

Transcendental consciousness wakes up in dreaming and deep sleep

Commentary on “The neurobiology of consciousness: Lucid dreaming wakes up” by J. Allan Hobson

Lynne I. Mason & David W. Orme-Johnson

Maharishi University of Management, USA

Summary. Researchers present evidence in support of a model of consciousness that includes lucid dreaming, witnessing/transcendental consciousness during dreaming and witnessing/transcendental consciousness during deep sleep. Due to the potential for confusion between subjective reports of lucid dreaming and witnessing dreaming or witnessing sleep the authors suggest researchers screen for them all. The authors review electrophysiological findings in the night sleep of subjects reporting a peaceful inner awareness- witnessing/transcendental consciousness during dreaming and deep sleep and the implications for lucid dreaming research. Findings included EEG tracings of theta alpha (7-9 Hz) simultaneously with delta during deep sleep stages 3 and 4, decreased chin EMG, and highly significant increased theta2 and alpha1 relative power during stage 3 and 4 sleep as compared to controls. The authors discuss alpha synchrony during witnessing deep sleep and gamma during lucid dreaming.

1. Models of Consciousness

Hobson (2009) highlights the contribution of lucid dreaming research to the field of consciousness study. Hobson (2009) also sites a lack of paradigms and theoretical models of consciousness to advance lucid dreaming research. However in addition to Hobson's AIM model (Hobson, Pace-Schott & Stickgold, 2000), there exists discussions of developmental models of consciousness that include lucid dreaming, witnessing waking, witnessing dreaming and witnessing deep sleep that have previously been presented (Alexander et al., 1985; Alexander, 1988; Alexander et al., 1990; Alexander and Langer; 1990; Gackenbach, 1991; Travis, 1994; Mason, 1995; Mason et al. 1997; Travis, 2005). The authors discuss the possibility of a continuum of experiences that includes lucid dreaming, witnessing dreaming and witnessing deep sleep and their relationship to so-called higher states of consciousness. While lucid dreaming is described as the commingling of ordinary waking state consciousness with dreaming (Gackenbach, 1991), witnessing dreaming has been described as the integration of transcendental consciousness with dreaming and witnessing deep sleep has been described as the integration of transcendental consciousness with deep sleep (Maharishi, 1969). Phenomenological reports of witnessing/transcendental consciousness have been described as an awareness of a peaceful inner wakefulness when one is awake or dreaming or even

in deep sleep and are found across cultures, meditation techniques and traditions (Bucke, 1991). Gackenbach and Bosveld (1989, p. 182) state, “The evolution of self-reflective consciousness does not end with lucidity. One can move further along the continuum to a quieter, uninvolved state of awareness that is experienced as having no boundaries known as witnessing.”

Maharishi's (1969) model predicts that experiences of transcendental consciousness will occur in meditation (referring specifically to Transcendental Meditation), also during waking activity, later during dreaming and finally even during the inertia of deep sleep. In this model one method of increasing and stabilizing experiences of transcendental consciousness is through habituation processes, from alternating regular meditation with regular waking activity as well as having adequate rest at night. According to this model when transcendental consciousness is experienced continuously especially during deep sleep then a new so called higher state of consciousness has been achieved. Below is a presentation of research testing this model during dreaming, sleeping, waking and meditation and implications for lucid dreaming research.

2. Transcendental Consciousness during Dreaming

Mason et al. (1997) measured the electrophysiology during night sleep in 11 long term practitioners of meditation (experimental group) claiming to experience witnessing/transcendental consciousness during dreaming as compared to 9 meditating and 11 non-meditating controls. Subjects' electrophysiological tracings were reviewed for any evidence of lucid dreaming and sleep disorders and subjects were screened in interviews, questionnaires, and written

Corresponding address:

Dr. Lynne I. Mason, World Association for Children and Parents, Seattle, Washington 98138
Email: lynnemason108@yahoo.com

self-reports for evidence of lucid dreaming and sleep disorders. Experimental subjects had significantly increased REM density as compared to the control groups during REM sleep (Mason et al., 1997) supporting earlier findings (Meirsman, 1990). Both experiments involved practitioners of Transcendental Meditation. There were no significant differences in time spent in REM sleep between groups or evidence of lucid dreaming. Mason et al. (1997) finding of no significant differences in time spent in REM between groups does not support an aspect of cross cultural models (Krippner, personal communication, 1998) that describes individuals in a higher state of consciousness spending less time dreaming.

3. Transcendental Consciousness during Deep Sleep

Mason's et al., (1997) subjects also reported witnessing/transcendental consciousness during deep sleep and their EEG tracings included theta alpha (7-9 Hz) simultaneously with delta during deep sleep stages 3 and 4 as well as significantly decreased chin EMG as compared to controls. Spectral analysis revealed highly significant increased theta2 and alpha1 relative power during stage 3 and 4 in experimentals as compared to controls. This research was consistent with earlier pilot findings of simultaneous alpha with delta during deep night sleep (Mason et al., 1990) and delta waves and alpha spindles in night sleep of 12 practitioners of Transcendental Meditation versus controls (Banquet and Sailhan, 1974). One subject could signal delta waves indicating extended awareness and ability to signal. Furthermore, Orme-Johnson et al. (1977) found significant correlations of frontal and central alpha, theta and beta EEG coherence with reports of witnessing during sleep as compared to matched controls not witnessing sleep.

The results of these studies taken collectively were interpreted as support for a model of consciousness that includes the continuous integration of transcendental consciousness during waking, dreaming and deep sleep (Maharishi, 1969). According to this model when transcendental consciousness is experienced continuously even during deep sleep then a stabilized higher state of consciousness has been established and is known in Sanskrit as *Turiyatit Chetana*, and called cosmic consciousness in English (Maharishi, 1969; Alexander & Langer, 1990; Schmidt-Wilk, et al. 2005).

Recent reviews of basic research on the functional significance of alpha EEG coherence as the ground of conscious experience supports this theory (Palva & Palva, 2007, Sausseng & Klimesch, 2008). Where as higher frequencies of EEG of beta (13-40 Hz) and gamma (30 to 50 Hz) play an important role in binding local proximal cortical areas during waking state cognitive processing such as perception, mental calculations, and sensory motor tasks, alpha coherence appears to function to bind distant cortical areas into a screen of awareness necessary for conscious awareness of and interpretation of the meaningfulness of events (Palva & Palva, 2007). Recent research on cross-frequency phase synchrony indicates that local cortical binding via beta and gamma become synchronized with large-scale binding via alpha band synchrony in order to carry out cognitive tasks (Palva et al., 2005). Alpha synchrony appears to provide the background continuum of conscious awareness upon which various specific waking state cognitive processes are

carried out. When the specific mental cognitive processing becomes minimized during some meditations, beta and gamma decrease, leaving alpha synchrony as the background state of simple awareness. We propose that when this alpha synchrony and coherence are maintained along with delta sleep, inner awareness is present during sleep.

4. Transcendental Consciousness during Waking

Further support for this model of consciousness is indicated in the neurophysiological results of subjects recorded during waking that report experiences of transcendental consciousness during waking and sleep states. Subjects with self-reports of these experiences showed a higher contingent negative variation during simple tasks, 6-12 Hz activity, and higher EEG amplitude as well as higher frontal coherence during more complicated tasks as compared to controls (Travis et al., 2002) and higher frontal coherence, higher alpha and lower gamma power during tasks (Travis et al., 2004). Orme-Johnson & Haynes (1981) found increased frontal EEG alpha coherence in subjects reporting clear experiences of transcendental consciousness and increased creativity during waking activity. Higher EEG alpha coherence, the signature of witnessing, is also correlated with efficiency of concept learning, emotional stability, lower anxiety, higher levels of moral reasoning, and a transcendental versus material world view during waking (Dillbeck et al., 1981; Nidich et al., 1983; Travis & Arenander, 2006).

5. Transcendental Consciousness during Meditation

Research on transcendental consciousness during sleep and dreaming is less extensive in scope than during meditation. Further support for this model (Maharishi, 1969) is indicated in numerous studies of experiences of transcendental consciousness during meditation. The EEG associated with self-reports of periods of transcendental consciousness measured during one type of meditation (Transcendental Meditation) has included non-descending theta-alpha (7-9) pattern (Herbert and Lehmann 1977), increased alpha and alpha1 frontal coherence (Dillbeck & Bronson, 1981; Travis, 2001; Travis & Arenander, 2006), increased frontal alpha1 power, increased beta1 frontal coherence (Travis & Wallace, 1999), and increased frontal and parietal alpha1 interhemispheric coherence and increased frontal and frontal-central beta2 intrahemispheric coherence (Travis et al., 2009). Badawi et al., (1984) found increased broad band EEG coherence across all frequencies associated with the deepest phase of Transcendental Meditation, as indexed by respiratory suspension. Others found enhanced anterior posterior alpha phase synchrony (Herbert et al. 2005). Alpha1 sources were identified in midline cortical regions using eLORETA analysis (Travis et al., 2009) and in medial prefrontal cortex that overlap the default mode network (DMN) and anterior cingulate cortices using magnetoencephalographic localization algorithms (Yamamoto et al., 2006). The DMN is known to be the neural substrate of one's sense of self, and increased coherence in DMN appears to reflect the more expanded sense of self (Maharishi, 1969; Mason, 1997; Travis & Pearson, 2000) characteristic of transcendental consciousness and witnessing.

Other research suggests that the increases in alpha coherence, such as those associated with transcendental consciousness, indicate enhanced wakefulness. Cantero

et al. (1999) found that state-dependent increases in interhemispheric alpha coherence between the left and right frontal cortex (F3F4) and intrahemispheric alpha coherence between anterior and posterior cortical areas (frontal and occipital) correspond to increases in arousal as one transitions from dreaming (REM) to drowsiness (sleep onset) to relaxed wakefulness. In the light of the Cantero et al.'s arousal dimension, the finding that Transcendental Meditation practice further increases these coherence parameters as one transitions from relaxed wakefulness to meditation corroborates subjective experiences that transcendental consciousness (or witnessing) is a state of even greater inner awareness than ordinary wakefulness (Travis & Pearson, 2000). One could say that transcending during meditation is literally "falling awake" from the waking state. It is "falling" in the sense that, like falling sleep, it is an automatic process that requires no effort, and, in fact, for which any effort or trying would be counterproductive (Travis & Shear, in press). Also, unlike ordinary waking in which awareness is "object referral" due to attention being deployed towards perceptions and thoughts, transcendental consciousness is a "self referral" state, in which the observer or "witness" is only aware of him/herself and is not aware of any object or thought outside of the self (Travis et al., 2004). Moreover, since autonomic parameters show decreased arousal during meditation, as indicated by decreased respiration rate, skin conductance, and plasma lactate (Dillbeck & Orme-Johnson, 1987), transcendental consciousness is not "arousal" in the autonomic sense, but is a state of deep physiological rest along with enhanced wakefulness, or "restful alertness" (Wallace, 1970).

For a recent review of brain wave patterns of different meditations from various traditions, discussion of the default mode network, and the integration of multiple states of consciousness see (Travis et al., 2009, Travis & Shear, in press). Of interest will be the increased gamma synchrony reported during Tibetan Buddhist meditation (Lutz et al., 2004 as cited in Travis et al., 2009). The functional significance of gamma in binding local cortical areas is of special interest in light of Voss et al., (2009) gamma findings during lucid dreaming. Since gamma has been associated with waking state cognitive processes (Palva and Palva, 2007, Sauseng & Klimesch, 2008), the presence of gamma during lucid dreaming suggests that lucid dreaming is a mix of waking state awareness and dreaming, as Gackenbach has proposed.

6. Implications for Lucid Dreaming Research

Gackenbach (1991) notes that it is premature to conclude that lucid dreaming and witnessing dreaming are completely distinct phenomena and may represent a continuum of experiences. Furthermore results and phenomenological reports associated with transcendental consciousness during NREM and REM (Mason, 1995; Mason et al., 1995;1997; Banquet & Sailhan, 1974; Meirmen,1990) suggest that lucid dreaming researchers consider screening and controlling for experiences of witnessing/transcendental consciousness in dreaming and deep sleep. Researchers of witnessing dreaming and witnessing deep sleep are advised to continue their protocol of screening and controlling for lucid dreaming and sleep disorders as well as explore the practicality of using MRI for future investigations and analysis of REM and NREM. LaBerge (et al. 1981) study reported on one non-REM lucid dream in stage 2 transition to REM

underscores the need for further investigation of lucidity in sleep stages 2 as well further investigation of stages 3 and 4 for lucidity. This analysis holds the potential to elucidate differences and similarities between witnessing and lucidity, find evidence (or not) for lucidity during deep sleep and delineate further states of consciousness.

We have a vision (or perhaps a lucid dream or a witnessing dream) that the scientific community will cognize a complete grand unified theory of consciousness with phenomenological and neurophysiological correlates for all states of consciousness, stages of consciousness, and experiences of consciousness inclusive of disorders. We thank Dr. Hobson as well as all consciousness researchers and their subjects for their contributions to the field of consciousness. The first author wishes to acknowledge how fortunate she is to have worked directly with Drs. Gackenbach, Mahowald, Alexander, Orme-Johnson, Travis and others. Our hope is that the study of consciousness continues to expand and reveals practical applications for improving life for the individual, society and the environment as a whole.

References

- Alexander, C.N. (1988). A conceptual and phenomenological analysis of pure consciousness during sleep. *Lucidity Letter*, 17(2), 39-45.
- Alexander, C.N., Boyer, R.W., Cranson, R., & Orme-Johnson, D.W. (1985). Distinguishing between transcendental consciousness and lucidity. *Lucidity Letter*, 4(2), 68-85.
- Alexander, C.N., & Langer, E.J. (Eds). (1990). *Higher Stages of Human Development: Perspectives on Adult Growth*. New York: Oxford University Press.
- Alexander, C.N., Davies, J.L., Dixon, C., Dillbeck, M.C., Oetzel, R.M., Muehlman, J.M., & Orme-Johnson, D.W. (1990). Growth of Higher stages of consciousness: Maharishi's Vedic psychology of human development. In C.N. Alexander & E.J. Langer (eds.), *Higher Stages of Human Development: Perspectives on Adult Growth* (p. 286-341). New York: Oxford University Press.
- Badawi, B.K., Wallace, R.K., Orme-Johnson, D.W., & Rouzere, A.M. (1984). Electrophysiological characteristics of respiratory suspension periods occurring during the practice of the Transcendental Meditation program. *Psychosomatic Medicine*, 46(3), 267-276.
- Banquet, J.P., & Sailhan, M. (1974). Quantified EEG spectral analysis of sleep and Transcendental Meditation. *Electroencephalography and Clinical Neurophysiology*, 42, 445-453.
- Bucke, R.M. (1991). *Cosmic Consciousness*. New York. EP Dutton.
- Cantero, J.L., Atienza, M., Salas, R.M., Gomez, C.M. (1999). Alpha EEG coherence in different brain states: an electrophysiological index of the arousal level in human subjects. *Neuroscience Letters*, 271, 167-170.
- Dillbeck, M.C., & Bronson, E.C. (1981). Short-term longitudinal effects of the Transcendental Meditation technique on EEG power and coherence. *International Journal of Neuroscience*, 14, 147-151.
- Dillbeck, M.C., & Alexander, C.N. (1989). Higher states of consciousness: Maharishi Mahesh Yogi's Vedic psychology of human development. *The Journal of Mind and Behavior*, 10(4), 307-334.
- Dillbeck, M.C. & Orme-Johnson, D.W. (1987). Physiological differences between Transcendental Meditation and rest. *American Psychologist*, 42, 879-881.
- Dillbeck, M.C., Orme-Johnson, D.W., & Wallace, R.K. (1981). Frontal EEG coherence, H-reflex recovery, concept

- learning, and the TM-Sidhi program. *International Journal of Neuroscience*, 15(3), 151-157.
- Gackenbach, J., & Bolsveld, J. (1989). *Control your dreams*. New York: Harper and Row.
- Gackenbach, J., Cranson, R., & Alexander, C.N. (1986). Lucid dreaming, witnessing dreaming, and the Transcendental Meditation technique: A developmental relationship. *Lucidity Letter*, 5(2), 34-41.
- Gackenbach, J., Morrecroft, W., Alexander, C.N., & LaBerge, S. (1987). Physiological correlates of "consciousness" during sleep in a single TM practitioner. *Sleep Research*, 16, 230.
- Gackenbach, J. (1991). A developmental model of consciousness in sleep. From sleep consciousness to pure consciousness. In J. Gackenbach & A.A. Sheikh (Eds.), *Dream images: a call to mental arms*. 287-308. New York: Baywood.
- Hebert, J.R., & Lehmann, D. (1977). Theta bursts: an EEG pattern in normal subjects practicing the Transcendental Meditation technique. *Electroencephalography and Clinical Neurophysiology*, 42(3), 397-405.
- Hebert, J.R., Lehmann, D., Tan, G., Travis, F.T., & Arenander, A. (2005). Enhanced EEG alpha time-domain phase synchrony during Transcendental Meditation: implications for cortical integration theory. *Signal Processing*, 85(11), 2213-2232.
- Hobson, A. (2009). *The Neurobiology of Consciousness: Lucid Dreaming Wakes Up*. *International Journal of Dream Research*, 2(2), 41-44.
- Hobson, J.A., Pace-Schott, E.F., & Stickgold, R. (2000). Dreaming and the brain: toward a cognitive neuroscience of conscious states. *Behavioral and Brain Sciences*, 23, 793-842.
- Krippner, S. (1998). *Personal communication. Toward a Science of Consciousness III*. Tucson Arizona.
- LaBerge, S., Levitan, L., & Dement, W.C. (1986). Lucid dreaming: physiological correlates of consciousness during REM sleep. *Journal of Mind and Behavior*, 7 (2-3s), 251-258.
- LaBerge, S., Nagel, L., Dement, W.C., & Zarcone, V., Jr. (1981). Lucid dreaming verified by volitional communication during REM sleep. *Perceptual and Motor Skills*, 52, 727-732.
- Maharishi Mahesh Yogi (1969). *On the Bhagavad Gita: a new translation and commentary*. Harmondsworth, UK. : Penguin.
- Mason, L.I. (1995). *Dissertation Abstracts International*. Electrophysiological correlates of higher states of consciousness during sleep. Ann Arbor, Mich.: Dissertation Information Service, No. 9605338. Maharishi University of Management.
- Mason, L.I., Alexander, C.N., Travis, F., & Gackenbach, J. (1990). EEG correlates of consciousness during sleep: A Pilot Study. *Lucidity Letter*, 9(2), 85-87.
- Mason, L.I., Alexander, C.N., Travis, F., Gackenbach, J., & Orme-Johnson, D. (1995). EEG Correlates of higher states of consciousness during sleep. *Sleep Research*, 24, 152.
- Mason, L.I., Alexander, C.N., Travis, F.T., Marsh, G., Orme-Johnson, D.W., Gackenbach, J., Mason, D.C., Rainforth, M., & Walton, K.G. (1997). Electrophysiological correlates of higher states of consciousness during sleep in long-term practitioners of the Transcendental Meditation program. *Sleep*, 20(2), 102-110.
- Miersmen, J.M.R. (1990). Neurophysiological order in the REM sleep of participants in the Transcendental Meditation and TM-Sidhi program. In R.K. Wallace, D.W. Orme-Johnson, M.C. Dillbeck (Eds.), *Scientific research on the Transcendental Meditation and TM-Sidhi program: Collected Papers, Vol 5* Fairfield IA: MIU Press, 3033-4.
- Nidich, S.I., Ryncarz, R.A., Abrams, A.I., Orme-Johnson, D.W., & Wallace, R.K. (1983). Kohlbergian moral perspective responses, EEG coherence, and the Transcendental Meditation and TM-Sidhi program. *Journal of Moral Education*, 12(3), 166-173.
- Orme-Johnson, D.W., Clements, G., Haynes, C.T., & Badawi, K. (1977). Higher states of consciousness: EEG coherence, creativity and experiences of the Sidhis. In D.W. Orme-Johnson & J.T. Farrow (Eds.), *Scientific research on Maharishi's Transcendental Meditation program: Collected papers, Vol 1*. Rheinweiler, Germany: Maharishi European Research University Press.
- Orme-Johnson, D.W. & Haynes, C.T. (1981). EEG phase coherence, pure consciousness, creativity and TM-Sidhi experiences. *International Journal of Neuroscience*, 13, 211-7.
- Palva, S. & Palva, J.M. (2007). New vistas for alpha-frequency band oscillations. *Trends Neurosci*, 30(4), 150-158.
- Palva, J., Palva, S., & Kaila, K. (2005). Phase synchrony among neuronal oscillations in the human cortex. *The Journal of Neuroscience*, 25(15), 3962-3972.
- Sauseng, P., & Klimesch, W. (2008). What does phase information of oscillatory brain activity tell us about cognitive processes? *Neurosci Biobehav Rev*, 32(5), 1001-1013.
- Schmidt-Wilk, J., Orme-Johnson, D.W., Alexander, V.K., & Schneider, R.H. (Eds.) (2005). *Applications of Maharishi's Science Honoring the Lifework of Charles N. Alexander Ph.D. Special Issue of Journal of Social Behavior and Personality*.
- Travis, F.T. (1994). The junction point: a field model of waking, sleeping and dreaming, relating to dream witnessing, the waking/sleeping transition and transcendental meditation in terms of a common psychophysiological state. *Dreaming*, 4, 91-99.
- Travis, F.T. (2005). The significance of Transcendental Consciousness for addressing the 'hard' problem of consciousness. *Journal of Social Behavior and Personality*, 17(1), 123-135.
- Travis, F.T., & Wallace, R.K. (1999). Autonomic and EEG patterns during eyes-closed rest and transcendental meditation tm practice: the basis for a neural model of TM practice. *Consciousness and Cognition*, 8, 302-318.
- Travis, F.T., Tecce, J., Arenander, A., & Wallace, R.K. (2002). Patterns of EEG coherence, power and contingent negative variation characterize the integration of transcendental and waking states. *Biological Psychology*, 61(3), 293-319.
- Travis, F.T., Arenander, A., & DuBois, D. (2004). Psychological and physiological characteristics of a proposed object-referral/self-referral continuum of self-awareness. *Consciousness and Cognition*, 13, 401-420.
- Travis, F.T., & Arenander, A. (2006). Cross-sectional and longitudinal study of effects of Transcendental Meditation practice on interhemispheric frontal asymmetry and frontal coherence. *International Journal of Neuroscience*, 116(12), 1519-38.
- Travis, F.T., Haaga, D.H., Hagelin, J.S., Tanner, M., Arenander, A., Nidich, S., Gaylord-King, C., Grosswald, S., Rainforth, M., & Schneider, R.H. (2009). A self-referential default brain state: patterns of coherence, power, and eLORETA sources during eyes-closed rest and the Transcendental Meditation practice. *Cognitive Processes*, 11-1, 21-30.
- Travis, F.T., & Pearson, C. (2000). Pure consciousness: distinct phenomenological and physiological correlates of 'Consciousness Itself'. *International Journal of Neuroscience*, 100(1-4), 77-89.

- Travis, F.T. & Shear, J. (in review). Focused attention, open-monitoring and automatic transcending: categories to organize meditations from Vedic, Buddhist and Chinese Traditions.
- Voss, U., Holzmann, R., Tuin, I., & Hobson, J.A., (2009). Lucid Dreaming: A state of consciousness with features of both waking and non-lucid dreaming. *Sleep* 32(9),1191-1200.
- Wallace, R.K. (1970). Physiological effects of Transcendental Meditation. *Science*, 167, 1751-1754.
- Yamamoto, S., Kitamura, Y., Yamada, N., Nakashima, Y., & Kuruda, S. (2006). Medial prefrontal cortex and anterior cingulate cortex in the generation of alpha activity induced by transcendental meditation: a magnetoencephalographic study. *Acta Medica Okayama*, 60(1), 51-58.