

## Transcendental Meditation in the Treatment of Mental and Physical Conditions

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### Abstract and Keywords

The Transcendental Meditation technique (TM) is a process of transcending from the active mind to the silent mind, creating a feeling of well-being that many people describe as blissful. As the mind settles, the body becomes deeply rested, as indicated by reductions of physiological stress markers. The meditator typically experiences expanded inner awareness, which corresponds to marked slowing of the breath and increased brain wave (EEG) coherence, a measure of brain integration that is associated with higher levels of creativity. This chapter reviews work on the effects of TM in major areas of human functioning such as physical and psychological health, considers its impact on behavior, and examines some of the processes through which TM has its effects. The literature suggests that regular TM practice can help defuse the stresses and strains accrued during the day. Through regular practice, the body begins to function in a more stress-free, efficient, and resilient way outside of meditation. Well-controlled studies indicate that TM results in improvements in physical health (e.g. it reduces hypertension and cardiovascular disease), and psychological health (e.g. it reduces anxiety, depression, and anger), as well as influencing people's behavior (e.g. reductions in drug, alcohol, and cigarette use, as well as in recidivism).

Keywords: Transcendental Meditation, stress reduction, cardiovascular disease, medical care utilization, PTSD, post-traumatic stress disorder, anxiety, depression, prison recidivism, substance abuse

### Introduction

The Transcendental Meditation (TM) technique has its roots in the ancient Vedic tradition of India and was introduced to the West in the 1950s by Maharishi Mahesh Yogi (Maharishi Mahesh Yogi, 1963, 1969). It has been taught in a standardized way worldwide since then, and there are now about ten million practitioners (Forem, 2012; Roth, 2018). The standardization of TM has facilitated research on it, and there are currently over 675 studies on it conducted at over 250 universities and research centers in thirty countries and published in over two hundred peer-reviewed journals. This body of research has

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been anthologized in seven volumes of collected papers on TM (Orme-Johnson & Farrow, 1977; Chalmers, Clements, Schenkluhn, & Weinless, 1989; Wallace, Orme-Johnson, & Dillbeck, 1990; Dillbeck, 2011; Dillbeck, Barnes, Schneider, Travis, & Walton, 2013).

This chapter reviews work on the effects of TM in major areas of human functioning such as physical and psychological health, considers its impact on behavior, and examines some of the processes through which TM has its effects. However, it also has some omissions. Discussion of work on the “Maharishi effect,” where it has been shown that groups of people meditating together can have marked influences on various societal indices including infant mortality and violent crime (Cavanaugh & Dillbeck, 2017a, 2017b; Dillbeck & Cavanaugh, 2016, 2017; Hagelin et al., 1999), is beyond the scope of the chapter. So also is work by Alexander and colleagues integrating Maharishi’s descriptions of the stages of enlightenment from the ancient Vedic tradition of India with concepts of higher levels of mental health and cognitive development as conceptualized in contemporary psychology (Alexander, Druker, & Langer, 1990; Alexander, Davies, et al., 1990; Alexander, Heaton, & Chandler, 1994; Orme-Johnson, Zimmerman, & Hawkins, 1997; Orme-Johnson, 2000; Dillbeck, 1983, 1990).

## What Is the Transcendental Meditation Technique?

There are many definitions of the word “meditation.” For TM practitioners, meditation means transcending or going beyond the thinking level of the mind, hence the name “Transcendental” Meditation. During TM, one sits comfortably for about twenty minutes and silently repeats a mantra or sound as taught by the teacher, which allows the mind to settle down to quieter levels. The TM mantras are ancient traditional sounds from the Vedic tradition of India, which are said to have beneficial effects on all levels of the mind. They were handed down by Maharishi on behalf of the tradition to the TM teachers who, also on behalf of the tradition, pass them on to the TM students.

Whereas other types of mantra meditations focus on the meaning of the mantras, an important feature of TM is that the mantras do not have a meaning. They are not Sanskrit words; they are just sounds. Their purpose is to keep the mind lively but undirected, because in that condition attention is effortlessly drawn to inner silent levels of the mind. Maharishi explains: “The manner in which Transcendental Meditation takes the mind from the gross to the subtle is very simple and based upon the innate tendency of all human minds to seek happiness. The very nature of the mind is to go to a field of greater happiness. The happiness referred to is not pleasure, nor sensual gratification, nor excitement, but a tranquil and confident state of knowing—of knowing that *‘I am,’* of knowing that *‘I’* exist and that it is permanent and unchanging” (Maharishi Mahesh Yogi, 2013).

The Transcendental Meditation technique can only be learned from a certified teacher and not from a book or on the internet because learning it requires an interaction between the teacher and the student and instruction proceeds according to what the stu-

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dent experiences. Teachers of Transcendental Meditation are highly trained and certified, guaranteeing that instruction is standardized worldwide, which has protected its effectiveness and facilitated research on it. It is taught in a standard seven-step course, typically over four consecutive days (Forem, 2012).

This technique can be practiced anywhere, even on a bus or in a noisy airport, but a quiet place is preferable. One only needs a comfortable chair. It does not require any faith or belief in it for it to work. It works even for skeptics. In fact, it is better to approach it innocently, with no preconceptions about what is supposed to happen. As the mind settles down, the body settles down, and the person typically reports experiencing deep relaxation. Exactly what happens during meditation depends on the condition of the body. If one is fatigued, one might fall asleep. Thoughts inevitably arise, and the meditator is taught how to deal with them, and not to struggle against them or against noise. There is no concentration or control of the mind involved in TM, which distinguishes it from most other meditation techniques.



*Figure 1.* Photo taken in Fiuggi Fonte, Italy, June 1972. From left to right are Peggy and Dr. Vincent Snell, national directors of the TM organization in the United Kingdom, Dr. David Orme-Johnson, and Dr. Keith Wallace, who had recently published his research on the physiological effects of TM in *Science* (Wallace, 1970a). I was explaining to Maharishi about my research showing TM increases stability of the autonomic nervous system, which regulates emotional and motivational responses.

## Cultural Background

In the Vedic literature from which TM is derived, the state of deep inner peace has been variously called pure consciousness, transcendental consciousness, the Self, *samādhi*, *atman*. In the Vedic literature, Patañjali's *Yoga Sūtras* described pure consciousness as yoga, the union of the individual mind with the cosmic mind. It describes how this union is achieved as:

*Yogaś citta-vṛtti-nirodhaḥ*

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*yogaḥ* union, transcendental consciousness, *citta* mind. *vrtti* activity, *nirodhaḥ* complete settling, cessation

Yoga is the complete settling of the activity of the mind. (2)

TM is seen as a means to achieve this end (Egenes, 2010).

According to the Vedic tradition, pure consciousness is the fourth major state of consciousness, different from waking, dreaming, and sleeping. For example, the *Māṇḍūkya Upaniṣad* 7 states: “The fourth condition is Atman in his own pure state. It is neither outer nor inner consciousness, neither semi consciousness, nor sleeping consciousness. It cannot be seen or touched. It is above all distinctions, beyond thought, ineffable. In the union with him is the supreme proof of his identity. It is peace and love” (Mascaro, 1965; see also Katz & Egenes, 2015).

### Differences between Meditation Techniques

Scientifically, TM is called automatic self-transcending because it is an effortless, automatic process by which the mind transcends or goes beyond the technique itself. That is, it goes from effortless thinking of the mantra to silence. This process is associated with a brain wave (EEG) frequency of 8–10 cycles per second (Hz), called Alpha1, which is seen during *restful alertness*, the state when the mind is resting but wide awake inside (Travis & Shear, 2010). Studies have shown that during specific periods of pure consciousness the breath markedly slows and the brain becomes globally coherent, as indicated by increased EEG coherence among all cortical areas in all frequency bands (Badawi, Wallace, Orme-Johnson, & Rouzeré, 1984; Farrow & Hebert, 1982; Travis, 2001, 2004), which suggests a high level of global integration in the brain.

Meditation techniques that require focused mental activity have different physiological effects. Non-reactive monitoring of one’s thoughts, as in some mindfulness (Open Monitoring) techniques, are associated with theta EEG (2–7 Hz), characteristic of that kind of mental activity. Focused Attention meditation, voluntarily focusing attention on a chosen object, is associated with gamma EEG (20–50 Hz), a frequency band generally known to correlate with focusing attention (Travis & Shear, 2010).

## Areas of TM Research Not Reviewed in This Chapter

The reader may be interested to know that Alexander and colleagues have integrated Maharishi’s descriptions of the stages of enlightenment from the ancient Vedic tradition of India with concepts of higher levels of mental health and cognitive development as conceptualized in contemporary psychology (Alexander, Druker, & Langer, 1990; Alexander, Davies, et al., 1990; Alexander, Heaton, & Chandler, 1994; Orme-Johnson et al., 1997; Orme-Johnson, 2000; Dillbeck, 1983, 1990). Maharishi described the growth of enlightenment in terms of seven states of consciousness, of which waking, dreaming, and sleeping

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are the first three, the four others being a sequence of higher states of consciousness (Maharishi Mahesh Yogi, 1963, 1969). This is the general theoretical framework from which specific research hypotheses for TM research were derived.

Another body of research studies beyond the scope of the present chapter is on collective consciousness. According to the Vedic tradition, everyone and everything is interconnected by a common universal field of consciousness. Consequently, when we directly experience pure consciousness, a positive influence on others is radiated throughout the field. There have been over fifty studies showing that when the TM technique and its advanced program, the TM-Sidhis, including Yogic Flying, are practiced in a group of at least the  $\sqrt{1}$  percent of a population, they produce beneficial changes in the larger society. For example, four recent studies in the United States have shown that when such a group was formed in Iowa, there were simultaneous reductions in national rates of violent crime, motor vehicle fatalities, other accidental deaths, infant mortality, and drug-related deaths, which could not be explained by other events at the time (Cavanaugh & Dillbeck, 2017a, 2017b; Dillbeck & Cavanaugh, 2016, 2017; Hagelin et al., 1999). Other studies have reported reductions of armed conflict and terrorism, as well as improved cooperation among nations acting as a whole when the requisite size groups are created (Orme-Johnson, Alexander, Davies, Chandler, & Larimore, 1988; Orme-Johnson, Dillbeck, & Alexander, 2003; Davies & Alexander, 2005; Orme-Johnson, 2016). It has been pointed out that these studies are not random assignment, which would be ideal (Kreplin, Farias, & Brazil, 2018). However, to put it in context, there have never been any random assignment studies in the entire history of social science on the level of cities, states, nations, and the world like the TM research. Moreover, this is the only body of experimental research on conflict resolution that has created groups in conflict areas to successfully reduce armed conflict, with changes in objective, publicly available social indicators (Orme-Johnson, Alexander, & Davies, 1990; Hagelin et al., 1999). In the tradition of naming scientific discoveries after their founder (e.g., the Meissner Effect, the Doppler Effect), this discovery was named the Maharishi Effect after Maharishi Mahesh Yogi.

## The Transcendental Meditation Technique and Physical Health

The basic rationale for TM's effects on health is that stress adversely affects virtually all areas of health, and TM reduces stress, as measured by many physiological and neurohormonal parameters. During TM the body gains deep rest like sleep, but the mind maintains inner awareness. Thus, the TM state is called *restful alertness* (Wallace, 1970b, 1972; Wallace, Benson, & Wilson, 1971). Compared to just sitting with eyes closed resting, TM produces greater reductions of physiological stress markers, suggesting that it may have additional healing properties not afforded by ordinary forms of rest (Dillbeck & Orme-Johnson, 1987). A recent neuroimaging study reinforces earlier findings that TM produces restful alertness (Mahone, Travis, Gevirtz, & Hubbard, 2018; see Table 1).

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Table 1. Decreased Physiological Indices of Stress

Authors	Study Design	Results
Wallace, 1970a, 1972; Jevning, Wallace, & Biedebach, 1992; Wallace et al., 1971	<b>Physiological changes</b> during TM compared to eyes closed baseline in the same subjects.	Significant decreases in oxygen consumption, CO <sub>2</sub> elimination, minute ventilation, respiratory rate, heart rate, plasma lactate, with no change in PO <sub>2</sub> or pCO <sub>2</sub> . Increased basal skin resistance and increased alpha1 (8-9 Hz) EEG power, indicating a state of restful alertness.
Dillbeck & Orme-Johnson, 1987	<b>Meta-analysis of physiological changes</b> during TM compared to sitting resting eyes closed, 32 studies.	During TM, strong to moderate effects on decreasing basal skin resistance, respiratory rate, and plasma lactate. Outside of TM, moderately lower stress indicators: spontaneous GSR, heart rate, plasma lactate, and respiratory rate.
Mahone et al., 2018	<b>Functional Magnetic Resonance Imaging (fMRI) study:</b> Changes during TM compared to ordinary resting eyes closed in long-term TM meditators.	Increased blood flow in areas associated with awareness and attention (anterior cingulate and dorsolateral prefrontal) and reduced blood flow in areas associated with somatic arousal (pons and cerebellum).

### Cardiovascular Health

By far the most extensive TM research using the gold standard of randomized controlled trials (RCTs) has been on cardiovascular disease, spearheaded by Robert Schneider and Charles N. Alexander (Alexander, Langer, Newman, Chandler, & Davies, 1989; Schneider et al., 1995; Alexander et al., 1996). Cardiovascular disease is the leading cause of death

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in the United States and the world (Mackay, Mensah, Mendis, & Greenland, 2004). One of the principle risk factors for it is psychosocial stress, which is directly addressed by TM.

Most of the studies on heart disease have compared TM with health education (HE) classes as a control treatment. Like TM, HE subjects were presented with research on the health benefits of diet, exercise, and other health recommendations so that their expectations were similar to the TM group. The studies also typically have made the TM and HE groups equivalent on the amount of attention given to the subjects by the therapists, the teaching environments, and by the course schedule and contact time with the instructors. To further ensure that the studies were as objective as possible, the attending physicians and the personnel collecting the data did not know which group the subjects were in. In all studies, TM was an adjunct to standard treatment, with all participants continuing with their usual medical care.

### **Blood Pressure**

There are nine randomized controlled trials using TM as a treatment for blood pressure, with subjects ranging from adolescents to eighty-one-year-olds (Anderson, Liu, & Kryscio, 2008). Thirty percent of American adults have high blood pressure, and 45 percent of coronary heart disease deaths and 51 percent of stroke deaths are attributable to it (Stevens, Mascarenhas, & Mathers, 2009). The mechanism for how TM affects blood pressure is by reducing stress. One of the potential biological mechanisms through which TM lowers stress is by reducing beta-adrenergic receptor sensitivity (Mills, Schneider, Hill, Walton, & Wallace, 1990) and levels of vanillylmandelic acid, indicating reduced turnover of the major stress hormones norepinephrine and epinephrine. This may contribute to decreased contractility of the vascular smooth muscles, thus allowing blood to flow more freely at lower pressures and reducing the risk of heart disease (Walton & Pugh, 1995). In support of this hypothesis, studies have shown that both total resistance to blood flow in the body and blood pressure decrease during TM, suggesting an underlying hemodynamic mechanism for TM's protective effects on the heart (Barnes, Treiber, Turner, Davis, & Strong, 1999).

A systematic review and meta-analysis of the effects of stress reduction programs on hypertensive patients evaluated high-quality studies that used active controls, adequate baseline measurement, and blood pressure assessment by professionals who didn't know which group the patients were in. The Transcendental Meditation technique significantly lowered systolic/diastolic blood pressure, while the blood pressure decreases associated with biofeedback, relaxation-assisted biofeedback, progressive muscle relaxation, and stress management training were not statistically significant (Rainforth et al., 2007; see Table 2). Significant reductions of blood pressure by TM have been corroborated by other systematic reviews and meta-analyses, and its results are clinically meaningful (Anderson et al., 2008; Bai et al., 2015). One study, which needs to be replicated, found that TM also reduced the use of blood pressure medication (Schneider, Alexander, Staggers, Orme-Johnson et al., 2005a). A scientific review by the American Heart Association found the Transcendental Meditation technique to be the only meditation practice that has been

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shown to lower blood pressure and concluded that physicians could recommend TM in treatment plans for all individuals with blood pressure higher than 120/80 mm Hg (Brook et al., 2013).

A series of studies by Barnes and colleagues have explored the potential of TM for prevention by offering it to adolescents at risk for heart disease (Barnes, Bauza, & Treiber, 2003; Barnes, Treiber, & Davis, 2001; Barnes, 2004; Barnes, Johnson, & Treiber, 2009; Barnes, Kapuku, & Treiber, 2012; Barnes & Orme-Johnson, 2006). A study of adolescents found that two months of TM practice improved their blood pressure, heart rate and cardiac output responses to stress tests (Barnes et al., 2001). These findings suggest that TM practice may help protect from the detrimental effects of exaggerated cardiovascular stress reactivity. Other well-controlled studies on heart disease shown in Table 2 indicate that TM shows promise for helping to unblock arteries (carotid atherosclerosis), reducing or preventing enlargement of the heart (left ventricular hypertrophy), reducing insulin resistance and other parameters of metabolic syndrome, and restoring functionality to people whose hearts do not supply enough blood to their bodies (congestive heart failure).



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Table 2. Cardiovascular Health

Authors	Study Design	Results
Rainforth et al., 2007	Blood Pressure systematic review and meta-analysis of RCTs on five stress reduction programs on hypertensive patients evaluating high-quality studies using active controls, adequate BP baseline measurement, and blinded BP assessment.	Seventeen trials with twenty-three treatment comparisons and 960 participants with elevated BP met the study criteria, with six TM studies. TM significantly lowered SBP/DBP by 5.0/2.8 mm Hg. No BP decreases were associated with biofeedback, relaxation-assisted biofeedback, progressive muscle relaxation, or stress management training.
Barnes et al., 2001	Cardiovascular Reactivity: RCT of cardiac function during stress tests of adolescents at risk for heart disease, mean age 16, TM vs. HE controls, two-month intervention	TM subjects exhibited significantly greater decreases from pre- to post-intervention in SBP, heart rate and cardiac output reactivity to a simulated car-driving stressor, and reduced SBP reactivity to a social stressor interview compared to the control group.
Castillo-Richmond et al., 2000	Carotid Atherosclerosis: RCT on hypertensive patients (mean age 55), TM vs. HE, six-to-nine-month intervention.	Significant decrease in carotid artery blockage in TM subjects compared to controls, indicating TM reduces carotid atherosclerosis.

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Kondwani et al., 2005; Salerno et al., 2004	Left Ventricular Hypertrophy: RCTs on hypertensive patients (mean age 53), TM vs. HE. one year and seven months intervention.	In one study, the TM group showed decreases in their enlarged hearts, whereas the controls subjects did not decrease. In the second study, the TM subjects' hearts did not change while the control subjects' hearts continued to enlarge over the same period of time.
Paul-Labrador et al., 2006	Metabolic Syndrome: RCT on stable coronary heart disease (CHD) inpatients (mean age 67), TM vs. HE, sixteen-week intervention.	Use of TM for sixteen weeks in CHD patients found improved blood pressure and insulin resistance and other components of the metabolic syndrome, as well as improved cardiac autonomic nervous system tone compared with controls.
Jayadevappa et al., 2007	Congestive Heart Failure (CHF): RCT of CHF patients, (mean age 64), TM vs. HE, six-month intervention.	The TM group significantly improved on functional capacity on a six-minute walk test compared with control subjects who received only HE. TM subjects also had reduced depression.
(Zamarra et al., 1996)	Myocardial Ischemia: Controlled trial of patients with coronary artery disease and symptoms of angina, mean age 55, TM vs. WLC, 7.6-month intervention.	The cardiac response during a standard exercise protocol for TM subjects compared to controls showed reduced workload of the heart, as measured by reduced oxygen demand, increased maximum workload the patient could tolerate before angina symptoms occurred, and delayed appearance of electrocardiographic abnormalities.

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Barnes et al., 2005; Schneider Schneider, Alexander, Stagers, Rainforth, et al., 2005	Mortality: A pooled analysis of the results from two randomized trials of TM in subjects with high blood pressure used meta-analysis of individual patient data (N = 202) to compute mortality risk.	At a mean follow-up of $7.6 \pm 3.5$ years, the TM group showed a 30 percent decrease in the rate of cardiovascular mortality and 23 percent risk reduction for all-cause mortality compared to HE and relaxation controls. The relative risk for cardiovascular disease (risk of the experimental group divided by risk of the control group) was 0.70, and the relative risk of all-cause mortality was 0.77.
Schneider et al., 2012	Heart Attacks, Strokes, and Death: RCT of patients with coronary artery disease (mean age 59), TM vs. HE, 5.4 year mean follow-up.	Compared to controls, for all subjects the TM technique had 48 percent lower rates of a combined endpoint of all-cause mortality, nonfatal heart attacks, and nonfatal strokes. Mean regularity of TM practice was 61 percent, a little over once a day.

BP = Blood Pressure, SBP = Systolic Blood Pressure, DBP = Diastolic Blood Pressure, RCT = Randomized Controlled Trial, Hg = Mercury, TM = Transcendental Meditation technique, HE = Health Education, WLC = Waitlist Control, CHF = Congestive Heart Failure

## Attention-Deficit/Hyperactivity Disorder and Human Immunodeficiency Viruses

Table 3 shows pilot studies indicating that TM may be effective for treating attention-deficit/hyperactivity disorder (ADHD), a chronic condition marked by persistent inattention, hyperactivity, and sometimes impulsivity that plagues so many of our children and adults. Another promising area in research indicates that TM increases mental and physical health in patients with human immunodeficiency virus (HIV), a virus that attacks the body's immune system, which can lead to acquired immunodeficiency syndrome (AIDS), the most severe phase of HIV infection that weakens the body's ability to fight infection (see Table 3).

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Table 3. Other Health Conditions

Authors	Study Design	Results
Grosswald, Stixrud, Travis, & Bateh, 2008; Travis, Grosswald, & Stixrud, 2011	ADHD: Pilot study followed by pilot RCT on ADHD students, 11-14 years, TM vs. delayed-start controls, three and six month post-test. Controls learned TM after three months and were tested at six months.	The pilot study found significant reductions in stress, anxiety, and improvements in ADHD symptoms and executive function. The RCT found three months' TM practice resulted in improvements in brain measures of ADHA (theta/beta ratios, increased theta coherence) and increased letter fluency. The delayed-start group similarly had changes at the six-month post-test, after they practiced TM for three months.
Chhatre et al., 2013	HIV: RCT on persons with HIV, age $\geq 18$ years, TM vs. HE, six-month intervention.	Vitality, mental health, depression, social function, physical well-being and general health showed improvement in the TM group compared to controls. Evidence suggests immune activation stabilization.

ADHD = Attention-Deficit/Hyperactivity Disorder, HIV = Human Immunodeficiency Viruses

## Health Insurance Statistics

Studies of health insurance data have their advantages and disadvantages. The main disadvantage is self-selection, as the subjects have chosen to learn meditation, and this opens the possibility that such people may already be healthier than the general population or different on some other parameters that may confound the outcomes. The advantage of randomized controlled studies is that out of a pool of all people who are willing to try meditation, some are randomly assigned to a control group to either delay starting or to receive some other program, such as health education, that they perceive may be beneficial to them.

An advantage of studies on health insurance statistics is that they are blinded. That is, neither the people who learn to meditate, the people who collect the data, nor even the researchers know that the information collected is part of a study until after the data is

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all in. These data are likely to be accurate as they are part of financial accounting, and the data are available from independent agencies—the health insurance businesses. Such studies also have the advantage of being inexpensive to do on large numbers of people over many years, as they behave in their natural environment, choosing to meditate, organizing to learn it, paying for it themselves, and practicing it in their homes.

Table 4 shows a series of large studies of TM's effects on health insurance statistics. Herron and colleagues conducted a series of longitudinal studies on data on physician's payments collected from the government health insurance agency for Quebec, Canada. Fourteen years of data were collected for 1,418 people who had learned TM compared to a random sample of 1,418 people of the same age and habitation, half men and half women in each group. The data went back eight years before the TM group learned to meditate so that the TM group and controls could be compared *before* TM began. In addition, there were six years of data after the TM practice began, so TM and controls could be compared *after* TM commenced. The results showed that before learning TM, the TM and control groups were similar, indicating that before they learn to meditate, people who learn TM are not different from other people on how much they spend on health, suggesting that they have equivalent sickness rates. However, *after* learning TM, the medical expenses of the TM group began to decrease relative to controls every year by 14 percent per year. Subgroup analyses of 142 high-cost people and 163 elders over sixty-five years old show very similar results, approximately 14 percent reductions per year through TM practice compared to controls.

Table 4 also gives the results of a five-year study of Blue Cross insurance statistics showing that TM participants had reduced rates of hospitalization compared to normative data or matched controls across all disease categories and age groups, with the largest reductions for the older age group, who showed 69 percent fewer hospitalizations and 74 percent fewer doctor visits. Hospital admission rates for the TM group for diseases of the cardiovascular system, which include hypertensive disease, ischemic heart disease, coronary heart disease, angina, atherosclerosis, congestive heart failure, heart attacks, stroke, and aneurysm, were a mean of 87.3 percent lower than the norm over the five years. Other notable statistics were that hospitalization rates for the TM group were 55 percent less for cancer, 87 percent less for diseases of the nervous system, and 65 percent lower for metabolic diseases (Orme-Johnson, 1987).

A second study of Blue Cross data in Table 4 shows the results of medical utilization rates for the employees of an academic institution in Iowa (Maharishi International University, 693 members) who practiced TM and other Maharishi Ayurveda (MAV) natural health care modalities. Controls were equivalent on profession, age distribution, gender (about half males and half females in each group), climate, and geographic location. All three groups had similar insurance factors that could influence utilization (Orme-Johnson & Herron, 1997). Reductions in utilization were even greater than the previous study of TM alone, showing an 80 percent lower overall rate of hospitalization, with 66 percent less for benign and malignant tumors, 92 percent less for cardiovascular disease, 93 percent less for all infectious diseases, 92 percent less for all mental disorders, and 76 percent

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less for diseases of the nervous system. This suggests that the additional Ayurvedic modalities added health protective value to TM. Nine years of data were available for this study, which showed average reductions of 55 percent less for outpatient visits, 74 percent less for hospitalization, and 63 percent less for medical expenditures in the TM plus MAV group compared to the norm.

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Table 4. Medical Care Utilization

Authors	Study Design	Results
Herron & Hillis, 2000; Herron & Cavanaugh, 2005; Herron, 2011	Medical Care Expenses: fourteen-year study of Quebec statistics of the general population for 1,418 TM and 1,418 matched controls for eight years before the TM group learned TM and six years after.	For all subjects, the medical expenditures of the TM and control groups were increasing at a similar rate during the 8 years before TM began. After TM began, the expenditures for the TM group began to decrease by 14 percent per year relative to controls. Similar findings were found for the subgroup of elders over sixty-five and for high-medical-cost people.
Orme-Johnson, 1987	Medical Care Utilization: A five-year study comparing Blue Cross insurance statistics for a TM group (average over 5 years, 1,468) with normative data (N ≈ 600,000) and controls matched for age, profession (N = 22,440).	The TM group compared to the norm and controls had reduced rates of hospitalization across all disease categories and age groups. The largest decreases were for TM participants over forty, who had 69 percent less hospitalization than the norm, compared to younger people, who had only 50 percent less. Similarly, outpatient visits were 74 percent less than the norm for TM participants over forty compared to 55 percent less for younger TM.

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Orme-Johnson & Herron, 1997	Medical Care Utilization: An eleven-year study of Blue Cross insurance statistics on a group of 695 practicing TM plus other Maharishi Ayurveda modalities compared with normative data and controls matched for age, profession, and geographic region (N = 4,148).	This study replicated the results of the previous study of TM on medical care utilization, finding reduced hospitalization across all disease categories and age groups, with the largest decreases in hospitalization for the older subjects (-88 percent) relative to the norm and controls. Over all nine years of the study the TM group consistently showed reduced hospitalization by 74 percent, reduced outpatient visits by 55 percent, and reduced medical expenditures by 63 percent. TM had the strongest effects on more serious health issues that required hospitalization.
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The conclusion from these long-term health insurance studies and the 5.4 year study on heart attacks, strokes, and death is that TM reduces sickness rates and medical expenses by 10 percent to 14 percent per year, with the caveat that more large well-designed randomized controlled studies are needed to replicate these results.

## The Transcendental Meditation technique and Psychological Health

Beginning in 1971, a series of promising studies were published on the effects of the TM technique on psychiatric patients, which were conducted at the Institute of Living, a leading residential psychiatric facility in Hartford, Connecticut (Glueck & Stroebel, 1975a, 1975b, 1984; Stroebel & Glueck, 1978). Stroebel & Glueck, 1978 wrote: "Clinical outcome data comparing TM patients and their matched controls receiving just the usual hospital treatment plan overwhelmingly favoured the TM group by whatever measure has been evaluated (condition on discharge, MMPI admission-discharge difference scores, daily automated nursing-note evaluation of psychopathology, decrease in medication for insomnia, etc., with TM versus matched control group p values ranging from .05 to .001 using t tests and chi-square tests of significance, as appropriate)." p. 413.

Also in the 1970s, an epidemiological study by the Swedish government found that the rate of mental health problems among the 35,000 people in the country who practiced the Transcendental Meditation technique was one hundred to two hundred times lower than



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the general population. Questionnaires were sent to 182 psychiatric care units in Sweden, including 133 hospitals and forty-nine polyclinics. It was found that whereas the total incidence of psychiatric hospital care was 1:20 for the whole population of Sweden, the incidence for the subpopulation of 35,000 TM meditators in Sweden was 1:3,500. This government-sponsored study provided strong evidence that the TM program is beneficial to mental health (Ottoson, 1977; Suurkula, 1977).

Similarly, our large health insurance studies in the United States have found 30 percent lower rates than the norm of hospitalization for the category of all mental disorders for TM subjects (Orme-Johnson, 1987) and 92 percent lower for the study where the subjects practiced other Ayurvedic modalities in addition to TM (Orme-Johnson & Herron, 1997). A major systematic review and meta-analysis reported that no safety concerns were raised in a report examining 813 studies of meditation practices for health, including the TM technique (Ospina et al., 2008). Similarly, other systematic reviews and meta-analyses have found no adverse effects of meditation reported in the studies they reviewed (Brook et al., 2013; Orme-Johnson & Barnes, 2013; Ospina et al., 2008; Sedlmeier, Eberth, Schwarz, Zimmermann, & Haarig, 2012). These findings support the safety and the potential efficacy of TM and other meditation practices for treating physical and mental problems.

### **Trait Anxiety**

“Trait” anxiety means how anxious a person generally is, whereas “state” anxiety refers to how anxious a person is at a particular time, such as at this specific moment. A meta-analysis of trait anxiety on 146 independent outcomes for various meditation and relaxation techniques found that the TM program had moderate to strong effects on reducing anxiety in a wide variety of populations. This conclusion was upheld in subgroup analyses that controlled for potential confounding variables, including mental health status of the population, age, gender, strength of experimental design, attrition, treatment duration and hours of treatment, pretest anxiety, and expectation effects. It is noteworthy that studies comparing TM with alternate treatments published by authors with neutral or negative attitudes toward TM had strong effects (Eppley, Abrams, & Shear, 1989). Two other meta-analyses have also reported that the size of the effects for TM are no larger in studies conducted by researchers who practice TM and/or who are affiliated with any Maharishi organization than studies by independent researchers and institutions (Orme-Johnson & Barnes, 2013; Orme-Johnson & Dillbeck, 2014). This suggests there is no author or institutional bias in the TM research.

It is noteworthy that one review of sixteen randomized studies on TM found that its effects on anxiety ranged widely, from no effect to strong effects. This heterogeneity was found to be due to how anxious the subjects were initially. For people who are not anxious to begin with, meditation does not reduce their anxiety, which would be expected. However, for highly anxious populations, such as veterans suffering from PTSD or prison inmates, TM produced large reductions in anxiety, which could not be accounted for by regression toward the mean (Orme-Johnson & Barnes, 2013).

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A meta-analysis of randomized controlled trials with active or attention controls on clinical or “stressed” adult populations located only two studies on TM and trait anxiety and reported it had nil effects (Goyal et al., 2014). A rebuttal article located six randomized controlled trials comprising 308 subjects meeting the study’s criteria, which, like other meta-analyses, found that TM significantly reduces anxiety. Of the two nil-effect studies, one was on patients with below-average initial anxiety, so no reduction would be expected, and in the other both TM and the active control were highly effective in reducing anxiety compared to a wait-list control (Orme-Johnson & Barnes, 2017).

A “trait,” by definition, is a relatively stable aspect of the personality, so one may question how TM could change a chronically anxious person into a calm one. As noted earlier, the physiology of TM is the opposite of anxiety. The repeated experience of this low-anxiety “state” during TM, alternated with regular daily activity outside of TM, habituates the function in low-stress style as a “trait” outside of meditation. Studies supporting this hypothesis show that outside of meditation TM subjects have lower levels of stress hormones, plasma lactate, heart rate, and spontaneous skin responses than controls (Dillbeck & Orme-Johnson, 1987; Infante et al., 2001; Walton, Pugh, Gelderloos, & Macrae, 1995).

Another example of the physiology being transformed through repeated meditation is that of EEG coherence. It is inversely correlated with anxiety: the higher the coherence, the lower the anxiety. Practice of TM increases EEG coherence longitudinally over a year, providing further indirect evidence for TM’s physiological effects on lowering trait anxiety (Travis & Arenander, 2006).

Numerous other studies also support the hypothesis that regular TM practice habituates the physiology to function in a more coherent, efficient, low-stress style by showing that the long-term benefits gained from practicing TM are proportional to how regularly one practices it. People who practiced once a day instead of the recommended twice daily get approximately half the benefit in stress reduction (Orme-Johnson & Moore, 2003), reduced PTSD symptoms (Herron & Rees, 2017), reduced heart attacks, strokes, and death (Schneider et al., 2012), increased resilience (Wendt et al., 2015), and increased intelligence (Tjoa, 1975).

### **Depression**

Randomized controlled trials on patient populations have found that the TM program reduces depression in patients who have chronic heart failure (Jayadevappa et al., 2007), enlarged hearts (ventricular hypertrophy) (Kondwani et al., 2005), HIV (Chhatre et al., 2013), and PTSD (Brooks & Scarano, 1985; Nidich et al., 2018); are prison inmates (Nidich et al., 2016); and in pre-hypertensive young adults (Nidich et al., 2009).

Controlled trials of the general population have found that TM practice reduces depression in business managers (Sheppard, Staggars, & Johns, 1997), industrial workers in Japan (Haratani & Hemmi, 1990b), ninth grade students (Wendt et al., 2015), and in school teachers suffering from burnout (Elder, Nidich, Moriarty, & Nidich, 2014). Sub-

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group analyses of the randomized controlled trial on cardiovascular events demonstrated that the high-stress subgroup had significant reductions in psychosocial stress, which is a composite index of hostility, depression, and anger (Schneider et al., 2012).

### Insomnia

Nearly 30 percent of Americans complain about insomnia (Roth, 2007). Insomnia causes unclear thinking, poor motor performance, and impaired quality of life. It increases healthcare utilization, absenteeism, and accidents, and presents a substantial financial burden on society (Szentkirály, Madarász, & Novák, 2009). Research has shown that TM reduces insomnia in a variety of populations. A three-month randomized controlled trial found TM improved sleep in war vets with PTSD compared to psychotherapy (Brooks & Scarano, 1985). A controlled longitudinal study reported improved sleep as well as reduced hostility and decreased neuroticism in incarcerated offenders (Abrams & Siegel, 1978). A five-month controlled study of 735 Japanese industrial workers found that TM reduced the number of people who took twenty minutes or more to fall asleep by 30 percent and reduced the number of people who woke up during night sleep by 26 percent (Haratani & Hemmi, 1990a).

A physiological mechanism by which TM could be expected to reduce insomnia is that it reduces cortisol. Elevated cortisol, particularly in the first part of nighttime sleep, is associated with chronic insomnia (Bush & Hudson, 2010). Practice of TM reduces cortisol throughout the twenty-four-hour daily cycle, during the night as well as during the day (MacLean et al., 1997; Walton et al., 1995).

### Post-Traumatic Stress Disorder

Post-traumatic stress disorder (PTSD) is a mental health condition resulting from experiencing or witnessing terrifying and life-threatening events. Symptoms of PTSD are classified into four clusters: *intrusions*, such as flashbacks and nightmares; *persistent avoidance* of stimuli and memories associated with the trauma; *negative alterations in cognition and mood*, such as uncontrollable thoughts and mood swings; and *marked alterations in arousal* such as panic attacks, depression, and insomnia (American Psychiatric Association, 2013).

The WHO World Mental Health Survey of 68,894 people in twenty-four countries found that 70.4 percent of respondents had experienced lifetime trauma. Post-traumatic stress disorder was most likely to develop from persistent interpersonal traumas. The trauma types with the highest PTSD burden were rape, other sexual assaults, being stalked, and the unexpected death of a loved one (Kessler et al., 2017). Similarly, in the United States, 70 percent of adults have experienced some type of traumatic event at least once in their lives (223.4 million people). Of those 20 percent go on to develop PTSD (44.7 million). At any one time 8 percent of Americans have PTSD (24.4 million). An estimated one in nine women develops PTSD, making them twice as likely as men; 17 percent of combat troops

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are women and 71 percent of them develop PTSD due to sexual assault within the ranks (PTSD United, 2018).

The gold standard for treating PTSD is prolonged exposure (PE), which requires the patient to repeatedly reexperience memories and stimuli associated with the trauma until their conditioned responses to them are extinguished. Because PE and other trauma-focused interventions are not emotionally tolerable for many patients, non-trauma-focused interventions such as meditation have been studied by the military and other agencies (Gallegos, Crean, Pigeon, & Heffner, 2017; Hilton et al., 2017).

The TM technique has consistently been found to be effective for treating veterans of the wars in Vietnam, Iraq, and Afghanistan (Brooks & Scarano, 1985; Heffner et al., 2014; Herron & Rees, 2017; Kang et al., 2018; Rosenthal, Grosswald, Ross, & Rosenthal, 2011; Heffner, Crean, & Kemp, 2016; Nidich et al., 2018). A high-quality randomized controlled trial of veterans with PTSD funded by the U.S. Department of Defense found that TM was not inferior to PE in reducing PTSD symptoms severity and co-morbid depression. Overall, 61 percent of those receiving TM, 42 percent of those receiving PE, and 32 percent of those receiving health education showed clinically significant improvements in PTSD symptoms severity over twelve weeks (Nidich et al., 2018).

Two studies have been conducted on refugees in the Congo who had been exposed to combat, sexual assault, torture, and/or forced to witness the abuse or killing of loved ones (Rees, Travis, Shapiro, & Chant, 2013, 2014). Within one month of TM practice the refugees went from highly traumatized to non-symptomatic levels of PTSD.

Two of the civilian populations in the United States with the highest levels of PTSD are incarcerated women and men, who typically have a history persistent abuse. Studies show that TM significantly reduces PTSD symptoms in prison inmates of both genders (Nidich et al., 2017; Nidich et al., 2016).

### **Self-Actualization**

Self-actualization is a term that expresses the quest for and attainment of higher levels of mental health in which one fully actualizes one's potential and creativity. Abraham Maslow and others considered self-actualization to be a basic biological need. Maslow devoted his studies to the healthiest, most creative people and observed that the characteristics of self-actualized people include the ability to judge situations correctly and honestly, and to comfortably accept oneself, others, and nature. They are independent, not reliant on culture and environment to form opinions and views. They are spontaneous and natural, autonomous, with constantly renewed appreciation of life's basic goods. They tend to form profound interpersonal relationships, yet be comfortable with solitude, to have a non-hostile sense of humor, to be socially compassionate, and to frequently have peak experiences, which are feelings of ecstasy, harmony, and deep meaning (Maslow, 1968, 1977).

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A meta-analysis of forty-two independent outcomes on the effects of various meditation and relaxation techniques found that TM has a strong effect on increasing self-actualization (Alexander, Rainforth, & Gelderloos, 1991). Over an average three-month intervention period, TM subjects became more open to their own feelings and more capable of warm interpersonal relations, with emotional expressions guided more by an internal gyroscope than by fleeting circumstances, indicating emotional maturity. They gained a more positive view of self and humanity, were better able to integrate dichotomies, and increasingly embraced higher values such as nurturance of the good in oneself and others (integrative perspective on self and world). Their awareness became more stabilized in the “here and now,” and they responded more adaptively to both internal and external challenges, indicating a more resilient sense of self (Alexander et al., 1991).

In a related series of studies, Alexander and colleagues explored the effects of TM on ego development, the maturation of the human mind over the life span to more self-actualizing values (Alexander, Davies, et al., 1990). In his doctoral dissertation at Harvard, Alexander found that maximum security prisoners grew more in cognitive complexity, character, and social development in one year of TM practice than is typically found in college students over a four-year period (Alexander & Orme-Johnson, 2003; Alexander, Walton, & Goodman, 2003). The inmates grew from the “conformist” stage (a dominance of concrete thinking) to the “self-aware” stage (a dominance of reflective thinking integrative of self and others).

A randomized study of TM’s effects on institutionalized elderly in their eighties found it improved their memory and cognitive flexibility, it decreased their blood pressure, they felt “less old,” they lived longer, and they loved their TM practice (Alexander et al., 1989). A ten-year longitudinal study of college graduates practicing TM found an unprecedented continued increase in ego development and moral reasoning, with 87 percent reaching above the highest level typically reached by adults. The matched control group showed the typical finding of little change on these measures after college (Chandler, Alexander, Heaton, & Grant, 2005).

### Learning and Creativity

Great scientific and artistic discoveries have been documented to occur in flashes of insight, the Eureka Effect, when the mind is relaxed, such as during a vacation, while jogging, or some other time when the mind is not engaged in focused activity. The mechanism by which TM could be expected to affect cognitive abilities is that it produces an integrated state of silence in which information gets consolidated and creativity takes place.

Studies show that TM increases alpha1 *coherence* and *synchrony* between the left and right hemispheres and anterior and posterior cortical areas (Wallace, 1970b; Banquet, 1973; Dillbeck & Bronson, 1981; Travis & Arenander, 2006; Travis et al., 2009; Cahn & Polich, 2006) and that alpha1 EEG coherence is correlated with increased creativity (Orme-Johnson & Haynes, 1981), concept learning, (Dillbeck, Orme-Johnson, & Wallace,

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1981), and moral reasoning (Nidich, Ryncarz, Abrams, Orme-Johnson, & Wallace, 1983). There is wide agreement that alpha and theta EEG coherence functionally bind distal cortical areas for perception, motor performance, task switching, and memory (Sauseng & Klimesch, 2008; Palva & Palva, 2007)

Moreover, TM increases EEG coherence within the default network, a network of frontal and parietal brain areas that operates during states of rest to integrate memories and thoughts through largely unconscious processes (Raichle & Snyder, 2007; Cabane & Pollock, 2017). Three randomized experiments on 362 high-school students compared TM either to napping, to a Taoist meditation technique, or to no-treatment wait-list controls. Various cognitive variables, as well as state and trait anxiety, were measured over a period of six months in two studies and of one year in a third study (So & Orme-Johnson, 2001). Students did not know they were in a study and thought the battery of tests were part of the regular school testing program. Strong effects of TM were seen across all three studies on creativity, practical intelligence, and field independence. The creativity test (Test for Creative Thinking-Drawing Production) is said to evaluate convergent and divergent thinking processes and to reflect affective and volitional domains, such as sensitivity, passion, humor, unconventionality, boundary-breaking, and willingness to take chances. Practical intelligence (Constructive Thinking Inventory) centers around non-intellective factors such as optimism and a positive outlook on life necessary for success in work, love, social relationships, and maintaining emotional and physical well-being. Field independence indexes executive functioning in working memory, sustained attention, and visual spatial organization, which is especially important in the management and interpretation of complex cognitive tasks.

The TM technique also had moderate effects on measures of fluid intelligence. Improved fluid intelligence and choice reaction time were also found in a two-year study of college students practicing TM compared to matched controls (Cranson et al., 1991). These choice reaction time measures have been interpreted as indicating reduced noise in the nervous system and as stability of attention. Practice of TM has also been found to improve cognitive flexibility and signal detection (Alexander et al., 1989; Dillbeck, 1982).

In other school settings, TM has been found to be effective in reducing psychological distress and improving academic achievement (Nidich et al., 2009; Nidich et al., 2011), in improving basic language and math skills in one year in Maharishi School children (Nidich, Nidich, & Rainforth, 1986; Nidich & Nidich, 1989), as well as in at-risk urban middle school students (Nidich et al., 2011; Nidich & Nidich, 1989; Nidich, Nidich, & Rainforth, 1986). The TM program is now being implemented in Quiet Time programs in schools with impressive results throughout Latin America, India, and in major US cities such as San Francisco, Chicago, and New York (see <https://www.davidlynchfoundation.org/schools.html>).

## Limitations of TM Research on Psychological Health

Despite Bernard Glueck and Charles Stroebel's promising research in the 1970s on the effectiveness of TM as an adjunct therapy for serious mental health problems (Glueck & Stroebel, 1975a, 1975b, 1984; Stroebel & Glueck, 1978) over the ensuing forty-five years there have been few high-quality large studies on TM and mental health. More research is needed on clinical populations with different types of depression, anxiety, and other specific diagnostic categories. Perhaps even more urgent are good large-scale longitudinal studies on teaching TM in schools to evaluate if it can *prevent* psychological problems.

## The Transcendental Meditation technique and Behavior

Like physical and mental health, problems of social behavior are exacerbated by stress. Research shows that social problems such as violent crime, diseases, alcoholism, and drug abuse are linked to social stressors, such as the prevalence of unemployment, bankruptcies, divorces, and high school students dropping out of school (Linsky & Strauss, 1986). Since TM reduces stress at the individual level, it can be considered to be a grass-roots approach to behavioral problems in society.

### School Behavior

The impact of TM practice on school behavior was studied in the context of a randomized study of ambulatory blood pressure in forty-five African American adolescents (ages 15–18 years). After four months, the TM group exhibited significantly fewer suspension days due to behavior-related problems, less absenteeism, and fewer rule infractions (Barnes et al., 2003). Practice of TM has also been shown to reduce the dropout rate, increase graduation rate, and increase acceptance to college and post-secondary school in inner city high school students, with the largest improvements found in students with low grades (Colbert & Nidich, 2013).

### Alcohol, Drug, and Cigarette Use

Evidence suggests that the restorative rest produced by TM practice normalizes the neurochemical imbalances motivating substance abuse, eliminating the physiological basis for craving to take drugs (Walton & Levitsky, 1994). A meta-analysis of 198 studies on behavioral techniques for reducing tobacco, alcohol, and drug consumption found that TM practice had substantially larger effect sizes in reducing harmful substance consumption than other techniques (Alexander, Robinson, & Rainforth, 1994). Practice of TM has moderate effects on reducing alcohol consumption. The average effect size for TM in the ten studies reporting illicit drug consumption relative to controls was strong. For reduction of

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smoking cigarettes, the average effect size for the six randomized and six longitudinal controlled trials on the TM technique was very strong.

The pattern of change produced by TM across substances is a gradual decline in abstinence over the course of a year. In contrast, other programs typically show 100 percent abstinence at the start of the program due to inspiration to quit, which falls off to only 10 percent by the end of the year. By contrast, the gradual change produced by TM apparently reflects the progressive normalization of physiological stresses, which reduces the desire to self-medicate in a mal-adaptive attempt to achieve a more ideal psychophysiological state (Alexander, Robinson, & Rainforth, 1994).

### **Prison Rehabilitation**

There have been roughly one hundred prison projects using TM worldwide, with twenty empirical studies (Hawkins, Orme-Johnson, & Durchholz, 2005). Incarcerated offenders show rapid positive changes in risk factors associated with criminal behavior, including reduced aggression, hostility, anxiety, and substance abuse, and increased moral judgment. Behavioral indications include reduced in-prison rule infractions in maximum security prisons (Anklesaria & King, 2003; Hawkins et al., 2005). A fifteen-year follow-up showed over 40 percent reduction in recidivism, defined as new incarcerations in inmates who learned TM while in prison compared to matched controls who participated in other rehabilitation programs (Rainforth, Bleick, Alexander, & Cavanaugh, 2003).

The studies on TM and behavior generally confirm the hypotheses that reducing stress in the individual improves their social behavior.

### **Conclusion and Future Directions**

Even after fifty years of research on TM, most governmental agencies and policy makers would maintain that there still need to be large-scale randomized trials in all areas of physical and mental health before public policy can be implemented to include it in national health care and educational systems. In this regard, I propose three directions for future research: (1) basic research using state-of-the-art technologies, such as neuroimaging, to study the meditation process and higher states of consciousness; (2) large-scale well-controlled research applications in medicine, education, and conflict resolution, etc.; and (3) theoretical research integrating the emerging empirical evidence on meditation and the traditional knowledge about it with the larger body of scientific knowledge.

But even given the body of research as it stands today, TM clearly is a valuable life-skill tool for most to consider, and it may well be an effective adjunct therapy for many physical and mental ailments.



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