

- Green HS, Kane JM (1983): The Dexamethasone Suppression Test in depression. *Clin Neuropharmacol* 6:7-24.
- Guillard A, Fenelon G (1983): Maladie de Parkinson et syndromes parkinsoniens. *Encycl Med Chir Paris Neurol* 17062 A<sup>10</sup>.
- Hamilton M (1960): A rating scale for depression. *J Neurol Neurosurg Psychiatry* 23:56-62.
- Hillhouse EW, Burden J, Jones MT (1975): The effect of various putative neurotransmitters on the release of corticotrophin releasing hormone from the hypothalamus of the rat in vitro. I. The effect of acetylcholine and noradrenaline. *Neuroendocrinology* 17:1-11.
- Hoehn MM, Yahr MD (1967): Parkinsonism: Onset, progression, and mortality. *Neurology* 17:427-442.
- Lamberts SWJ, Klijn JGM, de Quijada M, Timmermans HAT, Uitterlinden P, de Jong FH, Birkenhäger JC (1980): The mechanism of the suppressive action of bromocriptine on adrenocorticotrophin secretion in patients with Cushing's disease and Nelson's syndrome. *J Clin Endocrinol Metab* 51:307-311.
- Mayeux R, Stern Y, Rosen J, Leventhal J (1981): Depression, intellectual impairment, and Parkinson's disease. *Neurology* 31:645-650.
- Mayeux R, Stern Y, Cote L, Williams JBW (1984): Altered serotonin metabolism in depressed patients with Parkinson's disease. *Neurology* 34:642-646.
- van Loon GR, Hilger L, King AB, Boryczka AT, Ganon WF (1971): Inhibitory effect of 1-dihydroxyphenylalanine on the adrenal venous 17-hydroxycorticosteroid response to surgical stress in dogs. *Endocrinology* 88:1404-1414.
- Warburton JW (1967): Depressive symptoms in Parkinson patients referred for thalamotomy. *J Neurol Neurosurg Psychiatry* 30:368-370.

## The Influence of Daytime Naps on the Therapeutic Effect of Sleep Deprivation

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### Introduction

The antidepressant effect of total sleep deprivation has been noted by several observers (Gerner et al. 1979; Gillin 1983). It has also been reported that in some cases, even a short nap on the day following sleep deprivation can provoke a mood setback, or even a marked exac-

erbation of depression in patients who had improved (Pflug and Tölle 1971; Pflug 1972; Knowles et al. 1979; Roy-Byrne et al. 1984). These anecdotal accounts, however, have thus far not been systematically repeated in an experimental manner.

Beyond its clinical importance, the possible reversal of the benefits of sleep deprivation by a short nap carries some interesting theoretical implications. Stated simply, the depressiogenic sleep theory declares that sleep may induce depression and that sleep deprivation relieves it. The additional hypothesis has been advanced

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that the depressiogenic effect of sleep might be specifically due to rapid eye movement (REM) sleep. This hypothesis can be inferred from the antidepressant effect of selective REM sleep deprivation (Vogel et al. 1975, 1980) and from the fact that almost all antidepressant drugs suppress REM sleep (Chen 1979).

In the present preliminary study, we examined the effect of a daytime nap subsequent to total sleep deprivation on the psychopathology of depressive patients. We were especially interested in the relationship between the occurrence of REM sleep during naps and mood deterioration.

## Methods

Twelve patients (eight women, four men) with a major depressive disorder were included in the study, eight of whom were classified as "endogenous subtype" according to Research Diagnostic Criteria (RDC). The mean age of the patients was  $40.7 \pm 14.2$  years, and the mean baseline score in the 21-item Hamilton Depression Scale was  $26.52 \pm 6.84$ . All patients were free from antidepressant medication for at least 8 days prior to the first night of sleep deprivation and for the duration of the whole study period. A drug-free interval of 7 days has been found to be sufficient to exclude significant medication effects on nocturnal sleep (Berger et al. 1983).

After the washout period, two adaptation nights in the sleep laboratory were arranged. These were followed by one night of total sleep deprivation. Next day, the patients were asked to take a nap in the sleep laboratory at 1:00 PM, during which a sleep electroencephalogram (EEG) was recorded. This procedure was repeated 1 week later. The two procedures differed only with respect to the time of termination of the nap: a "REM nap" was terminated by an awakening after the first REM episode and a "non-REM nap" by waking the patient up immediately when an REM episode occurred. Those patients who woke up spontaneously without having had an REM episode were included in the latter group. The sequence of both procedures was randomized and was blind to patient

and rater. In two patients, there was an additional repetition, with naps terminated by spontaneous awakenings. Mood changes during sleep deprivation and naps were scored by means of the 6-item version of the Hamilton Depression Scale (Bech et al. 1975). Efficacy of the sleep deprivation was arbitrarily defined as a decrease of at least 30% in the score of the Hamilton Scale. "Mood change" during nap was defined as an increase of at least 2 points. Self-ratings were performed using the Adjective Mood Scale (AMS) (von Zerssen 1986).

## Results

Twelve patients underwent a total of 23 sleep deprivations with succeeding naps. Only 3 of them responded repeatedly to deprivations. As this number was too small for intraindividual comparisons of REM naps versus non-REM naps, we confine ourselves to a cumulative description. As the data are partially interdependent (due to the repetition of the sleep deprivation procedure), statistical analysis has to be restricted to selected basic descriptive parameters.

Twelve responses and 11 nonresponses to sleep deprivation occurred. In the cases of non-response, a subsequent nap, in general, had no apparent effect on mood. In the cases of response, six exhibited a relapse of depressive symptomatology after a nap (Figure 1). There was a high correlation (0.88) between observer-rated mood changes and patients' self-ratings of changes according to the AMS. In five of six naps that led to a worsening of mood, REM sleep appeared. In the six naps that had no effect on mood, REM sleep was either not present or was seen in a very rudimentary form only (1.5 min or less). There was, however, a difference in mean nap sleep time between those cases who felt worse ( $119.67 \pm 39.2$  min) as opposed to those who did not show mood change ( $61.8 \pm 33.2$  min). There was no obvious difference in other nap sleep parameters or in the baseline psychopathology. We found no indication of age and gender effects, but a definite statement is not possible because of the limitations of statistical analysis mentioned above.

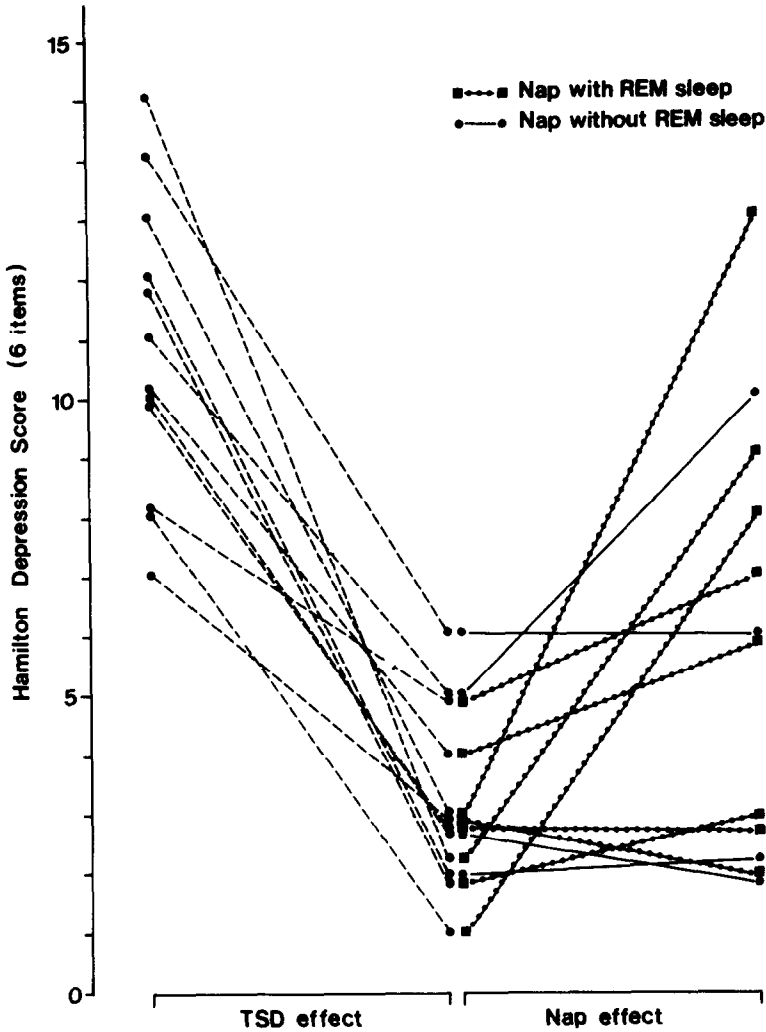


Figure 1. The effect of a nap (1:00 PM) on mood following successful sleep deprivation therapy.

### Discussion

These results support the hypothesis that sleep may have a potentially depressiogenic effect in depressed patients. A short sleep episode after one night of sleep deprivation can reverse a mood improvement and can cause a marked relapse into depression, going well beyond the slight temporary discomfort that might result from being awakened. In contrast, a mood decline is not observed in healthy subjects, who exhibit a res-

toration of mood after a nap following sleep deprivation (Taub et al. 1976; Naitoh 1981). This favors the hypothesis that the depressiogenic effect of sleep is specific to depressive patients. However, nothing has yet been reported about the effect of naps in depressive patients without previous sleep deprivation.

Our data point to the role of REM sleep as a crucial factor involved in mood deterioration. Nevertheless, a definite conclusion about this

role cannot yet be drawn, as the effect of nap sleep time could not be differentiated from that of the occurrence of REM sleep. Further studies are needed to clarify this problem.

## References

- Bech P, Gram LF, Dein E, Jacobsen O, Vitger J, Bolwig TG (1975): Quantitative rating of depressive states. *Acta Psychiatr Scand* 51:161-170.
- Berger M, Lund R, Bronisch T, von Zerssen D (1983): REM latency in neurotic and endogenous depression and the cholinergic REM induction test. *Psychiatry Res* 10:113-123.
- Chen CN (1979): Sleep, depression and antidepressants. *Br J Psychiatry* 135:385-402.
- Gerner RH, Post RM, Gillin JC, Bunney WE (1979): Biological and behavioral effects of one night's sleep deprivation in depressed patients and normals. *J Psychiatr Res* 15:21-40.
- Gillin JC (1983): The sleep therapies of depression. *Prog Neuropsychopharmacol Biol Psychiatry* 7:351-364.
- Knowles JB, Southmayd SE, Delva N, MacLean AW, Cairns J, Letemendia FJ (1979): Five variations of sleep deprivation in a depressed woman. *Br J Psychiatry* 135:403-410.
- Naitoh P (1981): Circadian cycles and restorative power of naps. In Johnson LC, Tepas DI, Colquhoun WP, Colligan MP (eds), *Biological Rhythms, Sleep and Shift Work*. New York: Spectrum, pp 553-580.
- Pflug B (1972): Über den Schlafentzug in der ambulanten Therapie endogener Depression. *Nervenarzt* 43:614-622.
- Pflug B, Tölle R (1971): Therapie endogener Depressionen durch Schlafentzug. *Nervenarzt* 42:117-124.
- Roy-Byrne PR, Uhde TW, Post RM (1984): Anti-depressant effects of one night's sleep deprivation: Clinical and theoretical implications. In Post RM, Ballenger JC (eds), *Neurobiology of the Mood Disorders*. Baltimore: Williams & Wilkins, pp 817-835.
- Taub JM, Tanguay PE, Clarkson D (1976): Effects of daytime naps on performance and mood in a college student population. *J Abnorm Psychol* 85:210-217.
- Vogel GW, Thurmond A, Gibbons P, Sloan K, Boyd M, Walker M (1975): REM sleep reduction effects on depression syndromes. *Arch Gen Psychiatry* 32:765-777.
- Vogel GW, Vogel F, McAbee RS, Thurmond AJ (1980): Improvement of depression by REM sleep deprivation. *Arch Gen Psychiatry* 37:247-253.
- von Zerssen D (1986): Clinical Self-Rating Scales (CSRS) of the Munich Psychiatric Information System (PSYCHIS München). In Sartorius N, Ban TA (eds), *Assessment of Depression*. Berlin: Springer, pp 270-303.