

“Consciousness” During Sleep in a TM Practitioner: Heart Rate, Respiration and Eye Movement.

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Reports of consciousness during dreaming or lucid dreaming have been verified by having the dreamer signal from the dream that he/she is dreaming with a prearranged set of distinctive lateral eye movements (LaBerge, 1985). This basic methodology has subsequently been replicated in other sleep laboratories. Relatedly, a continuation of consciousness from the waking state into the sleep state is claimed to be a key aspect of the experience of "Transcendental Consciousness", which is developed by the practice of Transcendental Meditation (TM; Banquet & Sailhan, 1974).

Research suggests that a distinctive psychophysiological state of restful alertness, referred to as Transcendental Consciousness, may be produced during subperiods of practice of the Transcendental Meditation (TM) program (e.g., Orme-Johnson & Haynes, 1981). In this state, the subject-object relationship is said to be transcended, including all representation structures; knower, known and process of knowing converge in one unified field of pure (content-free) consciousness. Reported episodes of Transcendental Consciousness (button press are highly correlated with bilateral and homolateral alpha and theta EEG coherence and with apparent periods of respiratory suspension for 15-60 seconds duration and lower heart rate (e.g., Farrow & Herbert, 1982). Vedic psychology (Maharishi, 1969; Alexander et al., in press) predicts that repeated experience of the least excited state of Transcendental Consciousness during TM can give rise to a stable higher stage of consciousness in which pure consciousness is maintained as a silent, uninvolved "witness" to the changing states of waking, dreaming and sleeping. In contrast "lucid dreaming" is associated with an increase in autonomic arousal indices suggesting an increase in active cognitive processing (LaBerge, 1985). It is predicted that the temporary experience of restfully alert, Transcendental Consciousness can be stably maintained as a higher stage of consciousness throughout the 24 hour waking, dreaming and sleeping cycle.

Methodology

This study investigated the electrophysiological correlates of sleep and dreaming in a single advanced practitioner of TM who reported maintaining the experience of "Transcendental Consciousness" throughout the 24 hour cycle. This 28 year old male had been meditating for 5.8 years and received one of the highest scores thus far recorded on an inventory designed to assess self reports of the attainment of higher states of consciousness (Stage of Consciousness Inventory, SCI; Alexander, Davis, Dillbeck, Dixon, Oetzel & Muehlman, in press). Further, he received low scores on the SCI scales which assess psychopathology and tendency to endorse misleading, grandiose sounding statements. During TM practice he displayed exceptionally high amplitude alpha spindles across all EEG channels and periods of respiratory suspension (Kesterson, 1985).

As noted the state produced by TM practice is characterized by low levels of autonomic arousal (Orme-Johnson & Haynes, 1981). Since the possibly related state of "lucid dreaming" is associated with increased autonomic arousal (LaBerge, Levitan & Dement, 1986), we addressed the question of whether experiences of "Transcendental Consciousness" signaled by eye-movements during sleep would show physiological correlates distinct from lucid dreaming.

The TM subject (TMS) and three others, two who reported frequent by experiencing lucid dreams and one who had never had a lucid dream, were studied in a sleep laboratory for 2 to 7 nights. Standard polysomnograms (EEG, EOG, and EMG as well as pulse and respiration) were recorded. Only eye movement, heart rate and respiration data will be reported here.

Results

Initially we looked at REM differences between this TM lucid dreamer and two dreamers who reported frequently experiencing lucidity, were able to accomplish the eyemovement signaling task at home but not during their two nights in the sleep laboratory (LDS) and one dreamer who reported never having had a lucid dream and was unable to do the signaling task at home when instructed to try (NLDS). The resulting one way analyses of variance on all three dependent variables were significant (eye movement, $F(2,993)=60.68$, $p<.00001$; heart rate, $F(2,784)=295.409$, $p<.00001$; respiration, $F(2,787)=185.37$, $p<.00001$). The Duncan's a-postori test showed, as expected by the low arousal model for Transcendental Consciousness, the TMS's heart rate and respiration were significantly lower than the LDS or the NLDS (mean heart rate/minute, TMS = 7.14, LDS = 7.32, NLDS = 9.11). However, for eye movement density, the picture was less clear. That is, the LDS's had significantly higher eye movement density per 30 second epoch (mean = 6.07) than either the NLDS (mean = 2.69) or the TMS (mean = 2.20) who did not differ.

To determine if there were any REM differences as a function of the different demand characteristics associated with the REM episodes of the TMS, we also looked at four types of REM episodes from this TM lucid dreamer and compared them to the REM episodes of the other two dreamer types. Specifically, we compared eye movement density, hear rate and respiration rate within the REM episodes of the two lucid dreamers (Group 6, Table 1) to those of the non-lucid dreamer (Group 5) and to four different types of REM episodes from the TM subject. These included REM epochs after he signaled (Group 4) and before he signaled (Group 3). Group 2 consisted of REM episodes where he did not signal nor was he instructed to signal and, finally, Group 1 consisted of REM episodes where he did not signal but he had been instructed to signal. As before, these one way analyses of variance were significant for all three dependent variables (eye movement $F(5,993)=25.47$, $p<.00001$; heart rate $F(5,784)=118.054$, $p<.00001$; respiration $F(5,787)=77.60$, $p<.00001$). The means and a-postori results are given in Table 1.

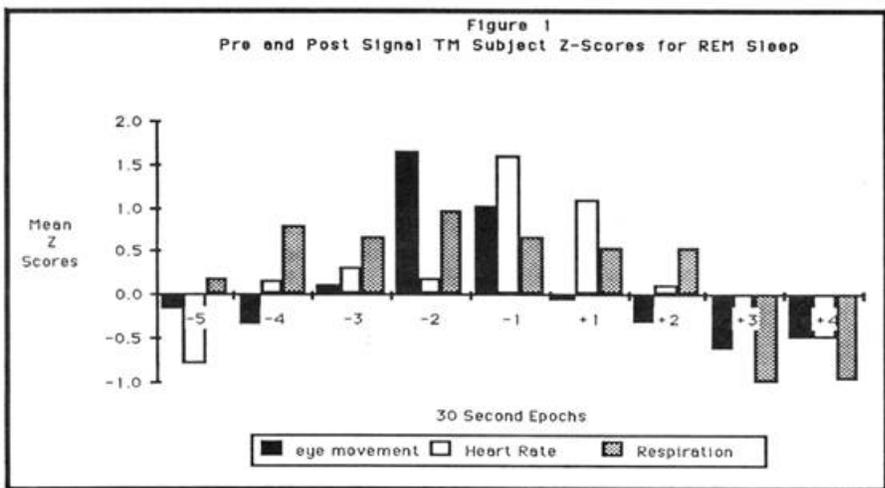
The results of these analyses are clearest for heart rate. That is, across types of REM and types of people the TM subject showed significantly slower heart rates. The picture is less clear for eye-movement density and respiration. For the former the significance was clearly accounted for by the high eye movement density of the lucid dreamers who did not signal in the laboratory but who were instructed to do so. For respiration, the non-lucid dreamer showed higher rates than the others. This is surprising if one assumes an arousal model as an individual predisposition for lucidity to occur (Snyder & Gackenbach, in press).

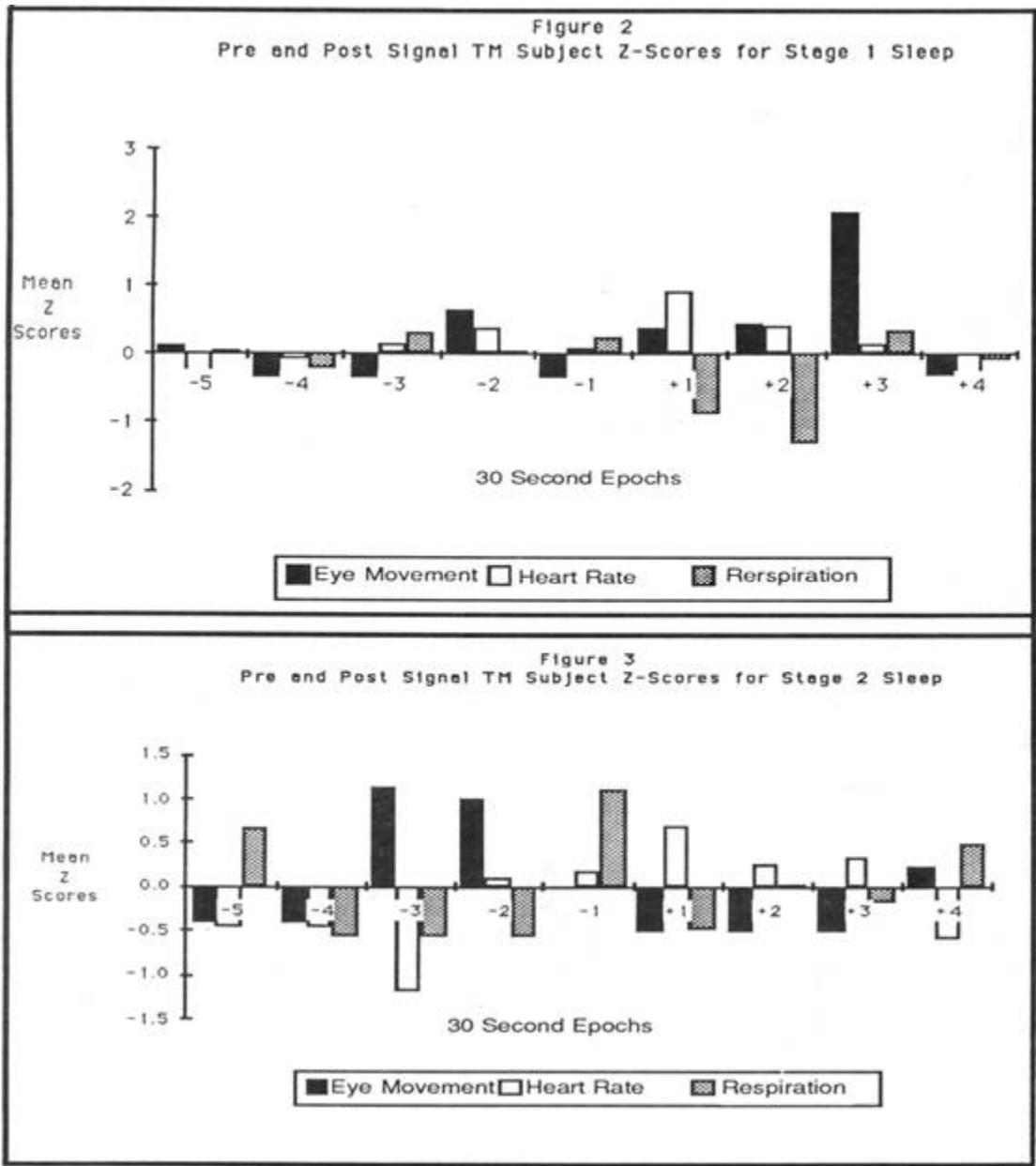
Table 1
Mean REM Eye Movement, Heart Rate and Respiration
for TM Lucid, Lucid and Nonlucid Subjects

Group	Eye movement/30 sec.	Heart rate/min.	Respiration/30 sec.
1. TM subject; No signal; Signal instructions	1.98 ¹ _a	51.00 _a	7.56 _b
2. TM subject; No signal; No signal instructions	2.04 _a	50.84 _a	7.06 _a
3. TM subject; Yes signal; Presignal epochs	3.25 _a	52.00 _a	7.33 _{ab}
4. TM subject; Yes signal; Post signal epochs	3.94 _{ab}	51.76 _a	7.40 _{ab}
5. Nonlucid subject; No signal; No signal instructions	2.69 _a	57.40 _b	9.11 _c
6. Lucid subjects; No signals; Signal instructions	6.07 _b	67.62 _c	7.32 _{ab}

1. Means with different letters within a column differ at the .05 level using the Duncan a-postori test.

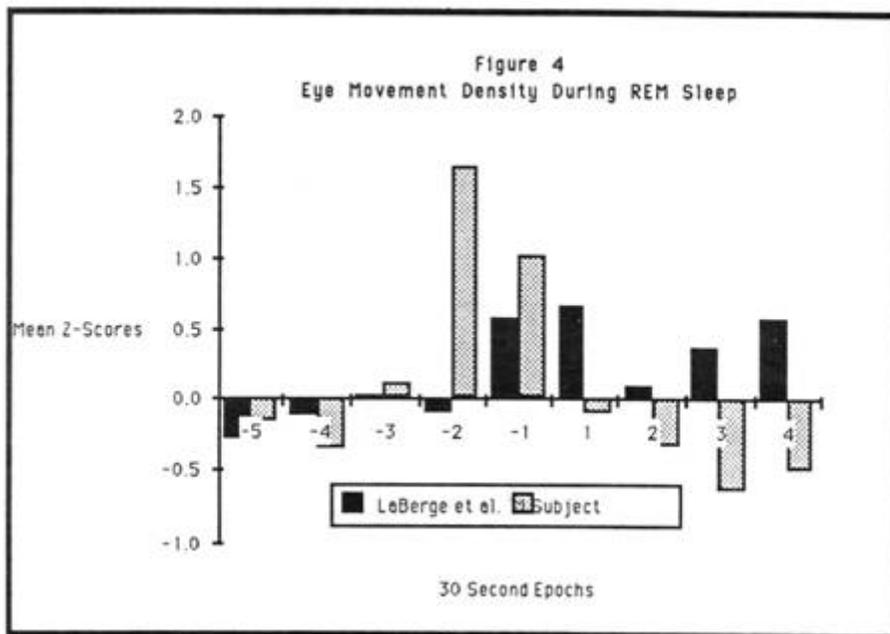
Next, following LaBerge et al, mean Z-scores per 30 second epoches counting from the prearranged eye movement signals were computed for REM density, heart rate and respiration rate. The TM subject maintained that he had been continuously “conscious”; the signals represent the times he “remembered to signal.” T-tests comparing, on the average, 10 epoches following the signal to, on the average, 30 epoches preceding the signal were computed on each dependent variable for each stage in which he signaled. These data are illustrated in bar graphs where z-scores from just prior to and just after the signal are graphed for all three dependent variable occurring during REM, Stage 1 and Stage 2 (see Figures 1, 2 and 3).

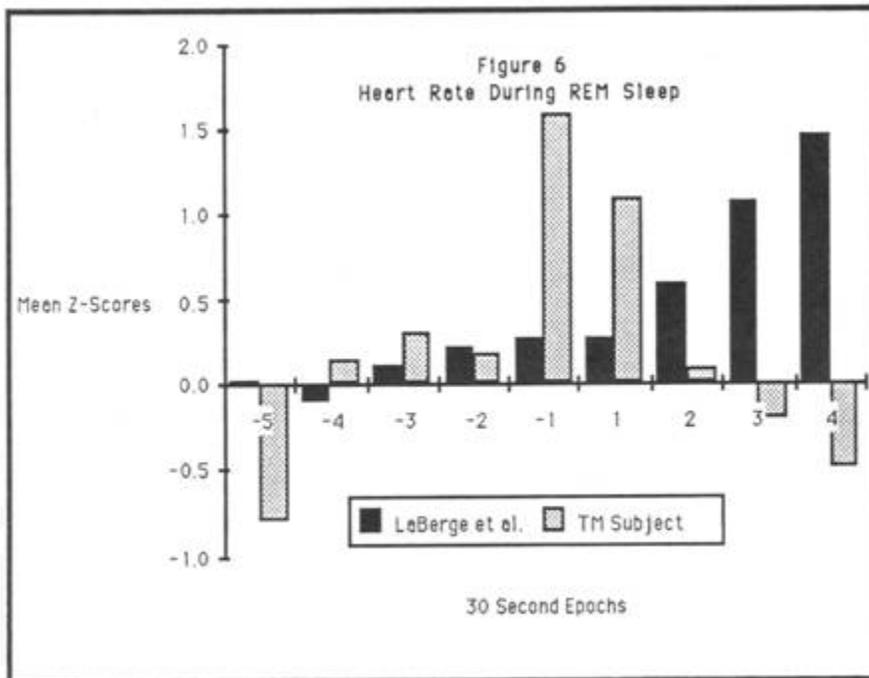
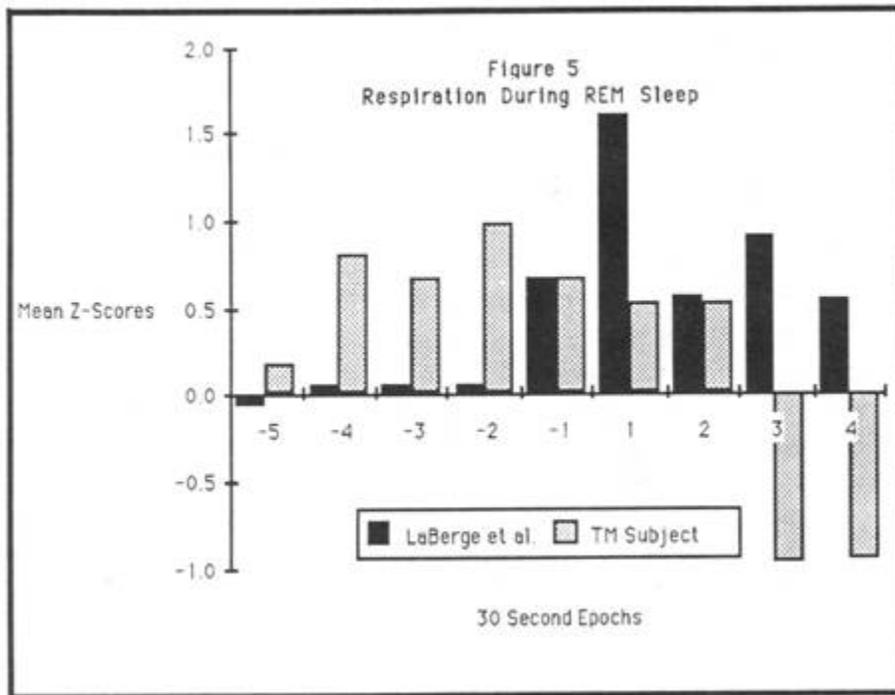


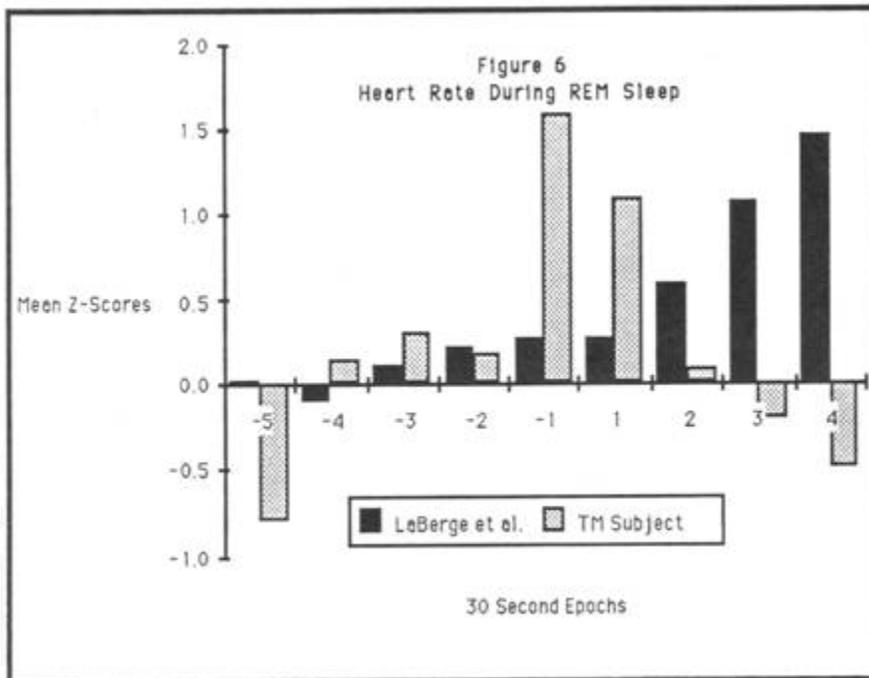
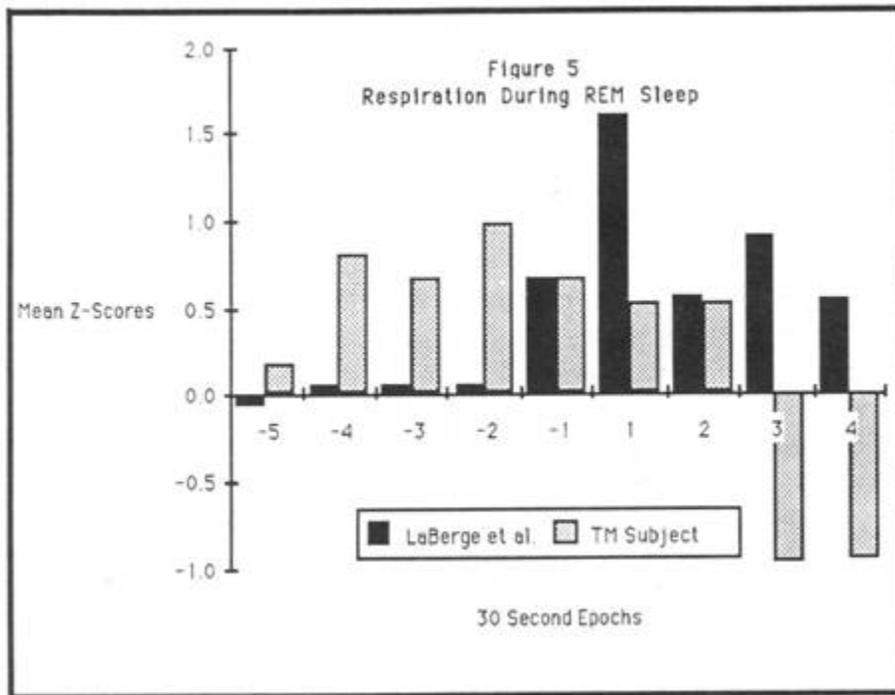


Again, as predicted with the lower arousal model for Transcendental Consciousness attained through Transcendental Meditation, no significant pre-post signal differences were found for any of the dependent variables from stages 2 or REM. However, for stage 1 eye movement ($t(79)=-2.85, p<.006$; see Figure 1) and respiration ($t(92)=2.03, p<.04$; see Figure 2) showed significant pre-post signal differences. Eye movement density went up after the signal (mean pre=-0.14, mean post=0.62) while respiration went down (mean pre=.10, mean post=-.40). If you look at the bar graph of Figure 1 you can see that the eye movement finding is probably an artifact of the high density of one epoch. The low respiration finding was consistent with the low arousal model.

Figures 4, 5, and 6 portray the z-scores from LaBerge et al.'s REM normative data and the TMS's REM data from signaled epochs. With regards to stage REM, as per LaBerge et al, eye movement density (Figure 4) and heart rate (Figure 6) showed elevated levels just prior to and/or just after the signal. It should be noted that the 30 second epoch just prior to the signal is considered part of the signaling process as generally one must think about signaling before one does it. Where these figures differ from those reported by LaBerge et al is that this subject seemed to recover more quickly from the momentary "arousal" caused by the signaling.







Discussion

Interpretation of these data is speculative as it involves only one TMS. However, with this limitation in mind, one could say that just as the experience of Transcendental Consciousness during Transcendental Meditation tends to be associated

with a lower state of arousal so to the reported experience of Transcendental Consciousness during sleep tended to be associated with a lower level of arousal than during lucid or nonlucid dreaming in other subjects. The finding that the TMS was able to voluntarily signal from REM, Stage 1, and Stage 2 indicates that this deep state of restfulness was combined with an inner state of alertness or wakefulness. Further, these findings suggest that the restfully alert state of Transcendental Consciousness was only momentarily disrupted during the signaling task and then quickly returned to the low arousal, silent, wakeful condition. In contrast, lucid dreaming appears to involve a high arousal active state of information processing that corresponds to and is maintained after the signal and apparently during the remainder of the lucid dreaming period.

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