

See discussions, stats, and author profiles for this publication at:
<https://www.researchgate.net/publication/261181813>

Transcendental experiences during meditation practice

Article *in* Annals of the New York Academy of Sciences · March 2014

DOI: 10.1111/nyas.12316 · Source: PubMed

CITATIONS

7

READS

1,059

1 author:



[Frederick Travis](#)

Maharishi University of Management

45 PUBLICATIONS 1,200 CITATIONS

[SEE PROFILE](#)

ANNALS OF THE NEW YORK ACADEMY OF SCIENCES

Issue: *Advances in Meditation Research: Neuroscience and Clinical Applications***Transcendental experiences during meditation practice**

Frederick Travis

Center for Brain, Consciousness, and Cognition, Maharishi University of Management, Fairfield, Iowa

Address for correspondence: Frederick Travis, 1000 North 4th MR 683, Fairfield, IA 52557. ftravis@mum.edu

This article explores transcendental experiences during meditation practice and the integration of transcendental experiences and the unfolding of higher states of consciousness with waking, dreaming, and sleeping. The subject/object relationship during transcendental experiences is characterized by the absence of time, space, and body sense—the framework that gives meaning to waking experiences. Physiologically, transcendental experiences during Transcendental Meditation practice are marked by slow inhalation, along with autonomic orientation at the onset of breath changes and heightened $\alpha 1$ (8–10 Hz) frontal coherence. The integration of transcendental experiences with waking, dreaming, and sleeping is also marked by distinct subjective and objective markers. This integrated state, called *Cosmic Consciousness* in the Vedic tradition, is subjectively marked by inner self-awareness coexisting with waking, sleeping, and dreaming. Physiologically, Cosmic Consciousness is marked by the coexistence of $\alpha 1$ electroencephalography (EEG) with delta EEG during deep sleep, and higher brain integration, greater emotional stability, and decreased anxiety during challenging tasks. Transcendental experiences may be the engine that fosters higher human development.

Keywords: transcending; transcendent; Transcendental Meditation; pure consciousness; brain coherence; enlightenment; yoga; higher states

Introduction

Meditation practices are embedded in conceptual frameworks that describe states beyond ordinary waking experiences.¹ Most meditation research, however, has focused on changes in cognition and performance rather than probing relational and transpersonal/transcendent aspects of meditation experiences. This article explores transpersonal/transcendent experiences during and after meditation practices.

Meditation techniques investigate consciousness from different angles and are associated with different patterns of brain activation.² Practitioners of meditation in the *focused attention* and *open monitoring* categories develop cognitive and affective skills during the meditation session that are then available to deal with challenges in daily life.³ For instance, compassion meditation, which is in the focused attention category, leads to higher γ (20–50 Hz) electroencephalography (EEG) and activation of limbic brain circuits, including the in-

sula and amygdala, during the practice.⁴ This meditation practice leads to more compassionate behavior after the practice.⁵ Mindfulness meditation, which is in the open monitoring category, leads to increases in bilateral frontal theta 2 (6–8 Hz) EEG⁶ and activation of anterior cingulate cortices during the practice.⁷ Developing mindfulness during the meditation practice helps one to be more mindful during stressful experiences, which helps to decrease the effects of stress on one's mind and body.⁸

Meditation practices in the *automatic self-transcending* category transcend cognitive and affective processes to reveal a nondual state of pure self-awareness—a state of being rather than thinking or doing, called pure consciousness.⁹ Transcendental Meditation (TM), which is in the automatic self-transcending category, is marked by frontal $\alpha 1$ power and coherence^{10,11} as well as elevated frontal blood flow and reduced brain stem blood flow.¹² Transcending during TM practice transforms the mind as a whole, leading to substantial

improvements across a wide range of psychological and physiological variables.^{3,13–16}

Meditations in the focused attention and open monitoring categories are embedded in philosophical traditions that also discuss the importance of nondual experiences.¹ However, the majority of research on meditations in these two categories have investigated easier-to-quantify domains, such as attention and emotional regulation, rather than the nature and physiological characteristics of nondual experiences during these practices. Collaborative research is needed to bring out the full picture of nondual experiences across meditation traditions.

A review of the literature found systematic investigation of nondual experiences during TM practice. Nondual experiences have been reported during Dzogchen meditation (a practice in the Buddhist tradition) in relation to patterns of intrinsic/extrinsic brain systems.¹⁷ However, researchers have not yet probed first-person descriptions and third-person physiological measures of nondual experiences during Dzogchen practice. This article will focus on nondual experiences during Transcendental Meditation.

Turiya chetana: the “fourth”

When thoughts are stilled, pure self-awareness is gained.⁹ It is written in the Katha Upanishad, which discusses the nature of pure consciousness (p. 31): “The Self is without sound, without touch and without form . . . You will know the Self when your senses are still, your mind is at peace, and your heart is pure.”¹⁸ The word “Self” is capitalized to distinguish it from our waking state sense of self that is identified with thoughts and actions. Figure 1 compares subjective and objec-

tive experiences during waking, sleeping, dreaming, and pure consciousness. Pure consciousness is pure in that it is Self-awareness free from changing mental content. This figure presents a 2 × 2 table—the presence/absence of sensory, mental, or affective content, and the presence/absence of self-awareness. Notice that the subject–object relationship during pure consciousness is completely different than that during waking, sleeping, or dreaming. In sleeping, there is no sense of self and no content; in waking, there is a sense of self and changing content. In dreaming, vivid dream images overshadow one’s sense of self. That leaves the bottom right cell—sense of Self with no mental content.

Some scientists might comment that the experience described in the bottom right cell—pure consciousness or pure Self-awareness—is not possible. They might ask: How can you be aware of yourself without also being aware of your body, or your feelings, or what you are thinking?¹⁹ William James, in his *Principles of Psychology*²⁰ observed (p. 300):

... it is difficult for me to detect in [mental] activity any purely spiritual element at all. Whenever my introspection glance succeeds in turning round quickly enough to catch one of those manifestations of spontaneity in the act, all it can ever feel distinctly is some bodily process, for the most part taking place within the head.

This conclusion is a valid conclusion for waking experience, which always includes a sense of self with changing content. However, pure consciousness is an experience during Transcendental Meditation practice.

Transcendental Meditation practice can be superficially described as thinking or repeating a mantra—a sound without meaning—and going back to it when it is forgotten.²¹ A person with this understanding might maintain that thinking a mantra and experiencing pure self-awareness are mutually exclusive; they are right. In pure consciousness, there can be no shadow of thought or individual intention. Other mantra meditations involve keeping the mantra in awareness, linking the mantra with our breath, or thinking about the meaning of the mantra. These would be counter to the process of transcending. The TM technique does involve a

		Self - Awareness	
		No	Yes
Thoughts	Yes	Dreaming	Waking
	No	Sleeping	Pure Consciousness

Figure 1. Comparison of subjective and objective experiences during waking, sleeping, dreaming, and pure consciousness.

mantra; but TM is a process of transcending perception of the mantra. Transcending means appreciating the mantra at finer levels in which the mantra becomes increasingly secondary in experience, ultimately disappearing, and self-awareness becomes primary.^{9,22} Silence, expansion, and evenness begin to dominate awareness, while mental activity decreases in intensity and frequency, and ultimately ceases. Transcending is automatic, conducted by the natural tendency of the mind,⁹ and must be an automatic process. Any intention or individual directing of the mind leads to increased activity in a localized area—the mind cannot transcend. Maharishi Mahesh Yogi, who brought the TM technique to the West, described pure consciousness in this way:

The state of Being is one of pure consciousness, completely out of the field of relativity; there is no world of the senses or of objects, no trace of sensory activity, no trace of mental activity. There is no trinity of thinker, thinking process and thought, doer, process of doing and action; experiencer, process of experiencing and object of experience. The state of transcendental Unity of life, or pure consciousness, is completely free from all trace of duality.⁹

The experience of pure consciousness is called Transcendental Consciousness. In this state, one has transcended the subject/object dichotomy that marks waking experiences; the subject—self-awareness—is both the subject and object of experience. It is a Self-referral experience. On one hand you can say there is no content in pure consciousness. On the other, you could say the content is wakefulness itself²³ or consciousness itself.²⁴ In the Vedic tradition, Transcendental Consciousness is called “the fourth” or *turiya chetana*.²⁴

Transcendental Consciousness occurs spontaneously during TM practice. One starts the mantra, and then the process unfolds in its own time. There may be momentary experiences of Transcendental Consciousness during a meditation session, or these experiences may last from 10 to 40 s in duration.²⁵

First-person investigation of Transcendental Consciousness

Fifty-two college students who practiced the TM technique for a few months to over 8 years were asked to describe their deepest experiences during TM practice. They were asked to imagine that

they were describing this state to someone who did not meditate. All of their reports were of a state where thinking, feeling, and individual intention were missing, but Self-awareness remained. A content analysis of their descriptions yielded three themes that were common to all reports—absence of time, space, and body sense.²² Time, space, and body sense make up the framework that gives meaning to waking experience. Note that Transcendental Consciousness was not described in relation to distorted content—strong emotions, or vivid visual, auditory, and tactile sensations, or a distorted sense of self. Rather, Transcendental Consciousness was described by the absence of the customary framework and characteristics that define waking experience.

Physiological patterns during Transcendental Consciousness

Changes in breath rate, skin conductance, and EEG patterns have been reported during Transcendental Consciousness. Refined breathing was the first published marker of this experience. Farrow and Hebert²⁵ and later Badawi *et al.*²⁶ observed suspension of normal respiration from 10 to 40 s during Transcendental Consciousness. Subjects marked these periods with button presses indicating the transition from Transcendental Consciousness to thinking and experiencing outer objects. This type of breathing, while initially termed *respiratory suspension*, is very often an example of apneustic breathing—slow, prolonged inspiration.²⁷ Apneustic breathing is supported by different respiratory drive centers in the brain stem than those that drive breathing during waking.²⁸

A second marker of this state is skin conductance responses at the onset of breath changes.²⁹ These autonomic responses are similar to those seen during orienting—attention switching to environmental stimuli that are novel^{30,31} or significant.^{32,33} These autonomic responses could mark the transition of awareness from active thinking processes to the mental silence of Transcendental Consciousness.

A third marker of Transcendental Consciousness is increased frontal $\alpha 1$ (8–10 Hz) coherence as reported in two random assignment studies comparing TM practice to eyes-closed rest—one study had a within-subjects design³⁴ and the other had a between-subjects design.¹¹ The within-subjects study compared 10-min counterbalanced TM and

eyes-closed resting periods. Significant condition differences were seen in the first minute of TM practice characterized by higher frontal $\alpha 1$ coherence, lower sympathetic activity, higher parasympathetic activity, and slower breathing rate. The measures reached similar levels at the fifth and tenth minutes during TM practice. The authors used these data to suggest a two-circuit model of TM practice in which one brain circuit activates a neural switch to lower levels of physiological activation while maintaining alertness, while the other brain circuit maintains this restfully alert state with minimal resources. The between-subjects study was a 3-month longitudinal analysis of TM practice and eyes-closed resting controls. In this study, TM practice led to higher frontal interhemispheric $\alpha 1$ coherence and $\alpha 1$ frontal log power, and lower $\beta 1$ and γ frontal log power.

It is important to note that $\alpha 1$ (8–10 Hz) brain waves are seen during TM practice rather than $\alpha 2$ (10–12 Hz) waves. The $\alpha 2$ frequency is associated with cortical idling,³⁵ as indicated by lower thalamic activity and lower cerebral metabolic rate in sensory and motor areas during simple sensorimotor tasks.³⁶ Alpha 2 activity has also been reported in sensorimotor areas during mindful body scanning.³⁷ Typically, theta and β EEG are reported during mindfulness practice.³⁸ This report of α activity during mindful body scanning is probably an instance of the well-researched mu rhythm (11 Hz)³⁹ associated with the motor cortex at rest.

Alpha 1 activity in frontal association cortices, in contrast, is correlated with higher cerebral metabolic rate. It is called paradoxical α and is reported during tasks involving internally directed attention,⁴⁰ such as imagining a tune compared to listening to a tune.⁴¹ Alpha 1 activity is thought to represent heightened alertness or wakefulness. For instance, when solving a problem by intuition or insight, a burst of $\alpha 1$ EEG occurs first—the “aha”—followed by high-frequency EEG (γ) when the details of the idea come to mind.⁴² Recent functional magnetic resonance imaging (fMRI) research reports increased frontal blood flow during TM practice,¹² along with $\alpha 1$ EEG, which supports the association of $\alpha 1$ EEG with TM practice.

A theoretical paper suggests that pure consciousness experiences may be supported by activation of thalamocortical matrix circuits, known to diffusely activate layer I of the cortex and so modulate wakefulness levels; and by deactivation of thalamocorti-

cal core circuits, known to project to layer IV of the cortex and so modulate the content of experience.⁴³

Turiyatit chetana or Cosmic Consciousness

The experience of Transcendental Consciousness during TM practice occurs for many seconds spontaneously throughout the practice. By alternating the experience of Transcendental Consciousness during TM practice with waking activity, the experience of Transcendental Consciousness begins to be integrated with waking, dreaming, and sleeping. Now the rest of sleep, illusory dream images, and changing waking experiences come and go on a continuum of inner self-awareness.^{44,45} In the Vedic tradition, this state is defined as a fifth state of consciousness, called *turiyatit chetana* or Cosmic Consciousness.²⁴ In Cosmic Consciousness, all activity is on the surface of life; deep within is immovable silence, uninvolved with ongoing experience. Maharishi Mahesh Yogi describes Cosmic Consciousness in the following way:

... [in Cosmic Consciousness] Being is permanently lived as separate from activity. Then a man realizes that his Self is different from the mind which is engaged with thoughts and desires. It is now his experience that the mind, which had been identified with desires, is mainly identified with the Self. He experiences the desires of the mind as lying outside himself, whereas he used to experience himself as completely involved with desires. On the surface of the mind desires certainly continue, but deep within the mind they no longer exist, for the depths of the mind are transformed into the nature of the Self. All the desires which were present in the mind have been thrown upward, as it were, they have gone to the surface, and within the mind the finest intellect gains an unshakeable, immovable status. ‘Pragya’ is anchored to ‘Kutastha’. This is the ‘steady intellect’ in the state of *nitya-samadhi*, Cosmic Consciousness.⁹

In Cosmic Consciousness, the immovability of inner silence becomes the predominant element of experience because it does not change; while outer activity leaves less and less of a mark because it is always changing. One identifies with the nonchanging

continuum of inner Self-awareness. During sleep, this state was described in the following way by a 65-year-old male TM practitioner with 39 years of practice:

... there's a continuum there. It's not like I go away and come back. It's a subtle thing. It's not like I'm awake waiting for the body to wake-up or whatever. It's me there. I don't feel like I'm lost in the experience. That's what I mean by a continuum. You know it's like the fizzing on top of a soda when you've poured it. It's there and becomes active so there's something to identify with. When I'm sleeping, it's like the fizzing goes down.

Inner wakefulness during sleep is the marker of Cosmic Consciousness in the Vedic tradition.²⁴ It is a state that cannot be faked. The body is asleep, the senses are shut down, the thinking mind is quiet, while a continuum of self-awareness persists from falling asleep to waking up. The quote above uses an analogy: during sleeping, the “fizzing” or stream-of-consciousness experience goes down to reveal the underlying “soda” or pure Self-awareness that continues throughout the night. When one wakes up, the fizzing simply begins again.

First-person perspective during Cosmic Consciousness

A cross-sectional study compared descriptions of the sense of self in three groups of age- and gender-matched subjects: 17 meditation-naïve subjects, 17 subjects with 7 years of TM experience (approximately 4900 h), and 17 subjects with 24 years of TM experience (approximately 18,000 h), reporting inner awareness throughout the night. Subjects were interviewed and were given tests measuring inner/outer orientation, moral reasoning, anxiety, and personality. Scores on the psychological tests were factor analyzed. The first unrotated principal component analysis (PCA) of the psychological test scores yielded a consciousness factor, analogous to the general intelligence or g factor in intelligence research. This first factor accounted for over half of the variance among groups on these personality tests.⁴⁶

Analysis of interviews of these subjects revealed fundamentally different descriptions of self-awareness. The meditation-naïve subjects described themselves in relation to concrete cognitive and behavioral processes (object-referral mode) and

exhibited lower consciousness-factor scores and lower frontal EEG coherence. In contrast, individuals reporting the state of Cosmic Consciousness described themselves in terms of a continuum of inner self-awareness underlying thought, feeling, and action (Self-referral mode) and exhibited higher consciousness-factor scores and higher frontal coherence.⁴⁶ Physiological measures were also assessed in these subjects and are reported in the following section.

Physiological patterns during Cosmic Consciousness

The study discussed above also compared brain wave patterns between these three groups of 17 subjects.⁴⁷ An electroencephalogram was recorded during simple and choice-paired reaction-time tasks. Each reaction-time task included a warning stimulus, a 1.5 s blank screen, and a second stimulus requiring a response. The brain preparatory response (contingent negative variation) was calculated before the second stimulus in both the simple and choice reaction-time tasks, and EEG patterns of power and coherence were calculated during the choice reaction-time tasks.

During these challenging computer tasks, the subjects reporting Cosmic Consciousness, in comparison to subjects in the other two control groups, exhibited higher levels of broadband frontal EEG coherence (F3–F4), higher frontal and central α relative power, and a better match in brain preparatory response to task demands during the simple and choice reaction-time tasks. These brain measures were transformed to z-scores and added together to yield a composite measure, the Brain Integration Scale.⁴⁷ Scores on the Brain Integration Scale significantly increased with 3 months of TM practice in a random assignment study with college students.⁴⁸ Scores on this scale were also reported to be higher in successful athletes, managers, and musicians,^{49–51} suggesting the practical value of developing brain integration for success in life.

Brain patterns have also been investigated during sleep in a similar set of subjects: 11 meditation-naïve subjects; 11 participants who practiced the TM technique for an average of 4 years (approximately 2800 h) but did not report inner wakefulness during sleep; and 11 participants who practiced the TM technique for 20 years (approximately 16,000 h) and reported the experience of inner wakefulness

during sleep for at least 1 year. The group that reported inner wakefulness during sleep had higher rapid eye movement (REM) density during dreaming, similar levels of delta EEG during stage-3 and -4 sleep, but higher levels of $\alpha 1$ activity during slow-wave sleep.⁵² It is interesting to note that the experience of inner wakefulness coexisting with the body sleeping deeply was associated with the brain wave pattern of transcending (α) coexisting with the brain patterns of deep sleep (delta).

Discussion

Brain patterns that defined transcendental experiences during TM practice and the integration of transcendental experiences with waking, dreaming, and sleeping were mainly found in frontal brain areas. This suggests that frontal circuits may play a critical role in transcendental experiences and the growth of higher states of consciousness. These states could be called higher states in that (1) the subject/object relationship is different in these states compared to waking, sleeping, and dreaming; (2) the sense of self is more expanded in these states; and (3) the physiological patterns are distinct from those during waking, dreaming, and sleeping.

The development of higher states may be an extension of the developmental trajectory that began as a toddler and continued into adulthood, supporting the emergence of adult abstract reasoning. Brain development begins in posterior sensory areas, which myelinate by age four. Posterior areas process sensory experiences and create the concrete present. Activity in posterior areas are associated with the first two stages of cognitive development described by Piaget—the sensorimotor and pre-operational stages.⁵³ The corpus callosum, which connects the left and right hemispheres, myelinates from age 7 to age 10. Now the dominant level of awareness de-embeds from sensory experience and reintegrates at the level of concrete operations—the ability to think about the objects that you see. The last brain circuits to myelinate are connections with frontal executive areas. These circuits begin to myelinate around age 12 and end around age 25.⁵⁴ With frontal myelination, the dominant level of awareness de-embeds from thinking and reintegrates at the level of formal operations—the ability to think about thinking. Now the teenager can see consequences; they can generate different reasons to explain observations.

Language learning is considered the engine for the development of abstract adult thinking. Language provides a symbolic system to represent objects and so allows a child to mentally manipulate concrete objects.⁵⁵ However, we can become stuck in our words and concepts. To develop beyond language-based thinking, we need a technique to transcend language and enable the experience of pure (content-free) consciousness underlying the changing activity of thinking and feeling. The experience of Transcendental Consciousness transcends language and provides a platform for experiencing the world more with respect to inner abstract structures and less with respect to outer, changing concrete objects. This experience of Transcendental Consciousness is not a luxury and should not be isolated to a few individuals transcending during meditation practice. Rather, the experience of Transcendental Consciousness should be available to everyone to allow them to realize their full human birthright.

Conflicts of interest

The author declares no conflicts of interest.

References

1. Shear, J. 2006. *The Experience of Meditation: Experts Introduce the Major Traditions*. Princeton, NJ: The Infinity Foundation.
2. Travis, F. & J. Shear. 2010. Focused attention, open monitoring and automatic self-transcending: categories to organize meditations from Vedic, Buddhist and Chinese traditions. *Conscious Cogn.* **19**: 1110–1118.
3. Sedlmeier, P., J. Eberth, M. Schwarz, *et al.* 2012. The psychological effects of meditation: a meta-analysis. *Psychol. Bull.* **138**: 1139–1171.
4. Lutz, A., H. Slagter, J.D. Dunne & R.J. Davidson. 2008. Attention regulation and monitoring in meditation. *Trends Cogn. Sci.* **12**: 163–169.
5. Desteno, D., P. Condon, G. Desbordes & W. Miller. In press. Can meditation make you a more compassionate person? *Psychol. Sci.*
6. Tsai, J.F., S.H. Jou, W. Cho & C.M. Lin. 2013. Electroencephalography when meditation advances: a case-based time-series analysis. *Cogn. Process.* **14**: 371–376.
7. Chiesa, A. & A. Serretti. 2010. A systematic review of neurobiological and clinical features of mindfulness meditations. *Psychol. Med.* **40**: 1239–1252.
8. Zeidan, F., K.T. Martucci, R.A. Kraft, *et al.* 2013. Neural correlates of mindfulness meditation-related anxiety relief. *Soc. Cogn. Affect. Neurosci. Epub ahead of print.*
9. Maharishi Mahesh Yogi. 1969. *Maharishi Mahesh Yogi on the Bhagavad Gita*. New York: Penguin.

10. Travis, F. & A. Arenander. 2006. Cross-sectional and longitudinal study of effects of transcendental meditation practice on interhemispheric frontal asymmetry and frontal coherence. *Int. J. Neurosci.* **116**: 1519–1538.
11. Travis, F., D.A. Haaga, J. Hagelin, *et al.* 2010. A self-referential default brain state: patterns of coherence, power, and eLORETA sources during eyes-closed rest and transcendental meditation practice. *Cogn. Process* **11**: 21–30.
12. Ludwig, M. 2011. Brain activation in experienced meditators (doctoral dissertation). Retrieved from dissertations and theses database. (UMI No. 3114720).
13. Alexander, C., M. Rainforth & P. Gelderloos. 1991. Transcendental meditation, self-actualization, and psychological health: a conceptual overview and statistical meta-analysis. *J. Soc. Behav. Pers.* **5**: 189–247.
14. Anderson, J.W., C. Liu & R.J. Kryscio. 2008. Blood pressure response to transcendental meditation: a meta-analysis. *Am. J. Hypertens.* **21**: 310–316.
15. Eppley, K.R., A.I. Abrams & J. Shear. 1989. Differential effects of relaxation techniques on trait anxiety: a meta-analysis. *J. Clin. Psychol.* **45**: 957–974.
16. Rees, B., F. Travis, D. Shapiro & R. Chant. 2012. Reduction in posttraumatic stress symptoms in congolese refugees practicing transcendental meditation. *J. Trauma Stress.* **26**: 295–298.
17. Josipovic, Z., I. Dinstein, J. Weber & D.J. Heeger. 2012. Influence of meditation on anti-correlated networks in the brain. *Front. Hum. Neurosci.* **5**: 183.
18. Reddy, K., T. Egenes & L. Egenes. 1999. *All Love Flows to the Self. Samhita Productions.* New York: Schenectady.
19. Natsoulas, T. 1999. The concept of consciousness. *J. Theory Soc. Behav.* **29**: 59–87.
20. James, W. 1890/1951. *Principles of Psychology.* New York: Dover Books.
21. Raffone, A. & N. Srinivasan. 2009. The exploration of meditation in the neuroscience of attention and consciousness. *Cogn. Process* **11**: 1–7.
22. Travis, F. & C. Pearson. 2000. Pure consciousness: distinct phenomenological and physiological correlates of “consciousness itself.” *Int. J. Neurosci.* **100**: 77–89.
23. Travis, F. 2012. Core and Matrix Thalamic Nuclei: parallel circuits involved in content of experience and general wakefulness. *NeuroQuantology* **12**: 1–6.
24. Maharishi Mahesh Yogi. 1994. *Celebrating Perfection in Education.* Vlodrop: Maharishi Vedic University Press.
25. Farrow, J.T. & J.R. Hebert. 1982. Breath suspension during the transcendental meditation technique. *Psychosom. Med.* **44**: 133–153.
26. Badawi, K., R.K. Wallace, D. Orme-Johnson & A.-M. Rouzeré. 1984. Electrophysiological characteristics of respiratory suspension periods occurring during practice of the transcendental meditation program. *Psychosom. Med.* **46**: 267–276.
27. Kesterson, J. & N. Clinch. 1989. Metabolic rate, respiratory exchange ratio, and apneas during meditation. *Am. J. Physiol.* **89**: R632–R638.
28. Plum, F. & J.B. Posner. 1980. *The Diagnosis of Stupor and Coma.* Philadelphia: F.A. Davis.
29. Travis, F. & R.K. Wallace. 1997. Autonomic patterns during respiratory suspensions: possible markers of transcendental consciousness. *Psychophysiology* **34**: 39–46.
30. Sokolov, E.N. 1963. *Perception and the Conditioned Reflex.* Oxford: Pergamon.
31. O’Gorman, J.G. 1979. The orienting reflex: novelty or significance detector? *Psychophysiology* **16**: 253–262.
32. Spinks, J.A., G.H. Blowers & D.T.L. Shek. 1985. The role of the orienting response in the anticipation of information: a Skin Conductance Response study. *Psychophysiology* **22**: 385–394.
33. Maltzman, I. 1977. Orienting in classical conditioning and generalization of the galvanic skin response to words: an overview. *J. Exp. Psychol. Gen.* **106**: 111–119.
34. Travis, F. & R.K. Wallace. 1999. Autonomic and EEG patterns during eyes-closed rest and transcendental meditation (TM) practice: the basis for a neural model of TM practice. *Conscious Cogn.* **8**: 302–318.
35. Pfurtscheller, G., A. Stancak & C. Neuper. 1996. Event-related synchronization (ERS) in the alpha band—an electrophysiological correlate of cortical idling: a review. *Int. J. Psychophysiol.* **24**: 39–46.
36. Oakes, T.R., D.A. Pizzagalli, A.M. Hendrick, *et al.* 2004. Functional coupling of simultaneous electrical and metabolic activity in the human brain. *Hum. Brain Mapp.* **21**: 257–270.
37. Kerr, C.E., S.R. Jones, Q. Wan, *et al.* 2013. Effects of mindfulness meditation training on anticipatory alpha modulation in primary somatosensory cortex. *Brain Res. Bull.* **85**: 96–103.
38. Dunn, B.R., J.A. Hartigan & W.L. Mikulas. 1999. Concentration and mindfulness meditations: unique forms of consciousness? *Appl. Psychophysiol. Biofeedback* **24**: 147–165.
39. Hari, R. 2006. Action-perception connection and the cortical mu rhythm. *Prog. Brain Res.* **159**: 253–260.
40. Shaw, J.C. 1996. Intention as a component of the alpha-rhythm response to mental activity. *Int. J. Psychophysiol.* **24**: 7–23.
41. Cooper, N.R., A.P. Burgess, R.J. Croft & J.H. Gruzelier. 2006. Investigating evoked and induced electroencephalogram activity in task-related alpha power increases during an internally directed attention task. *Neuroreport* **17**: 205–208.
42. Kounios, J. & M. Beeman. 2009. The aha! Moment: the cognitive neuroscience of insight. *Curr. Dir. Psychol. Sci.* **18**: 210–216.
43. Travis, F. 2011. Comparison of coherence, amplitude, and eLORETA patterns during transcendental meditation and TM-Sidhi practice. *Int. J. Psychophysiol.* **81**: 198–202.
44. Maharishi Mahesh Yogi. 1978. *Enlightenment to Every Individual, Invincibility to Every Nation.* Vlodrop, Holland: Maharishi European University Press.
45. Travis, F. 2011. *States of Consciousness: Experimental Insights into Meditation, Waking, Sleep and Dreams.* D. Certkovik & I. Cosvic, Eds.: New York: Frontier Collection.
46. Travis, F., A. Arenander & D. DuBois. 2004. Psychological and physiological characteristics of a proposed object-referral/self-referral continuum of self-awareness. *Conscious Cogn.* **13**: 401–420.
47. Travis, F.T., J. Tecce, A. Arenander & R.K. Wallace. 2002. Patterns of EEG coherence, power, and contingent negative

- variation characterize the integration of transcendental and waking states. *Biol. Psychol.* **61**: 293–319.
48. Travis, F., D.A. Haaga, J. Hagelin, *et al.* 2009. Effects of transcendental meditation practice on brain functioning and stress reactivity in college students. *Int. J. Psychophysiol.* **71**: 170–176.
 49. Travis, F., H.S. Harung & Y. Lagrosen. 2011. Moral development, peak experiences and brain patterns in professional and amateur classical musicians: support for a unified theory of performance. *Conscious Cogn.* **20**: 1256–1264.
 50. Harung, H.S., F. Travis, A.M. Pensgaard, *et al.* 2011. High levels of brain integration in world-class Norwegian athletes: towards a brain measure of performance capacity in sports. *Scand. J. Med.Sci. Sports* **21**: 32–41.
 51. Harung, H.S. & F. Travis. 2012. Higher mind-brain development in successful leaders: testing a unified theory of performance. *Cogn. Process.* **13**: 171–181.
 52. Mason, L.I., C.N. Alexander, F.T. Travis, *et al.* 1997. Electrophysiological correlates of higher states of consciousness during sleep in long-term practitioners of the transcendental meditation program. *Sleep* **20**: 102–110.
 53. Piaget, J. 1954. *The Construction of Reality in the Child*. New York: Basic Books.
 54. Toga, A.W., P.M. Thompson & E.R. Sowell. 2006. Mapping brain maturation. *Trends Neurosci.* **29**: 148–159.
 55. Vygotsky, L.S. & A. Kozulin. 1986. *Thought and Language*. Cambridge, MA: MIT Press.