the all-night sleep recording. In the laboratory, bedtime was 2200-0530, and sleep EEGs were recorded and scored for sleep stages according to usual procedures (14). Pre-sleep heart rate (HR) was calculated by counting heart beats on the polygraphic record, obtaining 1-minute samples every 2 minutes from the time of lights out (LO) to Stage 2 onset. Spindle rate and delta rate during sleep were obtained according to procedures described previously (15,16). Following the morning awakening, subjects were asked to estimate their laboratory sleep latency and evaluate their nighttime sleep by responding to our Morning Questionnaire.

Group mean differences were tested through use of between-groups t-tests or, when category data were being evaluated, by Chi square analysis. Other procedures used for specific variables are described in the results section.

RESULTS

Sleep Latency: Table 1 summarizes the sleep latency data from the Sleep Questionnaires, sleep laboratory EEG recordings, and Morning Questionnaires for the DPS and QPS groups.

TABLE 1. *Sleep Latency Data (minutes)*

	QPS $\bar{X}$ (±SD)	DPS $\bar{X}$ (±SD)	p≤
"Usual sleep latency" (from Sleep Questionnaire)	90.5 (42.0)	76.5 (24.3)	ns
Laboratory sleep latency[a]	50.7 (27.8)	15.2 (6.1)	.0005
Morning estimate of laboratory sleep latency	51.6 (27.8)	35.3 (15.9)	.01

[a]Time, in minutes, from lights out to Stage 2 onset.

There were no significant differences between the two groups on the Sleep Questionnaire latencies, but they differed significantly on both the EEG-recorded latencies and subjectively reported latencies on the Morning Questionnaire. The QPS EEG mean sleep latency, 50.7 minutes, was over three times that of the DPS mean latency, 15.2 minutes. The QPS subjective estimate of sleep latency was significantly longer than the DPS estimate, 51.6 minutes versus 35.3 minutes, but the discrepancy between the subjective and EEG-recorded latencies was dramatically different for the two groups. The data in Table 1 indicate that the mean EEG-recorded and subjective estimates of sleep latencies differed by only 1 minute for the QPS group. In contrast, the difference between the two mean sleep latencies for the DPS group was 20 minutes. As shown in Table 2, when the subjects were categorized with respect to whether they overestimated, underestimated, or accurately estimated their laboratory sleep latency in their morning reports, the two groups differed significantly (X^2=10.12, df=2, P<.01). Nearly twice as many DPSs as QPSs overestimated their EEG sleep latency. Just the reverse was true for accurate estimation of EEG sleep latency.

TABLE 2. *Categorization of Morning Estimates of Sleep Latency*

	Overestimate	Underestimate	Accurate[a]
QPS	12 (17.8)[b]	10 (6.1)	8 (6.1)
DPS[c]	23 (17.2)	2 (5.9)	4 (5.9)

[a]Morning estimates were categorized as "accurate" if they were within ±5 minutes of the EEG-measured latency.

[b]Expected frequencies for the X^2 analysis given in parentheses.

[c]For DPS, N = 29 for this measure, because one subject did not give an estimate.

DPSs and QPSs did not differ in their morning estimates of total sleep time or number of awakenings. For both variables, the objective measures were not significantly different from subjective reports.

Sleep EEG: Analysis of EEG-recorded sleep data indicated that, after having fallen asleep, the two groups had similar sleep stage percentages, awake time after sleep onset, and number of awakenings (Table 3). QPSs had significantly lower sleep efficiency and total sleep time, but these differences were due to the longer laboratory sleep latency of the group. Spindle rate and delta rate during sleep did not differ between the two groups.

TABLE 3. *Sleep Measures*

Variable	QPS $\bar{X}$ ($\pm$SD)	DPS $\bar{X}$ ($\pm$SD)	p$\leq$
Sleep latency (min)	50.65 (27.81)	15.23 (6.06)	0.0005
Total sleep time (min)	366.92 (36.82)	411.02 (24.96)	0.0005
Total bed time (min)	446.72 (4.47)	445.05 (10.41)	ns
Sleep efficiency	82.12 (7.99)	92.33 (4.80)	0.0005
Stage wake %[a]	12.15 (7.46)	3.73 (3.51)	0.0005
Movement time %	1.45 (0.97)	0.95 (0.77)	0.05
Stage 1 %	4.29 (2.49)	2.99 (1.75)	0.05
Stage 2 %	55.38 (8.19)	58.69 (8.76)	ns
Stage 3 %	10.08 (3.32)	10.86 (5.17)	ns
Stage 4%	6.54 (6.55)	5.19 (6.22)	ns
Slow wave sleep %	16.62 (6.49)	16.35 (8.43)	ns
REM %	28.00 (6.14)	25.25 (5.27)	0.1
Awake time after sleep onset (min)	10.55 (13.38)	6.25 (13.19)	ns
Number of awakenings	2.30 (2.14)	1.70 (2.81)	ns

[a]Includes pre-sleep awake time.

Heart Rate: There were no differences in heart rate (HR) (bpm) at LO or at sleep onset, and average pre-sleep HR did not differ between the two groups. The plot of HR data for the period from LO to sleep onset suggested that heart rate decellerated more rapidly in the DPS group. However, slopes for the two groups were not significantly different, probably because of the wide intersubject variability in both HR and sleep latencies.

Sleep Questionnaires and POMS: Sleep Questionnaire responses did not differ between the two groups. POMS subscale scores were not significantly different, but there was a trend in the QPS group toward higher mean scores on Depression (raw score $\bar{X}_{QPS}$=11.6 versus $\bar{X}_{DPS}$=7.6) and Anger (raw score $\bar{X}_{QPS}$=6.2 versus $\bar{X}_{DPS}$=3.6). The QPSs also had a higher but not significantly higher Total Mood Disturbance score ($\bar{X}_{QPS}$=34.9 versus $\bar{X}_{DPS}$=23.8).

Medical Screening Questionnaire: In this young and healthy male sample, few medical illnesses and little use of medication were reported on the Medical Screening Questionnaire. However, DPSs were more likely to smoke cigarettes (X^2=7.16, df=1, p<.01) and to rate their overall health quality as "fair" or "average" compared to QPSs who were more likely to rate their health as "good" or "excellent" (X^2=13.96, df=3, p<.01).

DISCUSSION

Numerous studies (1-4) have reported that insomniacs overestimate their difficulty in going to sleep and underestimate their actual sleep time. These reports have led to a widespread belief that all insomniacs fit this pattern. The results of this study indicate that such a generalization is unwarranted. Only those insomniacs who did not meet our EEG sleep latency criterion overestimated their sleep onset difficulties. Those subjects whose EEG sleep latencies were longer than 30 minutes were more likely to underestimate or accurately report sleep latency than to overestimate it. Thus, the QPSs are good judges of the time it takes them to fall asleep. It is the DPSs, once called the pseudoinsomniacs, who are the poorer judges.

Hauri and Olmstead (17) have recently compared subjective reports of sleep latency with three EEG-measures, the time from LO to: (a) Stage 2 onset; (b) the first 15 minutes of uninterrupted Stage 2; and (c) the first 30 minutes of uninterrupted Stage 2. They found that, for four diagnostic categories of insomnia (without objective findings; psychophysiological; medical; and depressed), the subjective report of sleep latency was most consistent with the 15-minute EEG measure. These results are similar to our findings with DPSs, whose mean subjective estimate lagged behind the Stage 2 onset measure by 20.1 minutes. However, our QPSs, who are primarily psychophysiological insomniacs, gave a mean estimate most closely related to the Stage 2 onset criterion.

Do these DPS and QPS subjects differ in any meaningful way and can they be differentiated without a sleep laboratory recording? In this study, we looked at a number of subjective variables reflecting self-reported sleep quality, mood, and health, and found few significant differences. Several studies have contrasted good and poor sleepers, and differences have been found on psychological sleep questionnaires and physiological measures. Monroe (4), Church and Johnson (16), and Freedman and Sattler (19) reported higher pre-sleep HR in their poor sleepers when contrasted with good sleepers. We found no differences in HR between our QPSs and DPSs. In an extensive discriminant analysis study, we were consistently effective in identifying good and poor sleepers using Sleep Questionnaire responses and POMS scores (20). However, we were unable to significantly differentiate the QPSs from DPSs in any of the groups evaluated. The pattern when good sleepers were contrasted with subjective poor sleepers was exactly the same as that found when our good sleepers were contrasted with EEG-qualified poor sleepers. Thus, as in this study, except for the differences in sleep latency, our disqualified and qualified poor sleepers were homogenous, and both groups appear to differ from good sleepers.

The type of subjective estimates of sleep latency given by our DPS group indicates that this group is composed primarily of individuals who would be classified as having a "subjective DIMS complaint without objective findings" (10). The

implications of having a sleep problem which cannot be objectively measured are unclear. Some possible reasons for the disparity between subjective reports and objective measures in patients having "subjective DIMS without objective findings" have been listed. These include excessive mentation contributing to the "sense" of being awake, undiagnosed physiological sleep abnormalities, inaccurate time estimation, or a hypochondriacal obsession with sleep (10, p. 56). Our results do not suggest that physiological abnormalities exist in the sleep of the DPSs, although it is, of course, possible to argue that subtle differences escaped our recording techniques Our findings show that, aside from the sleep measures influenced by the longer sleep latencies in QPSs, subjects did not differ significantly on any sleep measure. Further, there were no differences between the two groups on all-night quantitative measures of spindle rate per minute or number of delta waves. In addition, pre-sleep HR did not differ significantly. Physiologically, these two groups were similar from our data.

The finding that our DPSs tended to rate their overall health lower than QPSs, even though objective medical data showed both were equally healthy, adds some support to the hypochondriacal hypothesis raised in the Diagnostic Classification of Sleep and Arousal Disorders (10). This hypothesis states that the reported sleep symptoms may represent the sleep analogue of hypochondriasis or somatic delusions. Whatever the reasons for the discrepancy between the subjective sleep report and objective finding, it would be an error to assume that these patients do not have problems. We have previously reported that poor sleepers are less effective sailors than good sleepers followed for 5 years in their Navy careers (20). In that longitudinal study, however, DPSs and QPSs were not considered separately. Recently, Sugerman et al. (21) studied the daytime sleepiness and performance of subjective and objective insomniacs. Their data suggested that the subjective DIMS subjects showed a tendency toward lower daytime arousal levels and performed more poorly on a daytime auditory vigilance test. Since, after going to sleep, the sleep of both the subjective DIMS patient and the DPS subject cannot be discriminated from that of good sleepers, these measurable deficits in daytime performance must not be related to poor sleep quality. At the present time, the data suggest these problems lie in the psychological rather than the physiological area.

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

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