

# INTRODUCTION TO VOLUME 8

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## **MAHARISHI VEDIC SCIENCE AS A SCIENCE OF CONSCIOUSNESS: CONSCIOUSNESS AS THE BASIS OF MIND, BODY, BEHAVIOUR, AND SOCIETY AND ITS APPLICATION TO CREATE AN INVINCIBLE SOCIETY**

Consciousness has been a topic of increasing scholarly interest over the past decades, indicated by numerous articles, as well as by the founding of journals and conferences devoted to the understanding of consciousness. This increasing vitality of ‘consciousness’ as a topic of interest is to be expected as the Transcendental Meditation and TM-Sidhi programme become more widely adopted in different areas of society.

On the basis of the direct experience of pure consciousness, and intellectual understanding of the full development of human consciousness, and the relationship of these to the deepest levels of Natural Law identified by modern science, Maharishi formulated a science of consciousness in theory and application. Moreover, the eight volumes of *Scientific Research on the Transcendental Meditation and TM-Sidhi Programme: Collected Papers* have demonstrated the success of Maharishi’s technology of consciousness in stimulating research. This research continues to uncover new avenues of knowledge, contributing to the quality of human life.

In the West, one of the enduring questions about consciousness is its place in nature—is consciousness fundamental in some way, or is a conscious experience merely another name for a physiological event? The assumption of materialist monism is the belief that there is in nature only one reality—matter. There are a number of cogent critiques of this common scientific assumption, not only by philosophers<sup>1</sup>, but also by physicists and life scientists<sup>2</sup>. They point out that this scientific materialism is inconsistent with empirical findings in quantum mechanics that document the influence of human awareness on quantum measurement processes.

Another conceptualization about consciousness is that consciousness is an ‘epiphenom-

enon’ (by-product) of physiological processes, presumably brain processes. This view, which has its source in dualistic assumptions about the physical and mental realms, holds that physical or neural events cause mental events, but mental events play no causal role in physiological processes or behaviour.

A limitation of these historical conceptions, and also others from the philosophical literature, is that they consider consciousness in terms of *waking state* conscious experience of an object, idea, or sensation. In contrast, Maharishi Vedic Science offers the means to *experience* or isolate consciousness itself—pure consciousness.

From the perspective of Maharishi Vedic Science, the causal relationship between physiological functioning and consciousness flows in both directions: consciousness has its basis in physiology and physiology has its basis in consciousness.

Maharishi Vedic Science describes seven states of consciousness—the three relative states of waking, dreaming, and deep sleep, as well as the state of pure consciousness or Transcendental Consciousness, and the stable stages of enlightenment—Cosmic Consciousness, God Consciousness, and Unity Consciousness. Each of the seven states is predicted to have its own mode of physiological functioning. Thus, from the perspective of Maharishi Vedic Science, physiology gives rise to consciousness.

Maharishi Vedic Science holds that one’s physiological functioning must be cultured to maintain higher states of consciousness. According to Maharishi Vedic Science this takes place through the causal influence of consciousness itself. The experience of Transcendental Consciousness and each of the stable stages of enlightenment is brought about by the practice of the Transcendental Meditation technique—a purely mental practice that has been demonstrated repeatedly by research to systematically change the state of physiological functioning. Thus, consciousness is clearly shown by the technology of Maharishi Vedic Science to also have a causal role in the functioning of the physiology.

So it is clear that the research on the Transcendental Meditation technique does not support the conception that consciousness is merely an epiphenomenon of brain activity. It should be noted that according to Maharishi Vedic Science, as the individual’s consciousness is developing towards the highest state, Unity Consciousness, it is appropriate to say that physiology gives rise to consciousness. However, once the permanent state of Unity Consciousness is gained, it is appropriate to say that consciousness gives rise to physiology, and all else. That is, in Unity Consciousness the individual directly experiences each object as an expression of the field of unified wholeness at the basis of subjective and objective existence—Transcendental Consciousness fully realized.

This analysis highlights an important principle of Maharishi Vedic Science, the principle that ‘knowledge is structured in consciousness’. That is, in each of the seven sequential states of consciousness reality is experienced in a fundamentally different and progressively more complete way. Therefore, in the field of philosophy, studying ‘ontology’—the nature of reality—separately

1 Chalmers, D. (1996) *The Conscious Mind*, New York: Oxford University Press.

Nagel, T. (2012) *Mind & Cosmos*. New York: Oxford University Press.

2 Goswami, A., Reed, R.E. & Goswami, M. (1995) *The Self-Aware Universe: How Consciousness Creates the Material World*, New York: Tarcher/Putnam.

Lanza, R. & Berman, B. (2010) *Biocentrism: How Life and Consciousness Are Keys to Understanding the True Nature of the Universe*, Dallas, TX: BenBella Books.

from ‘epistemology’—the nature of knowledge—can be misleading. From the perspective of higher states of consciousness, knowledge is different in different states of consciousness—that is, epistemology (knowledge) is so different in different states of consciousness that ontology (reality) is also different. If we seek a final or ultimate ontology, it must be that which corresponds to Unity Consciousness. Otherwise we would be required to investigate knowledge from the perspective of a developmental epistemology, somewhat similar to studying the growth of knowledge structures in childhood, in so-called genetic epistemology.<sup>3</sup>

Historically, the alternative to dualism and materialistic monism has been a type of monism in which either subjectivity is seen as the ultimate single reality (forms of idealism), or the ultimate reality is assumed to be single but neither objectivity nor subjectivity, giving rise to both (neutral monism).

The experience and understanding of pure consciousness or Transcendental Consciousness from Maharishi Vedic Science offers a new and yet ancient insight into this basic question. Lacking this experience or understanding, the tradition of thinkers and scientists in the West have defined consciousness in terms of the features of subjectivity in terms of basic sensations, emotions, etc.—the so-called ‘qualia’ of experience.<sup>4</sup> By that definition of subjectivity, pure consciousness may be understood as basic to subjectivity and yet fundamentally independent in its nature. That is, pure consciousness is the basis of subjectivity, yet different from subjectivity as conceived of in terms of the experience of different objects. The Vedic understanding of pure consciousness as the basic and unified foundation of reality may be therefore seen as consistent with either a conception of neutral monism or of idealistic monism.

As described earlier, Maharishi Vedic Science fulfils each perspective on the nature of consciousness by opening the experience of the individual to the full range of consciousness—the seven states of consciousness—leading ultimately in Unity Consciousness to the experience that consciousness is the fundamental constituent of all reality, subjective and objective. At the same time, by emphasizing that each state of consciousness has its associated style of functioning of the physiology, the essential and foundational role of the physiology for the consciousness of each individual is upheld.

From this basic consideration, let us examine the research and theoretical papers on the Transcendental Meditation programme in this volume. A number of the empirical studies in this volume have implications about the nature of consciousness, in that they give evidence for the causal influence of Transcendental Meditation technique on body, mind, and society—on physiological functioning, psychological processes, behaviour, and societal transformation.

<sup>3</sup> Piaget, J. (1972). *The Child & Reality: Problems of Genetic Epistemology*. Baltimore, MD: Penguin

<sup>4</sup> The paper by Dr. Nader (paper 660 in this volume) will be quite accessible to those who are used to thinking of consciousness in this way, because it proceeds from a consideration of the subject-object relationship, with pure consciousness understood as the experience in which knower, known, and process of knowing are the same consciousness independent of any other object.

The rest of this introduction has four sections: (1) Consciousness and Its Effect on Physiology; (2) Consciousness and Its Effect on Behaviour and Psychological Health; (3) Consciousness and Society; and (4) Consciousness and Reality. We consider some sample research programmes extended by the research in this volume, indicating the substantial impact of the Transcendental Meditation technique on physiology (brain processes, basic cellular processes related to free radical production, and cardiovascular functioning), on psychological health (especially in those suffering from previous trauma), on individual behaviour (of students), of societal integration (decreased crime and violence), and on the nature of consciousness itself (theoretical paper).

## 1. Consciousness and Its Effect on Physiology

### Brain Processes

This volume includes quite a few studies of brain activity during the Transcendental Meditation technique or during activity consequent to learning this practice. This section focuses on several papers that investigate in greater depth the brain processes stimulated by practice of the Transcendental Meditation technique, in such a way that we see the causal effect of consciousness on brain functioning, and also gain anatomical or functional insight into these processes.

For example, a study by Yamamoto et al. (paper 615 in this volume)<sup>5</sup> studied the brain activity during the Transcendental Meditation technique simultaneously using electroencephalographic (EEG) measurement on the surface of the scalp (which has been more commonly assessed in the past) and magnetoencephalographic (MEG) measurement to assess changing magnetic field potentials, which allow one to localize anatomically to a certain degree the underlying sources of the EEG changes observed. The EEG measurements replicated previous research, which showed significantly increased EEG power in the frontal area of the brain, and significant slowing of the frequency of the EEG alpha activity during the Transcendental Meditation technique practice, in contrast to a control condition of mental repetition.

The researchers used three different MEG analysis techniques, each with their own strengths, to localize the source of the alpha activity. These various MEG analyses indicated that the high-amplitude alpha wave activity during Transcendental Meditation originated in the area of the median prefrontal cortex (mPFC) and anterior cingulate cortex (ACC). These two brain areas are part of a neural network that includes the prefrontal cortex and the limbic association cortex; these two anatomical areas also modulate internal emotional responses. The authors speculate that these brain areas, by forming a diffuse alpha rhythm, may contribute to the relaxed comfortable sensation during the Transcendental Meditation technique.

<sup>5</sup> Yamamoto, S., Kitamura, Y., Yamada, N., Nakashima, Y., & Kuroda, S. Medial prefrontal cortex and anterior cingulate cortex in the generation of alpha activity induced by Transcendental Meditation: A magnetoencephalographic study. *Acta Medica Okayama* 60: 51–58, 2006.

A study by Travis et al. (paper **614** in this volume)<sup>6</sup> was a random assignment longitudinal study in which college students learned the Transcendental Meditation technique and practised it twice daily for 20 minutes each sitting, or those in the control condition did not change their daily schedule. Compared to control subjects, those practising Transcendental Meditation after 10 weeks showed higher frontal log-power in alpha1 (slow alpha—7.5–10 Hz) frequencies and lower frontal and parietal log-power in beta1 (13–20 Hz) and gamma (30.5–50 Hz) frequencies, as well as higher inter-hemispheric coherence in frontal and parietal areas and higher frontal and frontal-central intra-hemispheric coherence in beta2 frequencies (20.5–30 Hz), with no change in lateral asymmetry.

Relevant to the discussion of anatomic localization, an approach to EEG analysis termed eLORETA (exact Low Resolution Electromagnetic Tomography) was employed which uses electromagnetic current density to estimate intra-cerebral generators with precise localization but low resolution. The eLORETA analysis of the longitudinal EEG study revealed, in contrast to eyes-closed rest in controls, significant generators of alpha1 activity in cingulate and precuneus area cortices. The authors point out that these circuits overlap an area of the brain termed the ‘default mode network’, which is activated during low cognitive load activity as well as self-referential mental activity. As a result, they propose that the experiences during Transcendental Meditation may be not only distinct from, but foundational to, eyes-closed rest, in the same way that eyes-closed rest is foundational to task-oriented cognitive activity.

A third example is a study by Hebert et al. (paper **612** in this volume)<sup>7</sup> which focuses not on anatomical localization of brain processes during Transcendental Meditation, but on the impact of the technique on the functional processes of information transfer in the brain. In contrast to EEG coherence, which measures the stability of phase relationship between the EEG signal at two anatomical locations on the surface of the scalp, phase synchrony methods measure the ‘degree of precise timing’ of electrical waves that arise in different brain areas, i.e., the leading or lagging relation between the two signals. The high phase synchronization of EEG waves in fast (gamma) frequencies is involved in the integration of sensory events into conscious perceptions. The study by Hebert et al. was the first to examine phase synchrony during Transcendental Meditation, looking specifically at synchrony of EEG signals in the alpha frequencies. Low long-range synchrony of alpha waves has been found to be characteristic of the memory loss and disorientation of mild Alzheimer’s dementia.

Compared to eyes-closed rest control periods, there was an increase of long-term alpha

6 Travis, F., Haaga, D.A.F., Hagelin, J., Tanner, M., Arenander, A., Nidich, S., Gaylord-King, C., Grosswald, S., Rainforth, M., & Schneider, R.H. A self-referential default brain state: Patterns of coherence, power, and eLORETA sources during eyes-closed rest and Transcendental Meditation practice. *Cognitive Processing* 11: 21–30, 2010.

7 Hebert, R., Lehmann, D., Tan, G., Travis, F., & Arenander, A. Enhanced EEG alpha time-domain synchrony during Transcendental Meditation: Implications for cortical integration theory. *Signal Processing* 85: 2213–2232, 2005.

phase synchrony during Transcendental Meditation between anterior and posterior brain regions. Control subjects simply resting showed no changes. These areas and frequencies enhanced during Transcendental Meditation are the ones which are degraded (as noted above) with mild Alzheimer’s dementia.

### Basic Cellular Processes—Lower Level of Free Radical Production

Two papers in this volume give evidence for a possible lower level of production of ‘free radicals’ among participants in the Transcendental Meditation programme, i.e., the effects of consciousness on the molecular level of physiology. While cross-sectional rather than longitudinal in design, comparing existing groups, these studies are compelling both because they measure a very basic biological process and because they replicate the phenomenon of study.

Free radicals are atoms or molecules with a free or unpaired single external electron. In most cases, such free radicals are highly chemically reactive, because electrons normally are paired within their orbital. When the free radical interacts with other molecules, it may strip away an electron to complete its own unpaired electron, generating another free radical and thus a sequential reaction among molecules that terminates when a molecule becomes damaged or dysfunctional due to the missing electron.

The molecules and cells that can sustain damage from free radical formation include lipids, such as low-density lipoprotein (LDL), the so-called ‘bad cholesterol’ that contributes to atherosclerosis, as well as proteins, and DNA molecules, which when disrupted can lead to cancer as well as other biological damage.

Free radical damage has been hypothesized to play a central role in the ageing process and in a variety of chronic diseases. It is further suggested that metabolic activity in the mitochondria of cells can generate reactive oxygen species that in excess may damage mitochondrial DNA and its products, leading to cell dysfunction.

Previous research has indicated that long-term participants in the Transcendental Meditation programme have lower oxidative stress, as indicated by lower lipid peroxide levels in plasma (paper **527** in Volume 7)<sup>8</sup>, independent of smoking behaviour, fat intake, and vitamin use.

The two papers in the present volume make use of a non-invasive measure, ultraweak photon emission, the data of which is at least partially indicative of free radical activity. Ultraweak photon emission, the detection of a few photons of light (less than 100 photons per square centimetre of body surface area) spontaneously radiated by the human body, requires highly sensitive detection equipment. Such photon emission is a by-product of metabolic activity, corresponding in

8 Schneider R.H., Nidich S.I., Salerno, J.W., Sharma H.M., Robinson C.E., Nidich R.J., & Alexander C.N. Lower lipid peroxide levels in practitioners of the Transcendental Meditation program. *Psychosomatic Medicine* 60: 38–41, 1998.

animal models to the wavelength spectra of lipid peroxidation processes.<sup>9</sup>

The first of these two papers (paper **606** in this volume)<sup>9</sup> compared ultraweak photon emission in a sample of long-term male participants in the Transcendental Meditation programme compared to male controls of similar age. Ultraweak photon emission was recorded from 12 locations of the torso, head, and hands. Compared to controls, the Transcendental Meditation participants had lower emission intensities at all anatomic locations, an average of 35% less. Differences from controls at the solar plexus, heart, throat, and forehead locations were statistically significant. Thus the data were consistent with the hypothesis of lower free radical production among those participating in the Transcendental Meditation programme.

The second study in this series (paper **607** in this volume)<sup>10</sup> measured ultraweak photon emission in a sample of participants in the Transcendental Meditation programme, individuals who practised another meditation technique, and non-meditating controls. Ultraweak photon emission was recorded from the same locations and under the same conditions as the previous study again with all males. The Transcendental Meditation participants had emission intensities that were 27% lower than controls, statistically significant at 8 of 12 anatomic locations. The emission intensities of the other meditation group were 17% lower than controls, significant at 1 of 12 anatomic locations. The anatomic distribution of ultraweak photon emissions was similar for the three groups. The results of this study were again consistent with the hypothesis of less free radical production associated with practice of the Transcendental Meditation programme.

### Cardiovascular Functioning

A number of randomized controlled trials demonstrate the effect of the Transcendental Meditation technique on more effective functioning of the cardiovascular system, indicating the powerful influence of consciousness upon physiological functioning.

For example, three separate meta-analyses of longitudinal randomized controlled trials have reported a reduction in systolic and diastolic blood pressure through practice of Transcendental Meditation (papers **622**, **623**, and **625** in this volume).<sup>11</sup> Two of these meta-analyses (papers

9 van Wijk, E. P.A., Lüdtke, R., & van Wijk, R. Differential effects of relaxation techniques on ultraweak photon emission. *The Journal of Alternative and Complementary Medicine* 14: 241–250, 2008.

10 van Wijk, E. P.A., Koch, H., Bosman, S., & van Wijk, R. Anatomic characterization of human ultraweak photon emission in practitioners of Transcendental Meditation and control subjects. *The Journal of Alternative and Complementary Medicine* 12: 31–38, 2006

11 Anderson, James W.; Liu, Chunxu; and Kryscio, Richard J. Blood pressure response to Transcendental Meditation: A meta-analysis. *American Journal of Hypertension* 21: 310–316, 2008.

Bai, Z.; Chang, J.; Chen, C.; Li, P.; Yang, K.; and Chi, I. Investigating the effect of Transcendental Meditation on blood pressure; A systematic review and meta-analysis. *Journal of Human Hypertension* 29: 653–662, 2015.

Rainforth, Maxwell V.; Schneider, Robert H.; Nidich, Sanford I.; Gaylord-King, Carolyn; Salerno, John

**622** and **625**) included only studies of the Transcendental Meditation technique with their control groups. The third meta-analysis (Rainforth et al., 2007, paper **623**) looked at all the randomized trials available at the time on the effects of stress reduction procedures on blood pressure, and found that the Transcendental Meditation programme was unique in its significant effect for reduction of blood pressure. This same conclusion was reached by an independent review of the effects of all behavioural procedures on high blood pressure commissioned by the American Heart Association.<sup>12</sup> The research panel found that the Transcendental Meditation technique ‘may be considered in clinical practice to lower BP’ [blood pressure]. Based on the present state of research, ‘other meditation techniques are not recommended in clinical practice to lower BP at this time’.

At the same time, randomized controlled research shows that co-morbidities to hypertension may also be influenced by the Transcendental Meditation technique. For example, a study among a sample with congestive heart failure demonstrated after six months of Transcendental Meditation, in contrast to a control group of health educations, not only increased well-being on self-report measures of depression and social functioning, but increased functional capacity as measured by physiological performance on a walking test (paper **621** in this volume).<sup>13</sup> Among those diagnosed with coronary heart disease and displaying features of the metabolic syndrome (which may contribute to heart disease, stroke, or diabetes) who learned Transcendental Meditation in contrast to a health education control group (paper **620** in this volume),<sup>14</sup> after four months they displayed not only decreased systolic and diastolic blood pressure but also decreased insulin resistance (lack of appropriate response to insulin, which over time may lead to type 2 diabetes).

Similarly, Barnes et al. (paper **611** in this volume)<sup>15</sup> studied minority high school students with high blood pressure in a four-month randomized study, comparing learning Transcendental Meditation to a health education programme, with an additional four-month follow-up

W.; and Anderson, James W. Stress reduction programs in patients with elevated blood pressure: A systematic review and meta-analysis. *Current Hypertension Reports* 9: 520–528, 2007.

12 Brook, Robert D; Appel, Lawrence J.; Rubenfire, Melvyn; Ogedegbe, Gbenga; Bisognano, John D.; Elliott, William J.; Fuchs, Flavio D.; Hughes, Joel W.; Lackland, Daniel T.; Staffileno, Beth A.; Townsend, Raymond R.; and Rajagopalan, Sanjay. Beyond medications and diet: Alternative approaches to lowering blood pressure: A scientific statement from the American Heart Association. *Hypertension*, 61: 1360–1383, 2013.

13 Jayadevappa, Ravishankar; Johnson, Jerry C.; Bloom, Bernard S.; Nidich, Sanford; Desai, Shashank; Chhatre, Sumedha; Raziano, Donna B.; and Schneider, Robert. Effectiveness of Transcendental Meditation on functional capacity and quality of life of African Americans with congestive heart failure: A randomized control study. *Ethnicity & Disease* 17: 72–77, 2007.

14 Paul-Labrador, Maura; Polk, Donna; Dwyer, James H.; Velasquez, Ivan; Nidich, Sanford; Rainforth, Maxwell; Schneider, Robert; and Merz, C. Noel Bairey. Effects of a randomized controlled trial of Transcendental Meditation on components of the metabolic syndrome in subjects with coronary heart disease. *Archives of Internal Medicine* 166: 1218–1224, 2006.

15 Barnes, Vernon A.; Kapuku, Gaston K.; and Treiber, Frank A. Impact of Transcendental Meditation on left ventricular mass in African American adolescents. *Evidence-Based Complementary and Alternative Medicine Article ID 923153*, 2012.

measurement. Students who learned Transcendental Meditation showed at follow-up a significant decrease in left ventricular mass (LVM) and a corresponding LVM measure indexed by height compared to the control group. LVM is known to increase risk for cardiac illnesses, so this finding has important implications for prevention.

The long-term practical consequences of these influences on cardiovascular health stimulated by this programme for development of consciousness, the Transcendental Meditation technique, are indicated by a randomized controlled trial by Schneider et al. (paper 627 in this volume)<sup>16</sup> in which individuals with coronary heart disease who either learned Transcendental Meditation or participated in health education were followed after an average of 5.4 years. Those who learned the Transcendental Meditation technique showed less incidence of mortality, myocardial infarction, or stroke, with 48% risk reduction.

In summary, the results of research programmes on brain processes during Transcendental Meditation, reduction of basic processes related to free radical production, and reduction of cardiovascular health problems all indicate that consciousness has a fundamental causal role on physiological processes. This should not be taken as an indication that these physiological changes, and many others like them, are the result of conscious monitoring and specific attempts to use consciousness to intervene in physiological processes. Rather, they are different aspects of a spontaneous integrated physiological response to a systematic and natural change in the state of consciousness as the individual regularly settles down through the Transcendental Meditation technique from waking awareness toward the experience of Transcendental Consciousness.

Thus, these findings clearly are evidence against the idea the consciousness is an ‘epiphenomenon’ of physiological processes that has no causal influence on those processes. The next section amplifies this point of view by demonstrating the influence of consciousness on the behaviour and psychological health of the individual.

## 2. Consciousness and Its Effect on Behaviour and Psychological Health

### Behaviour

This volume contains two studies demonstrating improved performance among secondary school students who begin the practice of Transcendental Meditation in comparison to control students. These changes in test performance and graduation rate are certainly to some degree

16 Schneider, Robert H.; Grim, Clarence E.; Rainforth, Maxwell V.; Kotchen, Theodore; Nidich, Sanford I.; Gaylord-King, Carolyn; Salerno, John W.; Kotchen, Jane Morley; and Alexander, Charles N. Stress reduction in the secondary prevention of cardiovascular disease: Randomized, controlled trial of Transcendental Meditation and health education in Blacks. *Circulation: Cardiovascular Quality and Outcomes* 5: 750–758, 2012.

indicative of improvement in cognitive factors (refer to paper 552 in Volume 7 of this series),<sup>17</sup> but because they also represent longer-term changes in motivation and consistency of intention and performance, both sets of findings can be considered under the category of behavioural effects.

A study by Nidich et al. (paper 639 in this volume)<sup>18</sup> found that among urban ‘at-risk’ middle school students who were performing below proficiency level at the start of the study, the group who learned Transcendental Meditation and practised it as part of the daily school routine, compared to control students matched for prior test score results, showed significant improvement in standardized test scores for English and mathematics.

As an extension of this same trend, Colbert and Nidich (paper 640 in this volume)<sup>19</sup> analysed matched groups of low-income senior high school students. One group was instructed in the Transcendental Meditation technique and practised as part of the school day twice daily; the other group did not. The two groups were matched on prior grade point average (class marks). Among students who had a low grade point average (below the median), students who were practising Transcendental Meditation were significantly more likely to graduate (73% vs. 48%). Among all matched subjects (high or low previous performance) those who practised Transcendental Meditation were significantly less likely to drop out of school (5% vs. 21%), and more likely to be accepted for postsecondary education (51% vs. 33%).

These studies indicate that the experience of consciousness in its pure state, through the practice of the Transcendental Meditation technique, has a practically significant positive effect on the individual’s behaviour, encompassing cognitive and motivational factors.

### Psychological Health

A series of studies in this volume document significant recovery from trauma among refugees and natural disaster victims as well as military veterans suffering from Post-Traumatic Stress Disorder (PTSD), indicating the profoundly balancing effect for mind and body of the experience of Transcendental Consciousness gained through the Transcendental Meditation technique.

For example, two series of case studies (papers 650 and 651 in this volume)<sup>20</sup> indicate

17 So, K.-T.; and Orme-Johnson, D. W. Three randomized experiments on the longitudinal effects of the Transcendental Meditation technique on cognition. *Intelligence* 29: 419–440, 2001.

18 Nidich, Sanford; Mjasiri, Shujaa; Nidich, Randi; Rainforth, Maxwell; Grant, James; Valosek, Laurent; Chang, Walter; and Zigler, Ronald L. Academic achievement and Transcendental Meditation: A study with at-risk urban middle school students. *Education* 131: 556–564, 2011.

19 Colbert, Robert D.; and Nidich, Sanford. Effect of the Transcendental Meditation program on graduation, college acceptance and dropout rates for students attending an urban public high school. *Education* 133: 495–501, 2013.

20 Rosenthal, Joshua Z.; Grosswald, Sarina; Ross, Richard; and Rosenthal, Norman. Effects of Transcendental Meditation in veterans of Operation Enduring Freedom and Operation Iraqi Freedom with post-traumatic stress disorder: A pilot study. *Military Medicine* 176: 626–630, 2011.

reduction of clinician-assessed or self-assessed symptoms of PTSD among active-duty military personnel or among military veterans. Barnes et al. (paper 652 in this volume)<sup>21</sup> followed up these observations by measuring not only a reduction of severity of symptoms after one month among military personnel who learned the Transcendental Meditation technique in comparison to matched controls, but also measured a reduction in psychotropic medication use in the Transcendental Meditation group and no change in the control group.

Two studies by Rees et al. (papers 653 and 654 in this volume)<sup>22</sup> give evidence for rapid recovery from trauma among refugees of the Congolese conflict in Uganda who began the Transcendental Meditation technique and practised it regularly as part of a relief programme. Using a standard questionnaire for PTSD symptoms, the first study found significant reduction of self-assessed symptoms at 30 and 135 days after instruction in Transcendental Meditation that were large enough to be categorized as clinically significant, compared to no decrease among a matched control group. In the second follow-up study, waitlist controls from the first study were instructed in Transcendental Meditation, and they showed a significant reduction in PTSD symptoms at 10 and 30 days after instruction, in contrast to increases in the prior 90 days.

A study of residents of two of the major cities in Japan struck by the 2011 earthquake-tsunami (paper 655 in this volume)<sup>23</sup> found that even a number of months after the trauma, residents of these cities had greater and more intense mental and physical symptoms than control subjects, but after a week of instruction and practice of the Transcendental Meditation technique those symptoms and their intensity were significantly alleviated, with the result that these residents did not differ from controls in symptom scores.

In summary, the studies of the progressive and balancing effects for behaviour and psychological health of taking the awareness in the direction of the experience of pure consciousness or Transcendental Consciousness during the Transcendental Meditation technique constitute additional evidence of the 'causal' role of consciousness, not only for physiological processes but also for the

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Barnes, Vernon A.; Rigg, John L.; and Williams, Jennifer J. Clinical case series: Treatment of PTSD with Transcendental Meditation in active duty military personnel. *Military Medicine* 178: 7:e836, 2013.

21 Barnes, Vernon A.; Monto, Andrea; Williams, Jennifer J.; and Rigg, John L. Impact of Transcendental Meditation on psychotropic medication use among active duty military service members with anxiety and PTSD. *Military Medicine* 181: 1:56, 2016.

22 Rees, Brian; Travis, Fred; Shapiro, David; and Chant, Ruth. Reduction in posttraumatic stress symptoms in Congolese refugees practising Transcendental Meditation. *Journal of Traumatic Stress* 26: 295–298, 2013.

Rees, Brian; Travis, Fred; Shapiro, David; and Chant, Ruth. Significant reductions in posttraumatic stress symptoms in Congolese refugees within 10 days of Transcendental Meditation practice. *Journal of Traumatic Stress* 27: 112–115, 2014.

23 Yoshimura, Mitsunobu.; Kurokawa, Etsuko; Noda, Takayuki; Hineno, Koji; Tanaka, Yasuo; Kawai, Yuji; and Dillbeck, Michael C. Disaster relief for the Japanese earthquake-tsunami of 2011: Stress reduction through the Transcendental Meditation technique. *Psychological Reports: Mental & Physical Health* 117: 1–11, 2015.

expression of psychological processes. This evidence thus argues against the conception of consciousness as an epiphenomenon of brain processes that cannot causally influence those processes.

It also argues against the assumption of scientific materialism that consciousness is just equivalent to, or a term for, material processes in the body. That is, although the behavioural and psychological health results reported above presumably have a physiological basis, the fact that Transcendental Meditation, a technology of consciousness, could positively impact these problems that have previously been intractable to other efforts is striking. Even if we assume that physiological changes are associated with these results, the fact that consciousness itself is the master key to creating these effects gives consciousness the leading role and takes away the explanatory power of assuming that consciousness is just a term we use to describe physical processes that give rise to specific experiences.

The principle of parsimony would suggest that consciousness is in fact more fundamental than the specific physiological processes that are associated with conscious experience. This reminds us of the earlier descriptions by Maharishi that individual consciousness has a physiological basis, but at the same time consciousness in its pure form has a more basic existence, one which is fully revealed in the highest state of consciousness, Unity Consciousness.

This postulated nature of pure consciousness or Transcendental Consciousness independent of the individual's physiology is addressed empirically by the repeatedly-replicated effects of group practice of the advanced TM-Sidhi programme on the behaviour of the whole society if the size of the group is large enough.

### 3. Consciousness and Society

A recent study reprinted in this volume (paper 659)<sup>24</sup> evaluates the effect of a large assembly of participants in the Transcendental Meditation and TM-Sidhi programme upon homicide and urban violent crime in the United States. This paper extends a series of research studies testing the prediction of Maharishi that a group numbering at least the square root of one per cent of a society participating together twice daily in the Transcendental Meditation and TM-Sidhi programme is sufficient to generate an influence of order and harmony in the whole society, even if the members of the group do not interact behaviourally in a significant way with the larger society. This research hypothesis is based on the description of pure consciousness or Transcendental Consciousness as an underlying reality that connects individuals in society even if they are at a distance from each other.

This study evaluated the change in the U.S. social parameters when due to a concerted effort and an internationally-attended assembly, the size of the group practising the Transcendental

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24 Dillbeck, Michael C.; and Cavanaugh, Kenneth L. Societal violence and collective consciousness: Reduction of U.S. homicide and urban violent crime rates. *Sage Open* 6(1), 2016. doi: 10.1177/2158244016637891

Meditation and TM-Sidhi programme together at Maharishi University of Management in Iowa, in the U.S., quickly increased three-fold to be larger than the square root of one per cent of the U.S. population, a number virtually maintained or exceeded from January 2007 until December 2010, the last date at which monthly crime data was available at the time the study began. Using the baseline period 2002–2006, time series regression intervention analysis found that the rising trend of homicide rate of the baseline period was reversed during the experimental period, with a total drop in the national homicide rate of 21.1% over the four-year experimental period, or 5.3% per year. Correspondingly, there was a drop of 18.5% in the U.S. urban violent crime rate from a flat trend in 2002–2006, or a decline of 4.6% per year.

Another study in this volume (paper **658**)<sup>25</sup> responds to a critique of an earlier study (paper **333** in Volume 4 of this series)<sup>26</sup> and demonstrates by a series of statistical analyses that improvements in a multivariate index of quality of life in Israel during an experiment in 1983 in which a large group of Transcendental Meditation and TM-Sidhi programme participants was assembled, are independent of background political/cultural events that occurred at the time.

Such sociological studies give powerful empirical constraints on possible conceptions of consciousness. They are evidence for a characteristic of consciousness that is interpersonal and independent of behavioural interaction. As such, these studies clearly are evidence against the materialistic as well as the ‘epiphenomenon’ conceptions of consciousness.

At the same time, these studies suggest a clear possibility for creating a more ideal and invincible society, free from violence and turbulence, and an action plan for creating that state. This principle may be applied to any society and culture with predictable results.

We now turn to a theoretical approach to consciousness in light of Maharishi Vedic Science which considers the consequences of assuming that consciousness, rather than matter, is all that there is—that subjective experience is the most basic reality.

#### 4. Consciousness and Reality

In a theoretical paper (paper **660** in this volume)<sup>27</sup> Dr. Tony Nader (Maharaja Adhiraj Raja Raam) considers the perspective that consciousness has a ‘constitutive’ reality, i.e., that consciousness is all that there is. (Please refer to the earlier discussion of Maharishi’s principle, ‘knowledge is structured in consciousness’.) In light of the different experiences of reality associated with

25 Orme-Johnson, David W.; and Oates, Robert M. A field-theoretic view of consciousness: Reply to critics. *Journal of Scientific Exploration* 23: 139–166x, 2009.

26 Orme-Johnson, David W.; Alexander, Charles N.; Davies, John L.; Chandler, Howard M.; Larimore, Wallace E. International Peace Project in the Middle East: The effects of the Maharishi Technology of the Unified Field. *Journal of Conflict Resolution* 32:776–812, 1988.

27 Nader, Tony. Consciousness is all there is: A mathematical approach with applications. *International Journal of Mathematics and Consciousness* 1: 1–65, 2015.

the seven states of consciousness brought to light by Maharishi in his Vedic Science, it was pointed out that the concepts of ontology (nature of reality) and epistemology (knowledge) are not independent of each other. Thus, if one were to speak of an essential nature of reality, it would have to be in reference to the highest state of consciousness, Unity Consciousness, since the progression of human development leads to this state. The paper by Dr. Nader addresses this essential nature of reality and consciousness as they are revealed from the perspective of Unity Consciousness, but the logical development of Dr. Nader’s ideas assumes only that the reader is in waking state of consciousness. The paper does this by taking a logical-mathematical approach, using symbolic notation to clarify the meaning.

This paper proposes that the postulate that only consciousness has existence, and that this perspective is sufficient to describe the experience in each of the seven states of consciousness. The corresponding mathematical notation is also valuable for describing how consciousness can give rise to material existence, and other concepts of Maharishi Vedic Science.

#### Conclusion

To summarize the discussion of the implication of the papers in this volume for current concepts of consciousness, the conception that consciousness exists but as an epiphenomenon of physiological processes is clearly not supported by the research on the Transcendental Meditation technique, which shows a causal influence of the experience of Transcendental Consciousness on physiological and psychological processes.

Likewise, this research as well as the effect of the advanced TM-Sidhi programme on the behaviour of an entire society are evidence against a view that consciousness does not really exist—that only matter exists—and consciousness is just another name for certain brain processes (materialistic monism).

In fact, the research on the effects of the group practice of the TM-Sidhi programme supports the Vedic conception that pure consciousness has an existence that is independent of experiences of consciousness of specific objects, and independent of human behavioural interactions.

At the same time, this research offers a practical scientific programme for reducing violence and enriching the quality of life in any society.

We are uniquely fortunate to be living in a scientific age with the knowledge of enlightenment from Maharishi Vedic Science, so that both can proceed simultaneously and systematically—the development of our subjective experience and our physiological functioning towards Unity Consciousness, and the scientific knowledge of the impact of that subjective development upon all dimensions of life, so that individuals can grow in enlightenment as societies grow in freedom and invincibility.