THE EFFECT OF THE TRANSCENDENTAL MEDITATION PROGRAM ON COMPENSATORY PARADOXICAL SLEEP

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Subjects practicing the Transcendental Meditation technique showed faster recovery from sleep deprivation. — EDITORS

Subjects in control and experimental groups (N = 5 for each group) were deprived of one night's sleep and, as an index of recovery, were tested for paradoxical (REM) sleep on the two following nights. The experimental groups practiced the Transcendental Meditation technique for 20 minutes twice a day, and the control group sat with eyes closed and rested for the same period. Meditators showed a much lower total amount of paradoxical sleep on both nights following sleep deprivation and returned to their predeprivation level on the second recovery night, indicating a rapid elimination of fatigue through the practice of Transcendental Meditation.

INTRODUCTION

The most marked effects of sleep deprivation are (not surprisingly) "unconquerable sleepiness," exhaustion, and extreme muscular weakness. Kleitman has suggested that along with other behavioral and perceptual effects, these "suggest a fatigue of the higher levels of the cerebral cortex—the levels that are responsible for the critical analysis of incoming impulses and the elaboration of adequate responses of one's previous experience" (6).

It is claimed that the Transcendental Meditation (TM) technique produces within a few minutes a state of deep relaxation described as follows:

It can be said that awareness depends upon the state of the nervous system. When the nervous system is active in the waking state, the mind has no opportunity to dissociate itself from the surrounding world; when the nervous system is tired the mind has no chance to use its conscious capacity, and awareness is lost in deep sleep. If the nervous system could be brought to a state where it could hold the mind so that it neither uses its conscious capacity to experience an outer object nor yet completely loses its awareness—that is, if the mind could simply remain conscious without being conscious of anything in the outer world—it would attain a state of pure awareness where it is neither active nor passive. This pure awareness is the state of Being (7).

Thus, one might expect Transcendental Meditation to relieve effectively just that fatigue which, according to Kleitman, results from sleep deprivation. After a few months, many who practice Transcendental Meditation require less sleep. It should be noted, however, that Transcendental Meditation, while complementing sleep and ensuring periods of deeper rest, is not a substitute for sleep.

Another effect of sleep deprivation is an increase in paradoxical sleep (associated with dreaming) during a recovery night. Paradoxical sleep is a qualitatively distinct sleep state characterized by fast cortical EEG activity (a sign of wakefulness) coupled with muscular atony (a sign of deep sleep) and rapid eye movements. It is a natural reaction to stress and fatigue by the body's self-regulating physiological and psychological mechanisms. Dement and Fisher (3) and Berger and Oswald (1) demonstrated that following periods of prolonged sleep deprivation there is increased compensatory dreaming during subsequent recovery nights. These considerations led to the hypothesis that sleep-deprived meditators, gaining relief from fatigue through Transcendental Meditation, would show less compensatory paradoxical sleep stage than controls during subsequent recovery nights. The aim of the present study was, therefore, to investigate the effect of Transcendental Meditation on paradoxical sleep stage increases resulting from sleep loss.

METHOD

SUBJECTS—All subjects were unpaid male and female university undergraduates 18-25 years of age and in good health. The meditation group, composed of five subjects, was randomly selected from 12 volunteers at a weekly advanced meeting of the TM program. The nonmeditation group (also five subjects) was randomly selected from 19 volunteers. All meditators had been practicing TM regu-
larly for a period of five to seven months, while the nonmeditators had not used any type of Yoga techniques, other meditation practices, or biofeedback control during the same time period.

APPARATUS—Equipment included a Beckman RS portable polygraph, an Air Precision "collecteur tournant," an electrode junction box, and a Hunter electronic timer. The purpose of the collecteur tournant was to prevent electrodes from being pulled off by movement of the subject, while the junction box made cross-overs available if one recording electrode did become detached during the night, thereby facilitating recording without interrupting the subject's sleep. Using appropriate couplers, three physiological indices were measured: frontal electroencephalogram (EEG), rapid eye movement (REM), and electromyogram (EMG). Beckman biopotential skin electrodes were attached to the appropriate areas on the scalp as outlined in the International 10–20 system (5). The electrodes were held in place by adhesive collars. The lead wires passed through a flexible tube attached to a collecteur tournant above and behind the subject's head and then passed to recording equipment in another room.

PROCEDURE

Data for each subject were recorded for five sleeping nights (see table 1). The first two nights for all subjects were regarded as acclimatization sessions and consequently were not scored. The third full night's sleep provided the predeprivation record and was followed by a sleep deprivation session that totaled 40 hours, starting at the time the subjects woke up after the third night's sleep. The next two nights of sleep were termed Recovery Nights I and II. All recordings were taken during the same time period each night (approximately 12:00 midnight to 8:00 A.M.).

Throughout the experimental period the meditators practiced TM for 20 min twice daily. The nonmeditators had a corresponding period of sitting quietly with closed eyes for 20 min twice daily.

Each subject was asked to come to the recording room (a comfortable, quiet room, furnished to resemble a bedroom) an hour before the recording session. During this hour the subject prepared him/herself for bed, the electrodes were placed, the equipment (in another room) was checked to ensure a good recording, and the subject rested quietly until he/she fell asleep. Since each subject entered sleep at a different time, the recording session lasted for eight hours after the onset of slow-wave sleep and in all cases was terminated by 9:00 A.M.

The total time of paradoxical sleep in minutes per subject per night was recorded following the procedure outlined in Rechtschaffen and Kales (9). The statistical significance of the results was determined by using the Scheffé procedure.

RESULTS

Figure 1 and table 2 present the mean time and percentage of increase of paradoxical sleep for each group per night. The nonmeditation group showed a 25.3 percent increase in paradoxical sleep during Recovery Night I compared with the predeprivation night. The meditation group, by contrast, showed only a 13.1 percent increase in paradoxical sleep. The corresponding values for Recovery Night II are 9.2 percent (nonmeditators) and 4.2 percent (meditators).

Mean time of paradoxical sleep did not differ significantly for meditators and nonmeditators on the predeprivation night (table 3). The meditators exhibited significantly less compensatory paradoxical sleep than nonmeditators on both recovery nights. By the second recovery night the meditators had returned to a normal amount of paradoxical sleep (insignificantly different from the predeprivation night), whereas the nonmeditators still required a significantly greater amount of paradoxical sleep than on the predeprivation night.

Neither the meditators nor the nonmeditators fell asleep during meditation/relaxation periods on the days after sleep deprivation, despite the experimenter's expectation that some subjects, especially the nonmeditators, would sleep during these periods.

DISCUSSION

The statistical analysis of the results (table 3) shows that both groups required significantly more paradoxical sleep on Recovery Night I than on the predeprivation night. This result is consistent with previous findings (3, 8). The compensatory paradoxical sleep for the nonmeditation group was lower in minutes and in percentage of increase over predeprivation paradoxical sleep than that reported for subjects in Dement's study (2). This difference is probably due to the differences in procedure,
as Dement used three to seven consecutive nights of paradoxical sleep curtailment, while this study used only 40 hours of total sleep curtailment. Since the amount of compensatory paradoxical sleep is somewhat dependent upon the time and type of deprivation (4), the data on the nonmeditation group appear to be consistent with previous findings.

The amount of paradoxical sleep for meditators and nonmeditators on the predeprivation night was not significantly different; yet the compensatory paradoxical sleep required by the meditation group on both recovery nights was significantly less than that required by the nonmeditation group. This result indicates that the premise of the study was validated—that meditators, gaining more relief from fatigue through Transcendental Meditation than those not practicing the technique, would demonstrate less compensatory paradoxical sleep.

Figure 1 further illustrates that the meditation group returned to almost the same mean time for paradoxical sleep on the second recovery night as was recorded before deprivation. This indicates that the meditators had fully

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FIG. 1. RECOVERY FROM SLEEP DEPRIVATION. The mean total paradoxical sleep per night is shown for meditators and nonmeditating controls for the night before a 40-hour sleep deprivation session and for the first two nights after sleep deprivation. Lower values indicate less compensatory paradoxical sleep.
recovered by Recovery Night II and required no more compensatory paradoxical sleep. The nonmeditators, however, still needed significantly more paradoxical sleep on the second recovery night than on the predeprivation night. Thus, Transcendental Meditation seems to stabilize the sleep-dream cycle by reducing the effect of any disruption to this cycle and thereby restores the system more quickly to its normal level of functioning.

The argument that meditators needed less compensatory paradoxical sleep because they had two extra periods of rest during the day is not valid because the nonmeditating controls also rested with eyes closed for 20 min twice daily. As subjects of neither group fell asleep during the meditation/relaxation periods, these periods cannot be regarded as extra sleep sessions that would affect the amount of compensatory paradoxical sleep needed.

Since this study was conducted with a small sample and used a relatively short deprivation period, it is recommended that any further study use more subjects, a longer deprivation period, and be conducted over a longer period of time. In such a study normal sleep could be monitored, and the effects of sleep deprivation could be determined more accurately. Future studies should also consider the length of time a subject has been meditating, as this variable might affect the subject’s dreaming and paradoxical sleep patterns.

REFERENCES