

## **EEG CORRELATES OF CONSCIOUSNESS DURING SLEEP: A PILOT STUDY**

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*EDITORS NOTE: The following is an abstract of a pilot study posted in the corollary sessions at the Lucidity Association's Conference on Higher States of Consciousness, in Chicago in July, 1990.*

Vedic psychology, as presented by Maharishi Mahesh Yogi, delineates seven major states of consciousness (Maharishi, 1972). The daily cycle of waking, dreaming, and sleeping constitute the three ordinary changing states of consciousness. In addition, Maharishi's Vedic psychology describes an invariant sequence of higher stages of consciousness. The fourth state of consciousness, termed transcendental consciousness (TC), is characterized as a content-free state of "restful alertness", the ultimate ground state of the mind, pure consciousness (Maharishi, 1969). In this state "... awareness becomes completely 'self-referral' -- consciousness has nothing other than itself in its structure" (Maharishi, 1986, p. 27). Maharishi describes TC as follows:

This is a state of inner wakefulness with no object of thought or perception, just pure consciousness [TC], aware of its own unbounded nature. It is wholeness, aware of itself, [Self-awareness] devoid of differences, beyond the division of subject and object -- transcendental consciousness (Maharishi, 1977, p. 123).

TC is held to be as distinct from the ordinary waking state as waking is from dreaming or sleeping. Recent research reviews have identified over twenty physiological correlates distinguishing TC from simple relaxation, sleeping, dreaming and waking (See Alexander and Boyer, 1989; Alexander, Cranson, Boyer and Orme-Johnson, 1986; Wallace, 1986; for a complete review).

The distinguishing EEG characteristic of TC appears to be "non-descending theta" [theta/alpha] which is unlike the low-voltage mixed frequency of Stage 1 sleep (Pagano & Warrenburg, 1983; Wallace, 1970). Travis (1989), analyzing single frequency bands, found peaks at 8.5 Hz in the theta/alpha range for EEG power and coherence during meditation. This EEG activity in the theta/alpha range has also been seen during periods of respiratory suspension during TM and is correlated with the subjective experience of TC (Farrow and Hebert, 1982; Kesterson and Clinch, 1989). Taken collectively, these physiological parameters suggest a simultaneous

increase in alertness and decrease of arousal indicative of a distinct state of "restful alertness".

According to Vedic psychology, experience of the fourth state of consciousness, TC, provides the basis for the growth of higher states of consciousness. When TC is permanently maintained along with waking, dreaming, and sleeping, this state is called the fifth state of consciousness, cosmic consciousness (CC), the first of three HSC. The term "cosmic" is used because experience in this state is inclusive of the usual activity of waking, dreaming, and sleeping, along with the inner silence of TC. This experience of TC along with waking, dreaming and sleeping activity in CC is referred to as "witnessing" because the Self functions as a silent, uninvolved observer to all activity. The most stringent test for CC is witnessing in sleep, the maintenance of Self-awareness during deep sleep. It is the most stringent test of stabilization of CC, because two very contrasting states of consciousness and physiological functioning must be maintained simultaneously -- the inner Self-awareness of TC even during the inertia characteristic of deep sleep.

## **Method and Results**

We conducted a pilot study on the EEG of three TM subjects (Ss) reporting witnessing during sleep. EEG was recorded from C3-A2 and C4-A1; EOG, EMG, heart rate and respiration were recorded according to standard protocol (Rechtschaffen and Kales, 1968). One S was studied for three nights - an adaptation night and two baseline nights - and two Ss for one night only. Their EEG tracings showed extended periods in which the theta/alpha activity, typically seen during TC in meditation, was superimposed over the EEG of sleep: i.e., theta/alpha waves were riding the slow delta waves of Stage 3 and Stage 4 sleep. Also, there were extended periods (up to five minutes) of alpha/theta spindling activity between sleep cycles.

Preliminary computerized period amplitude analysis of the first sleep cycle of one subject showed, in comparison to age-matched normative data, four times the normal amplitude of theta/alpha activity and comparable levels of delta amplitude activity.

## **Future Study**

Based upon the encouraging pilot data, we propose the following experiment. Since witnessing of sleep is the hallmark of HSC in Maharishi's Vedic Psychology, we will compare the EEG sleep patterns of three groups of healthy Ss cross-sectionally: eight advanced TM Ss reporting experiences of witnessing sleep; eight non-meditating controls matched for age, gender, and diet; and eight TM Ss not reporting witnessing matched for age, gender, diet, and number of months' practice of

the TM and TM-Sidhi techniques. In addition, Ss in the witnessing group will act as its own control: unclear nights with less reported time witnessing will be compared to clear nights with more reported witnessing. We predict that the EEG pattern of TC will be superimposed over the EEG of each sleep cycle and will also be found between sleep cycles in Ss reporting experiences of witnessing. It is expected that this pattern will be seen to a lesser degree in the meditating group not reporting witnessing during sleep and least in the non-meditating group.

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