

# Research-Based Perspectives on the Psychophysiology of Yoga

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# Chapter 3

## Long-Term Changes in Experienced Yoga Practitioners: Growth of Higher States of Consciousness

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### ABSTRACT

*This chapter explores subjective and objective correlates of the state of Yoga during Transcendental Meditation practice. Yoga fits the three criteria of a higher state of consciousness: (1) Yoga has a different subject/object relationship than other states. In Yoga there is no content—only self-awareness. (2) Yoga involves a more expanded sense-of-self. Content analysis of descriptions of Yoga yielded three themes: the absence of time, absence of space and absence of body sense. Yoga is the most universal aspect of the individual. (3) Yoga is defined by distinct physiological patterns. Slowing of breath, autonomic orienting and frontal alpha1 brain coherence are reported during the state of Yoga. The integration of Yoga with waking, sleeping and dreaming also fits the criteria for being a higher state of consciousness, called Cosmic Consciousness in the Vedic tradition. The chapter ends with the conclusion that growth of higher states of consciousness is the most important result of experiencing the state of Yoga. Then, life is lived in freedom.*

### INTRODUCTION

Yoga has become part of main stream Western thinking. Yet, Yoga has many definitions. For some, Yoga involves postures, *pranayama* and meditation practice (Vinutha, Raghavendra, & Manjunath, 2015). Others understand Yoga as a philosophy with eight limbs that are eight *prescriptions* for practice (Jois, 1999). While others understand the eight limbs of Yoga to be *descriptions* of the state of Yoga—once Yoga is attained then one naturally exhibits traits such as contentment, truthfulness, and non-violence (Sands, 2013; Maharishi, 1969).

Patanjali (circa 900 BC) wrote the Yoga Sutra. In the second verse of the first chapter of the Yoga Sutra, he defines Yoga. The verse in Sanskrit reads:

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*Yoga chittavrittinirodhaha.1, 2*

These Sanskrit words can be translated as: *Yoga* (union), *Chitta* (mind), *Vritti* (fluctuations), and *nirodhaha* (complete absence). When put together, this verse could be translated as: “*Yoga* is the complete settling of the activity of the mind” (Egenes, 2012). From this perspective, *Yoga* is not a set of postures or a philosophy. Rather, *Yoga* is an internal state in which the activity of the mind is completely still. The next verse clarifies that this settled state of mind is not inert, but is the self-referral state of the observer. The verse in Sanskrit reads;

*Tadādraśṭuḥswarūpeavasthānam1,3*

This verse can be translated as “the observer is established in himself” (Maharishi, 1994). From this perspective, *Yoga* is the simplest form of human awareness in which the experiencer is awake to his own existence (Travis, 2014). It is a self-referral experience, in which the boundaries that define our individuality, such as age, height, gender, and style of thinking are transcended. The mind is wide awake devoid of changing thoughts, feelings or perceptions; one is awake to one Self (Maharishi, 1994). It is like a wave settling down to the ocean, and becoming the ocean.

This chapter uses the term *Yoga* to indicate the *state* of *Yoga*—silent, self-awareness that comprises the “complete settling of the activity of the mind” and the “observer established in himself”. It explores long-term effects of the experience of *Yoga*. Most scientific research has reduced meditation practice to a tool to combat depression, lower high blood pressure, or improve emotion regulation. While these benefits do occur, the author suggests that the integration of *Yoga*—inner silence—with outer activity is the most salient benefit of regular experience of *Yoga*. This is living life in higher states of consciousness. Then *Yoga* becomes the ground for action as described in the Bhagavad-Gita: *Yogastah Kuru Karmani*: Established in *Yoga* perform action (Maharishi, 1969).

## **MEDITATION PRACTICE AND THE STATE OF YOGA**

Meditation practice leads to the state of *Yoga*, but all meditations are not the same. Different meditation practices are associated with different cognitive processes and different patterns of brain activity. Three categories of meditation have been delineated: *Focused Attention*, *Open Monitoring* and *Automatic Self-Transcending* (Travis & Shear, 2010). Meditation practices in the *Focused Attention* and *Open Monitoring* categories develop cognitive tools during the meditation session that are then available to cope with challenges in daily life. For instance, Compassion meditation, which is in the *Focused Attention* category, is characterized by gamma EEG (20-50 Hz) and leads to activation of limbic brain circuits during the practice (Lutz, Slagter, Dunne, & Davidson, 2008). After the practice, research reports more compassionate behavior in daily life (Condon, Desbordes, Miller, & Desteno, 2013). Mindfulness meditation, which is in the *Open Monitoring* category, is characterized by bilateral frontal theta 2 EEG (6-8 Hz) and leads to activation of anterior cingulate cortices during the practice (Chiesa & Serretti, 2010). After the practice, research reports that one is more mindful during stressful experiences, decreasing the impact of stress on one’s mind and body (Zeidan, Martucci, Kraft, McHaffie, & Coghill, 2013). Transcendental Meditation®, which is in the *Automatic Self-Transcending* category, is characterized by frontal alpha1 EEG coherence (8-10 Hz) (Travis et al., 2010a). Transcendental Meditation is designed for transcend-

ing, rather than constructing cognitive tools to cope with situations after meditation. Transcendental Meditation is designed to lead to the state of Yoga (Maharishi, 1969).

This chapter will focus on effects of regular experience of Yoga during Transcendental Meditation practice. This subject population is used as an example of the transformative power of the experience of Yoga, and is not to suggest that the experience of Yoga only occurs during this meditation practice.

## **Research on Transcendental Meditation Practice**

Beginning in 1970, researchers began to systematically investigate effects of Transcendental Meditation practice on body, mind and behavior (Wallace & Wilson, 1971). This research program on Transcendental Meditation practice was the first systematic investigation into a meditation practice in the West. It included systematic investigation into the effects of Transcendental Meditation practice on brain functioning (Dillbeck & Bronson, 1981; Travis, 2001; Travis et al., 2010b; Wallace, 1970), reducing sympathetic activation (Dillbeck & Orme-Johnson, 1987; Orme-Johnson, 1973; Travis et al., 2009), decreasing anxiety (Eppley, Abrams, & Shear, 1989; Orme-Johnson & Barnes, 2014), enhancing self-development (Alexander, Rainforth, & Gelderloos, 1991), balancing hormonal levels (Bujatti & Riederer, 1976 ; Walton, Pugh, Gelderloos, & Macrae, 1995), and decreasing hypertension (Brook et al., 2013; Schneider et al., 2005 ; Schneider et al., 2012).

The majority of the research on Transcendental Meditation investigated experiences over the entire meditation session, which is a mixture of periods of settled experiences with more active mental and physiological processing (Travis, 2001). Research has also targeted the experience of Yoga that occurs often throughout a Transcendental Meditation session.

## **State of Yoga: Gained Through Transcending**

The state of Yoga results from transcending during Transcendental Meditation practice. During transcending, silence, expansion and evenness begin to dominate awareness, while mental activity decreases in intensity and frequency and ultimately ceases (Travis & Pearson, 2000). This state is called pure consciousness in the Vedic tradition and is the state of Yoga—the complete settling of the activity of the mind in which the observer is established in himself (Maharishi, 1969).

## **Yoga as a Fourth State of Consciousness**

Yoga is not an altered state of waking, but is a higher state of consciousness. This statement is based on the observation that Yoga fits three criteria of a higher state of consciousness. For a state of consciousness to be called *higher*, the author suggests that in comparison to waking, sleeping and dreaming it is characterized by: 1) a different subject/object relationship, 2) a more expanded sense-of-self, and 3) a distinct physiological pattern. The experience of Yoga will be explored in terms of these three criteria.

### **Different Subject/Object Relation**

Yoga has been defined as the state of least activity of the mind—free from thinking or perception—along with self-awareness, the observer is established in himself. This description of Yoga is fundamentally different than waking dreaming or sleeping. Figure 1 presents a 2x2 grid that compares subject/object

*Figure 1. Comparison of States of Consciousness. The horizontal axis displays presence/ absence of self-awareness. The vertical axis displays presence/absence of mental or perceptual content. Yoga fits in the bottom right cell and is characterized by a fundamentally different relation between subject and object than waking, dreaming or sleeping.*

		Self - Awareness	
		No	Yes
Mental Content	Yes	Dreaming	Waking
	No	Sleeping	Yoga

relations of waking, dreaming, sleeping and Yoga. A similar concept has been presented in an earlier publication (Travis, 2014). The horizontal dimension displays presence or absence of self-awareness. The vertical dimension displays presence or absence of content. Notice in this figure, sleeping in the lower left cell is characterized by the absence of content and self-awareness. Waking in the upper right cell is characterized by the presence of both content—thoughts, feelings and perceptions—and self-awareness. Dreaming in the upper left cell is characterized by bizarre dream images with a very fragile if any sense-of-self.

This leaves the bottom right cell—self-awareness without content. Many scientists, after some deliberation, would remark that this state is not possible. After all, how can you be aware of yourself, if you are not aware of the difference between inner and outer experiences? How can you have “self-awareness” and not observe that you are the experiencer having the experience? These objections come from experiences within waking state, which is characterized by changing content along with self-awareness.

Yoga fits in this bottom right cell. It is an experience free from customary content—the complete settling of the activity of the mind. It is also an experience of self-awareness—the observer is established in himself. Yoga is characterized by a fundamentally different relation between subject and object than waking, dreaming or sleeping, and so fulfills the first criteria of a higher state of consciousness.

### **The Sense-of-Self Is More Expanded**

Fifty-two college students were asked to describe their deepest experiences during Transcendental Meditation practice. They were asked to use their own words as if they were describing the taste of a strawberry to someone who had never tasted one. A content analysis of their descriptions yielded three

themes that captured the experience of Yoga—absence of time, absence of space, and absence of body sense (Travis & Pearson, 2000). Notice, the experience of Yoga was described as being outside of time and space, the usual framework that gives meaning to waking experience. This description is much broader than usual descriptions of ourselves that are in terms of our name, our job, our religion, our nationality, how we think, or how we act. Describing the state of Yoga as being a greater breadth of sense-of-self fulfills the second criteria of a higher state of consciousness.

## **Distinct Physiological Patterns**

Distinct patterns in breath rate, skin conductance, and EEG coherence have been reported during the experience of Yoga during Transcendental Meditation practice. During this state, breath rate slows (Badawi, Wallace, Orme-Johnson, & Rouzere, 1984; Dillbeck & Orme-Johnson, 1987; Farrow & Hebert, 1982) and sometimes periods of apneustic breathing are observed—slow, prolonged inspiration over 10 to 20 seconds (Kesterson & Clinch, 1989). In addition, skin conductance responses are reported at the onset of breath changes (Travis & Wallace, 1997). These autonomic responses could mark the transition of awareness from active thinking processes to the mental silence of Yoga. A third marker of the state of Yoga is increased frontal alpha1 (8 – 10 Hz) coherence. This brain signature is reported in the first minute of Transcendental Meditation practice (Travis & Wallace, 1999) and increases over three month's practice as reported in a random assignment longitudinal study (Travis et al., 2010a).

Other researchers have noted that slower frequencies such as alpha best capture the experience of Yoga. Berman and Stevens asked 44 meditation practitioners of TM, Vipassana, Mindfulness, breath/body awareness, mantra meditation or visualization to wink their left eye during their meditation, after the transition from the experience of transcendence back to conscious thought. The wink-signal led to an identifiable artifact in the record. The EEG signals 40 seconds before and after the signal were compared. EEG power was higher in slower frequencies including alpha, both before and after the wink-signal. However, the meditation session as a whole was characterized by higher gamma power (Berman & Stevens, 2015). This finding supports the association of Yoga with the alpha frequency. Also, these authors suggest that reports of gamma EEG during some meditation practices may be capturing the method of practice, rather than the state of Yoga itself.

It is important to note that alpha1 (8–10 Hz) brain waves are seen during the state of Yoga, rather than alpha 2 (10–12 Hz). The alpha 2 frequency is associated with cortical idling as indicated by *lower* cerebral metabolic rate in sensory and motor areas during simple sensori-motor tasks (Oakes et al., 2004; Pfurtscheller, Stancak, & Neuper, 1996). In contrast, alpha1 activity is associated with *higher* cerebral metabolic rate (Ludwig, 2011). Alpha1 is called “paradoxical” alpha, and is reported during tasks involving internally directed attention such as imagining a tune compared to listening to a tune (Cooper, Burgess, Croft, & Gruzelier, 2006). Alpha1 activity is thought to represent heightened alertness or inner wakefulness.

Yoga fits the criteria of a higher state of consciousness. It is characterized by a unique subject/object relation, a broader sense-of-self, and distinct physiological correlates. Table 1 summarizes key papers that discuss the fourth state of consciousness.

*Table 1. Research that studied physiological markers of the state of Yoga during Transcendental Meditation practice, a proposed 4<sup>th</sup> state of consciousness*

Reference	Design	Number of Subjects	Measures	Findings
Farrow and Hebert, 1982	Single group design	95 TM Ss	Aperiodic breathing	13 breath suspensions lasting 18.7 sec
	TM and matched control	21 TM Ss and 23 Controls	Aperiodic breathing	7.9 breath suspensions lasting 14.5 sec 0.6 breath suspensions lasting 4.3 sec (Controls)
	Single group design	11 TM Ss	Button presses indicating deep experiences	10.5 button presses that occurred within 10 sec of the offset of 4.5 breath suspensions (40% hit rate)
Badawi et al, 1984	Single group design	18 TM Ss and 30 controls	EEG coherence between nine sensors: F3, Fz, F4, C3, Cz, C4, P3, Pz, P4	Higher total coherence in the TM Ss (all frequencies and all coherence pairs)
Kesterson & Clinch, 1989	Matched Groups	34 TM Ss and 10 controls	O <sub>2</sub> consumption, CO <sub>2</sub> production, and breathe rate. Calculated metabolic rate and respiratory exchange ratio	Three patterns of breathing during TM TM1: no change in breath rate (N = 13) TM2: breath rate slow down (N = 11) TM3: Periods of breath suspension (N = 8) <ul style="list-style-type: none"> <li>• No difference in metabolic rate in the three TM groups and controls</li> <li>• Significant drop in respiratory exchange ratio in the three TM groups compared to controls</li> <li>• Apneustic breathing in the 3<sup>rd</sup> TM subjects, as measured by a spirometer.</li> </ul>
Travis and Wallace, 1997	Experimenter rang a bell to mark three different periods during TM practice	16 TM Ss	EEG power, skin conductance, breath and heart rate	Transcendental consciousness: <ul style="list-style-type: none"> <li>• Lower theta power and higher alpha power than other times during TM practice</li> <li>• Longer breath period (slower breath rate)</li> <li>• Higher heart rate de-celleration</li> <li>• Higher skin conductance—a burst in sympathetic activation</li> </ul>
Travis and Pearson, 2000	Qualitative study	54 TM Ss	Ss wrote descriptions of experiences of the state of Yoga during their meditation	The state of yoga was characterized by the absence of time, the absence of space and the absence of body sense.
Travis, 2014	Theoretical paper that discusses models, subjective experiences and physiological markers of the state of Yoga or Transcendental Consciousness			

## **INTEGRATING THE STATE OF YOGA WITH WAKING, DREAMING AND SLEEPING**

### **Growth of Enlightenment**

Yoga is experienced with the eyes closed and when one is sitting in silence. However, by alternating the state of Yoga during meditation practice with waking activity, the state of Yoga can be systematically integrated with waking, dreaming, and sleeping. This is growth of higher states of consciousness. The author suggests that this growth of higher states of consciousness is the most important benefit of long term Yoga practice.

## **Cosmic Consciousness: A Fifth State of Consciousness**

We have discussed Yoga as a fourth state of consciousness with a distinct pattern of subject/object relations, greater breadth of sense-of-self, and distinct physiological patterns. The integration of Yoga with the other three states of consciousness, comprises a fifth state of consciousness, called Cosmic Consciousness in the Vedic tradition or *Turyatit Chetana* (Maharishi, 1994). In Cosmic Consciousness, the activity of thinking, speaking, and behavior continues on the surface of life; but deep within is immovable silence—the state of Yoga—uninvolved with ongoing experience. Maharishi Mahesh Yogi (1969) describes Cosmic Consciousness in this 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 (pg. 85).*

In Cosmic Consciousness, the immovability of inner silence, of Yoga, becomes the most predominant element of experience. The outer activity of perception, thinking and acting continues. This outer activity is constantly changing. It has “phenomenal” existence—its reality is in change. This incessant change of the outer world does touch the non-changing continuum of Yoga, lived in the depths of the mind.

## **First Person Perspective of Cosmic Consciousness**

### **Experiences During Sleep**

The subjective experience of inner self-awareness during sleep is the necessary and sufficient marker of Cosmic Consciousness according to the Vedic tradition (Maharishi, 1994). It is a state that cannot be faked. The body is asleep, the sense are shut down, the thinking mind is quiet, but a continuum of self-awareness persists from falling asleep to waking up. During sleep, this state has been described as:

*...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. (65- year old male; 39 years TM practice)*

The quote uses an analogy of a soda to explain the integration of two styles of functioning. The “fizzing” is analogous to the stream of conscious experiences that characterizes waking experiences. Conscious awareness projects through the senses to engage with objects in the environment. There are changing states, so there is something to identify with. When asleep, the fizzing goes down to reveal the underlying “soda” or pure self-awareness that continues throughout the day and night.

## **Experiences During Eyes-Open Computer Tasks**

Research has investigated the subjective experience of Cosmic Consciousness during waking tasks. Three groups of age and gender-matched subjects were tested: 17 meditation naïve subjects, 17 subjects with 7 years TM experience (approximately 4900 hours), and 17 subjects with 24 years TM experience (approximately 18,000 hours) reporting inner awareness throughout the night. Subjects were interviewed and were given paper-and-pencil tests of inner/outer orientation, moral reasoning, anxiety, and personality.

The meditation naïve subjects described themselves in terms of cognitive and behavioral processes (Object-referral mode). They exhibited lower scores on the psychological tests. In contrast, the 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). They exhibited higher levels of emotional stability, moral reasoning, openness to experience, and lower levels of trait and state anxiety (Travis, Arenander, & DuBois, 2004).

## **Physiological Patterns During Cosmic Consciousness**

### **Patterns During Sleep**

Brain patterns during sleep were compared in 11 meditation naïve subjects; 11 participants who practiced the TM technique for an average of 1.5 years (approximately 2800 hours) but did not report inner wakefulness during sleep; and 11 participants who practiced the TM technique for 19 years (approximately 16,000 hours) and reported the experience of inner wakefulness during sleep for at least one year, the criteria for the state of Cosmic Consciousness. The group reporting inner wakefulness during sleep had similar levels of delta power but higher levels of alpha1 power during stage 3 and 4 sleep (Mason et al., 1997) than the two control groups. It is interesting to note that the experience of inner wakefulness co-existing with the body sleeping deeply was associated with the brain wave pattern of transcending (alpha1) co-existing with the brain patterns of deep sleep (delta).

### **Patterns During Computer Tasks**

EEG during computer tasks were compared in 17 meditation naïve subjects, 17 subjects with 7 years TM experience, and 17 subjects with 24 years TM experience reporting Cosmic Consciousness. The subjects reporting Cosmic Consciousness, in comparison to subjects in the other two control groups, exhibited higher broad band frontal EEG coherence (F3-F4), higher frontal and central alpha relative power, and a better match in brain preparatory response to task demands during the reaction time tasks (Travis, Tecce, Arenander, & Wallace, 2002). This constellation of brain patterns was called “brain integration.”

Higher brain integration is a marker of the state of Cosmic Consciousness. A longitudinal random assignment study of college students reported that brain integration significantly increased with three months of Transcendental Meditation practice (Travis et al., 2009). These data suggest that regular experience of the state of Yoga may be a driver for enhancing brain integration and so growth to Cosmic Consciousness. Table 2 presents the key research on growth of Cosmic Consciousness.

## **Long-Term Changes in Experienced Yoga Practitioners**

*Table 2. Research that studied psychological and physiological markers of the state of Cosmic Consciousness (CC), a proposed 5<sup>th</sup> state of consciousness*

Reference	Design	Number of Subjects	Measures	Findings
Mason et al, 1997	Matched Control	<ul style="list-style-type: none"> <li>• 11 TM Ss reporting CC (19 yrs TM)</li> <li>• 11 TM Ss (1.5 yrs TM)</li> <li>• 11 Control</li> </ul>	EEG and EMG during sleep	The 11 CC Ss during Stages 3 and 4 sleep within the first three sleep cycles had: <ul style="list-style-type: none"> <li>• Higher alpha/delta EEG</li> <li>• Higher chin EMG</li> </ul>
Travis et al, 2002	Matched Control	<ul style="list-style-type: none"> <li>• 17 TM Ss reporting CC (24.5yrs TM)</li> <li>• 17 TM Ss (7.8yrs TM)</li> <li>• 17 Control</li> </ul>	EEG estimates during computer tasks were used in a multiple discriminant analysis to distinguish groups	The 17 Ss reporting CC during demanding computer tasks had: <ul style="list-style-type: none"> <li>• Higher broad band frontal coherence</li> <li>• Higher alpha relative power</li> <li>• Higher Contingent Negative Variation (CNV) during a simple RT tasks, and lower CNV in a choice task</li> </ul>
Travis et al, 2004	Matched Control	<ul style="list-style-type: none"> <li>• 17 TM Ss reporting CC (24.5yrs TM)</li> <li>• 17 TM Ss (7.8yrs TM)</li> <li>• 17 Control</li> </ul>	<ul style="list-style-type: none"> <li>• Interview</li> <li>• Baruss Inner/ outer orientation</li> <li>• Gibbs moral reasoning</li> <li>• STAI anxiety</li> <li>• International Personality Item Pool.</li> </ul>	The 17 TM Ss reporting CC had: <ul style="list-style-type: none"> <li>• More expanded sense of Self</li> <li>• Greater Inner orientation</li> <li>• Higher Moral Reasoning</li> <li>• Lower anxiety</li> <li>• Higher emotional stability</li> </ul>
Travis, 2014	Theoretical paper that discusses models, subjective experiences and physiological markers of the state Cosmic Consciousness			

## **DISCUSSION**

The long-term individual benefit of regular experience of the state of Yoga was growth of higher states of consciousness. The state of Yoga and the integration of Yoga with waking, sleeping and dreaming met the criteria for a 4<sup>th</sup> and a 5<sup>th</sup> higher states of consciousness. Each were characterized by different subject/object relations, each had an expanded sense-of-self, and each were defined by specific physiological parameters.

Higher states of consciousness are part of the full range of human functioning—all you need are the proper experiences to build those circuits (Travis, 2016). By analogy, for children to develop abstract adult thinking, they need to learn language. Without the labels that language provide, a person cannot mentally manipulate objects (Vygotsky & Kozulin, 1986). Language frees the person from concrete perceptions. But abstract adult thinking or Piaget's formal operations is not the highest state of human development. Without further experiences, the person continues to identify with language-based thinking and language-based self-awareness, which is ruled by changing thoughts and perceptions. To develop beyond language-based thinking we need to transcend language—this is the experience of Yoga.

## **Practical Benefits of Cosmic Consciousness**

The state of Yoga is the necessary experience to allow individuals to step out of the cycle of waking, sleeping and dreaming and to experience that part of themselves which is outside of time, space and body sense. With the regular alternation of the state of Yoga and daily life, inner silence and outer activ-

ity begin to co-exist in one awareness. The regular experience of Yoga transforms our innermost self. Our inner unbounded nature becomes the stable immovable backdrop for changing outer experiences.

### **Emotional Stability**

Individuals reporting Cosmic Consciousness exhibited greater emotional stability (Travis et al., 2004). This does not mean emotional numbness. They have the capacity for deep feelings. Their sense of well-being is not overshadowed by the rise and fall of changing successes or failures. The state of Yoga is an all-time reality. It is there before the experience, during the experience and after the experience. So, inner silence becomes the most stable and “real” part of experience. Stability of inner silence is the basis for emotional stability.

### **Moral Reasoning**

Individuals reporting Cosmic Consciousness scored higher on Gibb’s Social Moral Reflection Scale (Travis et al., 2004). This moral reasoning test asks eleven questions, such as: What is the importance of keeping a promise to a friend? Or to a stranger? It then asks: Why? The justification of why you would act in a specific way reveals your underlying moral structure. Do you act because of external rules and external control? Do you act to uphold the inherent integrity of an individual? Do you use large natural principles to guide your decisions?

When Yoga is lived at the basis of thinking, individual experiences are appreciated in a larger context. You see greater affinity between you and others. You see yourself as “we,” as part of a larger system including other people, animals, plants, the earth and sky. Our justification for any action takes into account the whole system within which we are embedded.

### **Openness to Experience**

Individuals reporting Cosmic Consciousness are more open to new experiences (Travis et al., 2004). Yoga provides a stable frame for giving new meaning to every experience. You can be open to new experiences, because the specific effects of that experience do not deeply touch you. It is like a parent playing with a child’s toy. You can enjoy each new toy to its fullest and take from that experience whatever is useful.

### **Greater Success in Life: Increases in Brain Integration**

We saw that research associated higher brain integration with the state of Cosmic Consciousness. Higher brain integration is also reported in successful individuals. If higher brain integration indicates greater connection with one’s innermost self, then a person with higher brain integration might be less overshadowed in a turbulent situation and be able to generate better solutions to problems and make better decisions. The data support this prediction. Athletes who finished in the top ten for three seasons in the Olympics and National games, managers who were CEOs for an average of 18 years, and classical musicians had higher levels of brain integration compared to controls (Harung & Travis, 2012; Harung et al., 2011; Travis, Harung, & Lagrosen, 2011).

In Cosmic Consciousness, the brain functions more as a whole. Each experience is passing through a more integrated filter than it did before. Each experience is seen in a different context. Thus, one sees a different world, and chooses different actions.

## **Field Effects of Consciousness**

This paper has focused on experiences of the state of Yoga, and the integration of Yoga with daily life. Yoga was described as the absence of time, space and body sense. It is a state of Self-awareness outside of time and space, which can be conceptualized as a field of consciousness within which time, space and ongoing experience is appreciated. This concept is echoed in models of theoretical physics that describe a field of “information” underlying and directing observable phenomena (Stapp, 2007).

If a common field underlies all individuals, can contacting this field affect others at a distance? A research program on so-called “field effects of consciousness” has generated over 20 published papers reporting field effects between individuals, groups, and nations. A sample of studies are presented below.

### **Assessing Effects Between Individuals**

For my dissertation, I used time series analysis to compare changes in EEG coherence over time in a single person practicing Transcendental Meditation and in a non-meditating individual in an adjacent room engaged in a concept learning task. The time series analysis revealed that changes in EEG alpha coherence during Transcendental Meditation practice led to changes in EEG alpha coherence in the non-meditating subject. And when the non-meditating subject’s coherence was higher, he did better on the concept learning task (Travis & Orme-Johnson, 1989). Since an electromagnetic signal decreases over the distance squared, the authors suggested that these effects were not mediated by the electromagnetic field; the subjects were 6 feet apart. Rather, they concluded that changes in alpha coherence during Transcendental Meditation practice indicated contact with an underlying field and that the effects were transmitted through that field.

### **Assessing Effects of Groups on an Individual Subject**

Research has also investigated effects of groups of people practicing Transcendental Meditation on EEG patterns and subjective experiences of a single person. An individual practiced Transcendental Meditation for 12 consecutive days in a small room off of a larger common area. Unknown to that individual, a group of 12 graduate students came into the larger common area and either read a Research Methods text book or practiced Transcendental Meditation. When the group was practicing Transcendental Meditation, the subject had slower breath rate and higher alpha coherence—two markers of deeper Transcendental Meditation practice. She also reported deeper subjective experiences during her meditation (Kleinschmitz, 1997).

### **Assessing Effects of Groups on Serotonin and Cortisol Levels of Individuals Outside the Group**

Research has investigated effects of 2,000 individuals collectively practicing Transcendental Meditation and the advanced program, the TM-Sidhi program, on neurohormone levels in non-meditating individu-

als in the town (Walton, Cavanaugh, & Pugh, 2005). The researchers assessed salivary cortisol, a stress related hormone, and 5 HIAA, a metabolite of serotonin, in six non-meditating individuals who lived in Fairfield, Iowa. Samples were taken for 77 days. Time series analysis assessed changes in numbers meditating together in Fairfield, and concentrations of salivary cortisol and 5HIAA. Higher numbers meditating together led to decreases in salivary cortisol, suggesting lower stress, and increased in 5HIAA, suggesting enhanced well-being.

### **Assessing Effects of Groups on Societal Quality of Life Indicators**

Sociological research is inherently noisy, and it is difficult to control for all variables. To control some of these confounds, two studies set up scientific review boards of 27 non-meditating scientists to oversee the research. These scientific review boards saw the design of the proposed research before the study began. They received weekly updates of the numbers practicing Transcendental Meditation and the TM-Sidhi programs and of the outcome measures. They also saw all steps in the data analysis, which used transfer function fitting of time series. This is the recommended statistical tool to analyze multiple time points.

One study was conducted in Israel during the war between Lebanon and Israel in 1982. This study recorded data for 67 days. When the numbers of people practicing the Transcendental Meditation and TM-Sidhi programs were above a predicted threshold of 1% of the population of Israel, there were improvements in the quality of life between Israel and Lebanon as evidenced by 1) decreased war deaths, 2) decreased intensity in the fighting between the two countries, 3) decreased crime over all of Israel, and 4) decreased crime, fires and accidents in Jerusalem where the group was practicing Transcendental Meditation (Orme-Johnson, Alexander, Davies, Chandler, & Larimore, 1988).

The second study was conducted in Washington, DC. This study recorded data for 42 days. Four thousand individuals came to DC to be part of this project. As the numbers rose above the predicted threshold, violent crime significantly decreased (Hagelin et al., 1999). Summer temperatures and historic trends in DC crime did not significantly affect violent crime rates, as assessed by the time series analysis.

## **CONCLUSION**

This research extends our consideration of effects of the experience of Yoga to include the effects we have on the environment. We are not billiard balls colliding over time. We do not live in a classical existence. Rather, we are part of a larger system that is effected by the condition of every person in that system. This experience of Yoga is not a luxury and should not be isolated to a few individuals. Yoga and meditation practices are a means to transform the individual and thereby transform the society, creating a better quality of life on earth for everyone.

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## **KEY TERMS AND DEFINITIONS**

**Brain Integration:** Broadband frontal coherence, alpha relative power and brain preparatory response.

**Cosmic Consciousness:** The integration of the state of Yoga with waking, sleeping and dreaming.

**Higher States of Consciousness:** Any state, which in comparison to waking, sleeping or dreaming, comprises: 1) a different subject/object relationship, 2) a more expanded sense-of-self, and 3) a distinct physiological pattern.

**Pure Consciousness:** Another name for the state of Yoga.

**Transcendental Meditation:** A meditation in the *Automatic Self-Transcending* category that transcends the steps of the meditation practice.

**Transcending:** Mental activity decreases in intensity and frequency and ultimately ceases while inner silence, expansion and evenness grow.

**Yoga:** The state comprising the complete settling of the activity of the mind, in which the observer is established in himself.