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## Psychology of Meditation and Health: Present Status and Future Directions

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### ABSTRACT

Past four decades has witnessed substantial scientific research on meditation as an alternative mind-body therapy. This paper is an attempt to provide a comprehensive view of the present state of the research in meditation and health. It reviews major findings related to meditation and its effects on various disorders. Two major types of meditation practices dominating presently (concentration and mindfulness) are introduced. Effects of meditation on human physiology such as heart beat, blood pressure, cortical activity, metabolism, respiration, and skin resistance are discussed. Impact of meditation on human perception and cognition is also addressed. Possible pathways or mechanisms through which meditation impacts health such as, relaxation, systematic desensitization, release of repressed memories, un-stressing and so on are also discussed. Finally, major conceptual and methodological issues that need serious attention from researchers in this area for future research is addressed.

*Key words:* Meditation, health, concentration, mindfulness.

### RESUMEN

Los últimos cuatro decenios han presenciado importantes investigaciones científicas sobre la meditación como una alternativa terapéutica. Este artículo intenta brindar una visión global del estado actual de la investigación sobre meditación y salud. Examina los principales hallazgos relacionados con la meditación y sus efectos sobre diversos trastornos. Se presenta una introducción a los tipos principales de prácticas de meditación dominan actualmente (la concentración y el *mindfulness*). Se tratan los efectos de la meditación sobre aspectos de la fisiología humana como el ritmo cardíaco, la presión arterial, la actividad cortical, el metabolismo, la respiración, y la resistencia eléctrica de la piel, y se trata el impacto de la meditación sobre percepción y cognición humanas. Se discuten las posibles vías o mecanismos mediante los cuales la meditación impacta en la salud como son la relajación, la desensibilización sistemática, la liberación de recuerdos reprimidos y la disminución del estrés. Por último, se mencionan las principales cuestiones conceptuales y metodológicas que necesitan la atención de los investigadores para futuros estudios en esta área.

*Palabras clave:* meditación, salud, concentración, *mindfulness*.

The use of meditation for healing and enlightenment is not new. The practice of meditation has been prevailing throughout the human history among diverse cultures. In fact, all religious traditions practice some forms of meditation. It is generally

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associated with healing, spiritual growth, and enlightenment. After its introduction to the western world by Indian spiritualist Paramahansa Yogananda in 1920, the nature of scientific investigation of spiritual beliefs and practices underwent a drastic change. However, it was only during the 1960s that scientific studies started focusing on the clinical effects of meditation on health after the reports of extraordinary feats of bodily control and altered states of consciousness by eastern yogis reached the west. These reports captured the interest of many western behavioural scientists. With the scientific advancement and refinement in instrumentation, scientific study of effects of meditative practices became possible. A formal acknowledgement of the academic curiosity within psychology came in 1977, when the American Psychological Association issued a statement on meditation stating that-“meditation may facilitate the psychotherapeutic process.” They also encouraged research “to evaluate its possible usefulness” (Kutz, Borysenko, & Benson, 1985, p.1). As a result, both health care professionals and lay people embraced meditation as a valuable tool for stress reduction and a device for healing both mental and physical disorders.

The word “meditation” is derived from the Latin *meditari*, which means “to engage in contemplation or reflection.” The word meditation comes from the same Greek and Latin root as the word medicine. Manocha (2000) described meditation as a discrete and well-defined experience of a state of “thoughtless awareness” or mental silence, in which the activity of the mind is minimized without reducing the level of alertness. Walsh and Shapiro (2006) defined meditation from cognitive and psychological perspective, as a family of self-regulation practices that aim to bring mental processes under voluntary control through focusing attention and awareness. Other major descriptions of meditation emphasize components such as relaxation, concentration, an altered state of awareness, suspension of logical thought processes, and maintenance of self-observing attitude (Craven, 1989). Thus, meditation has been conceptualized in many ways and there exists no consensus definition. It is very difficult to capture its essence in one definition. However, Cardoso *et al.* (2004) developed an operational definition encompassing both traditional and clinical parameters. They defined any practice as meditation if it (1) utilizes a specific and clearly defined technique, (2) involves muscle relaxation somewhere during the process, (3) involves logic relaxation (i.e., not “to intend” to analyze the possible psychophysical effects, not “to intend” to judge the possible results, not “to intend” to create any type of expectation regarding the process), (4) a self induced state, and (5) the use of a self-focus skill or “anchor” for attention.

#### TYPES OF MEDITATION

Presently many meditation techniques are being practiced. However, all of them can be grouped into two basic approaches- concentrative meditations and mindfulness/insight meditations. *Concentration meditation* aims at single pointed focus on some sound, image or sensation to still the mind and achieve greater awareness. Most popular form of this meditation is “transcendental meditation”(TM) developed by Maharshi Mahesh Yogi in 1958. TM is generally done by focusing the mind on some *mantra* (sound) to achieve transcendental state of consciousness. *Mindfulness meditation* on the other

hand involves opening up or becoming more alert to the continuous passing stream of thoughts, images, emotions and sensations without identifying oneself with them. Such practice helps in developing non-reactive state of mind, which is the foundation for calm and peaceful state of consciousness. Here instead of narrowing the focus (concentration) practitioner becomes alert to the entire field of consciousness. Vipassana and Zen meditations belong to this category.

Mikulas (1990) propounded the classification of meditative practice into four components- form, object, attitude, and behaviours of the mind. *Form* refers to the setting of meditation and the activity of body during the meditation, whereas *object* refers to object of one's attention during the meditation. *Attitude* is the mental set with which one approaches meditation. *Behaviours of mind* connotes whether the meditation is based on concentration or mindfulness.

#### EFFECTS OF MEDITATION: PHYSIOLOGICAL

Even though meditation is a mental activity, its effects on human physiology has received much attention. Few Indian studies have attempted to examine and establish the neurological correlates of yogic practices, including meditation, (Bhushan, 2002, 2004; Ramamurthi, 1977; Varma, 1979) the development of brain imaging technique has thrown the ball in the Western court. The unavailability of adequate infrastructure and needed scientific temperament within the country has made very few centers move parallel to the Western labs. Some of physiological effects are summarized here.

##### *Heart rate*

Studies have indicated that heart rate slows down during quite meditation and quickens in the moments of ecstasy during meditation (Tamini, 1975). Meditations like TM, Zen, relaxation response and other calming forms of meditation generally decrease the rate of heart beat (Bono, 1984; Delmonte, 1984a). However, very pronounced decrease in heart rate is found among long term practitioners only.

##### *Blood pressure and hypertension*

Blood pressure is one of the easiest measurable physiological variables. There is strong evidence that meditation lowers blood pressure for the people who are normal or moderate hypertensive (Sears & Raeburn, 1980; Swami Karmananda Saraswati, 1982; Wallace *et al.*, 1983). However, most studies indicate that the benefit disappears once practice is discontinued (Patel, 1976).

##### *Cortical activity*

Evidence from many studies indicates that during meditation alpha activity increases significantly (Delmonte, 1984a; Daniels & Fernhall, 1984). Alpha waves are slow and high amplitude brain waves with frequency ranging from eight to thirteen cycles

per second. Alpha activity is generally indicator of deep relaxed state of mind. Long term meditation practitioners also exhibit theta brain wave activity (five to seven cycle per second) during which they report peaceful and pleasant experience with intact self awareness (Jacobs & Luber, 1989; Delmonte, 1984a). Research also indicates that during meditation right brain activity increases (Pagano & Frumkin, 1977). Delmonte (1984b) reported that meditation practice may begin with left-hemisphere activity, which then shifts towards the right hemisphere, while in advanced meditation both left- and right-hemisphere activity are largely inhibited or suspended. Schwartz (1975) pointed that meditation practices can lead to heightened cortical arousability and decreased limbic arousability, which lead to heightened perception and reduction of emotional activity. Goleman (1976) reported that meditators showed a significantly increased cortical excitation during meditation and a simultaneous limbic inhibition.

One of the recent research performed on the monks of *Dharamsala*, Himanchal Pradesh, have proved that their prefrontal lobes is lit even when they are not meditating (Davidson *et al.*, 2003). This area is responsible for positive emotions. Lou *et al.* (1999) found significant changes in the blood-flow in the cortex during *yoga nidra*. Using H2O-PET they found a decreased flow in the executive system of the brain, i.e., dorsolateral prefrontal, anterior cingulate, orbital frontal cortices, striatum, thalamus, brain stem and cerebellum. Lazar, Bush, Gollub, Fricchione, Khalsa, and Benson (2000) studied 5 subjects who had practiced *Kundalini* meditation daily for at least four years. A fMRI record was made while the participants passively observed their breath and silently repeated Sanskrit phrases during inhalations and exhalations during the session. During the meditation process an increased fMRI signal was recorded in the putamen, midbrain, pregenual anterior cingulated cortex and the hippocampal/ parahippocampal formation suggesting that the neural activity evolve during meditation practice and are dynamic.

The profound effect of Transcendental Meditation on the brain function is reflected in the form of increasing degrees of orderliness, integration and coherence. Several studies in the recent past confirm a unique style of brain functioning in enlightened people (Travis, 2001; Travis & Orme-Johnson, 1989; Travis & Pearson, 2000; Travis, Tecece, & Guttman, 2000). While a relative excitement is continuously present in the brains of non-enlightened subjects, the enlightened people maintain a low level of excitation until s/he confronts the very moment when it is appropriate to make a decision. This exactly matches with their subjectively felt and narrated experience of persistent immovable inner calmness, even while engaged in dynamic outer activity. Even though such empirical findings are coming now, it has always been advocated in the Indian religious/ philosophical texts and narrations. Attempts have also been made for MEG recording during transcendental meditation practice.

Litscher, Wenzel, Niederwieser, and Schwarz (2001) used TCD (Transcranial Doppler Sonography) and nearinfrared spectroscopy to measure oxygenation levels in the cerebral tissues of two QiGong (a Chinese meditation exercise) experts. During meditation the mean blood flow increased in the right posterior cerebral artery and decreased in the left middle cerebral artery. A simultaneous increase in oxyhemoglobin and total hemoglobin was also recorded. During QiGong predominant EEG activity was witnessed in the anterior half of the brain while it silently occurred in the posterior

half. This can be considered the cerebral *ying* and *yang*. Attempts are also being made to understand the relationship between neurotransmitters and meditation. The dopaminergic system seems to play an important role in the suppression of executive system during relaxation meditation.

#### *Metabolism and respiration*

Many studies have shown that during meditation oxygen consumption is reduced (sometime up to 50%), carbon dioxide elimination is reduced (sometime up to 50%) and respiration rate is lessened (Sudsuang, Chentanez, & Veluyan, 1991; Kesterson, 1986).

#### *Skin resistance*

Low skin resistance (measured in terms of galvanic skin response) is a good indicator of stress. As expected high skin resistance has been documented by many researchers especially among TM practitioners (Bono, 1984; Bagga & Gandhi, 1983).

### EFFECTS OF MEDITATION: PSYCHOLOGICAL

Many perceptual and cognitive abilities are associated with meditation practices. These abilities may range from normal to paranormal. Many scientific investigations have been conducted to measure various psychological and behavioral effects of meditation.

#### *Perceptual ability*

Brown, Forte, and Dysart (1984a, 1984b) conducted experiments on visual sensitivity among Buddhist meditation practitioners using before-after and control group design. Post test was conducted after three months of rigorous meditation practice. Visual sensitivity was measured by detection threshold and discrimination threshold using simple light flashes. They reported significant improvement in visual sensitivity after the meditation retreat. Other studies also reported similar decrease in visual threshold and increased auditory acuity after the meditation (McEvoy, Frumking, and Harkins, 1980; Keithler 1981). Other studies reported increased visual imagery abilities (Heil, 1983), enhanced attentive ability (Linden, 1973), reduction of perceptual noise (Walsh, 1978), increased reaction time (Robertson, 1983), and enhanced perceptual motor speed (Jedrczak, Toomey, & Clements, 1986).

#### *Memory and intelligence*

Jedrczak *et al.* (1986) reported that number of months of TM practice predicted the higher performance on nonverbal intelligence test. Other researchers also reported similar results of improvements in cognitive abilities (Verma, Jayashan, & Palani, 1982). Studies on TM practitioners generally reported to have positive impact on intelligence, school grades, learning ability, short and long term memory (Cranson *et al.*, 1991).

### *Creativity and self actualization*

Mixed results have been reported regarding creativity and meditation. TM researchers in particular reported enhanced creativity with TM practice (Ball, 1980; Orme-Johnson & Granieri, 1977). However, other researchers could not find any relationship between meditation and creativity (O'Haire & Marcia, 1980; Domino, 1977).

Self actualization is thought to be the major goal of dedicated meditation practitioner. Various studies have measured several aspects of self actualization and experiences in meditation. Alexander, Rainforth, and Gelderloos (1991) performed a meta-analysis on 42 studies on the effects of TM and other forms of relaxation on self actualization. Their measure of self actualization included three independent factors: affective maturity, integrative perspective on the self and world, and resilient sense of self. They found effect size of TM on self actualization is approximately three times larger than other forms of meditation and relaxation practices. Other studies also reported increase in various dimensions of self actualization with meditation (Gelderloos, Walton, Orme-Johnson, and Alexander, 1990).

### **MECHANISMS FOR THE THERAPEUTIC EFFECTS OF MEDITATION**

Helminiak (1981) described six possible mechanisms through which meditation works. These six mechanisms capture most of the explanations found in the existing literature. They are:

- (1) *Relaxation*: Relaxation is one of the primary components of all kinds of meditation which induce a pleasant and deep relaxed state of body and mind. Herbert Benson (1976) developed a therapeutic technique called "relaxation response" which is a form of meditation. His whole concern with meditation was to reduce stress and hypertension by inducing a state of deep relaxation. Benson (1976) measured series of physiological parameters in response to relaxation response. Various effects include-decrease in the rate of metabolism, decrease in the rate of heart beat, muscle relaxation, slow and rhythmic breathing, decrease in blood pressure, and so on. All this effects help in balancing physiological abnormalities and promotes healing.
- (2) *Systematic desensitization*: Joseph Wolpe's (1961) behavioural therapy is especially instrumental in reducing anxiety. This therapy involves three steps. First, the client is thought to induce a deep state of muscle relaxation. This is followed by preparing a hierarchical list of stimuli inducing anxiety. Finally, in a deep relaxed state client confronts (either by imagination or by presentation of actual stimuli) each of the anxiety producing stimuli progressing in hierarchy. This therapy is based on the principle of reciprocal inhibition. Since anxiety and relaxation are incompatible to each other, the stimuli loose their anxiety provoking quality. Client continues this process until he is desensitized to highest item in the hierarchy.

In meditation also a practitioner undergoes similar steps. Every meditation involves induction of a relaxed state. In meditation, the practitioner first enters in deep relaxation and suspends conscious thoughts by either detached observation or concentration. As a result, many anxiety provoking repressed memories, thoughts, and feelings arise in the mind. When one confronts them in a deeply relaxed state, these factors loose their power to induce anxiety and finally get eliminated.

- (3) *Release of repressed psychic material*: This is related to systematic desensitization. With regular practice of meditation, most of the practitioners encounter release of repressed unconscious thoughts, emotions, and images (Schwartz, 1974). This is very similar to the release of unconscious phenomenon during free association in psychoanalysis. This could be initially disturbing, but with constant practice unconscious mind gets cleaned of such memories and healthy mind is achieved. During meditation, the practitioner remains under low arousal and sensory deprivation for a long time and under such condition repressed feelings and thoughts arises (Benson, 1976).
- (4) *Unstressing*: Parallel to release of repressed memories, many practitioner reports many physical reactions during intense meditation. This could be involuntary muscular-skeletal movements such as repeated twitches, spasms, gasps, tingling, tics, jerking, swaying, pains, shaking, aches, internal pressures, headaches, weeping, and laughter. The experience covers the range from extreme pleasure to acute distress (Goleman, 1971). TM practitioner calls this as “*unstressing*”. Goleman (1971) interprets this phenomenon on the basis of psycho-physiological principle contemplating that all psychic and emotional phenomena have parallel physiological processes.
- (5) *Dissolution of habitual patterns of perception*: Human beings are mostly governed by rigid and fixed patterns of thinking, feeling, and reactions. Many of these patterns are unhealthy and cause neurotic and psychotic problems. Most of the unhealthy habitual patterns are due to our identification with emotions that we are not able to control and regulate. With detached observation, emotions and thoughts loose their power and practitioner is able to identify the unhealthy patterns of behavior and remove them with healthy ones.
- (6) *Cosmic consciousness*: Attainment of cosmic consciousness is a mystical concept and not available for scientific investigation. Many terms are used to represent cosmic consciousness such as *samadhi*, *nirvana*, *satori*, and *moksha*. It is the highest goal achieved by meditation in esoteric traditions where a person transcends his personal ego. In the state of cosmic consciousness a person realizes that he/ she is one with the whole cosmos and is not separate from others. As a result, a tremendous sense of love and compassion arises in him and it is the highest state a human can achieve.

#### MEDITATION AND HEALTH: REVIEW OF PRESENT STATUS

Effects of meditation on health are based on the principle of mind-body connection. Meditation practices are generally accepted as mind-body treatments for health related problems and overall well-being. There is a growing body of literature showing the efficacy of meditation on various health related problems. Meditation is reported to be effective in pain management and enhancing immune system (Kabat-Zinn, 1990). Studies on the long-term mental benefits of meditation show that meditation reduces stress and increases reported levels of happiness, self-confidence, and general effectiveness (Fergusson, Bonshek, & Boudigues, 1995; Hawks, Hull, & Thalman, 1995). Meditative interventions have been found to be beneficial in treating various clinical conditions. These include- hypertension (Barnes *et al.*, 1997); cardiovascular disorders (King, Carr, & D’Cruz, 2002); pain syndromes and musculoskeletal diseases (Astin, 2004); respiratory disorders such as asthma, congestive obstructive pulmonary disease (Wang, Collet, & Lau, 2004); dermatological problems such as psoriasis, allergies (Bilkis & Mark, 1998); immunological disorders (Astin *et al.*, 2003) and treatment-related symptoms of breast



and prostate cancer (Coker, 1999). Several Indian researchers have also made significant contribution. Their study range from anxiety (Jangid, Vyas, & Shukla, 1988; Sharma & Agnihotri, 1982), psychosomatic disorders (Divekar, 1982), neurotic disorders (Naug, 1975; Nagarathna & Nagendra, 1980) and stress (Sethi, Trivedi, & Anand, 1981). Studies suggest that intervention program using meditation is helpful in reducing headache as well as pain in neck, extremities and joints (Brendstrup & Launso, 1993). Decline in the use of tranquilizers, antirheumatics, and gastrointestinal agents have also been reported after meditation practices (DeBerry, Davis, & Reinhard, 1989; Ganguli, 1985; Singh, 1992). Further, Sethi (1989) has argued that meditation is a key coping mechanism for the problem of burnout in organizations. Various studies also reported the benefits of TM meditation in de-addiction from chemical substances (Gelderloos *et al.* 1991), and smoking (Royer-Bounouar, 1989).

Classic distinction suggests as many as 14 different forms of mediation (Goleman, 1978). However recently, University of Alberta Evidence-based Practice Center, Canada, conducted an exhaustive review of studies on meditation and its effects on health. This review was conducted on studies up to 2005. They identified five categories of meditation practices:

- (1) *Mantra meditation* (Comprising TM, relaxation response, and clinically standardized meditation),
- (2) *Mindfulness meditation* (comprising Vipassana, Zen Buddhist meditation, mindfulness based stress reduction, and mindfulness based cognitive therapy),
- (3) *Yoga* (This is based on Indian Yogic tradition developed by Patanjali. It incorporates various techniques like body postures, breath control and meditation.)
- (4) *Tai Chi* (This is a Chinese martial art that incorporates various slow rhythmic movements that emphasize force and complete relaxation. It has been also called "meditation in motion.")
- (5) *Qi Gong* (This is an ancient Chinese practice that combines breathing patterns with various physical postures, bodily movements, and meditation.)

This review was conducted on 813 studies. However, they reported most of the studies in this area are poor in quality. Most commonly studied disorders were hypertension, cardiovascular diseases, and substance abuse. Results of meta-analysis conducted on hypertensive participants showed that TM, Qi Gong and Zen Buddhist meditation significantly reduced blood pressure. Other findings indicated that Yoga contributed in stress reduction. However, Yoga was no better than Mindfulness-based stress reduction at reducing anxiety in patients with cardiovascular diseases. No clear picture from the studies on substance abuse was obtained. Meta-analyses on 55 studies indicate that some meditation practices produced significant changes in healthy participants. What is alarming is that the role of effect modifiers such as age, gender, duration of practice and so on has been largely neglected in the scientific literature. It is clearly evident from the current literature that therapeutic effects of meditation is uncertain and inconclusive and more rigorous studies are needed in future to get firm conclusions. Earlier also Delmonte (1986) had concluded that meditation as an intervention strategy was successful with anxiety and hypertension, but its effectiveness is doubtful in the treatment of other disorders.

### MAJOR ISSUES AND FUTURE DIRECTIONS

Reports of the review study on meditation and health by University of Alberta Evidence-based Practice Center clearly indicates that the present state of research does not give clear evidence regarding the efficacy of meditation as a therapeutic tool, primarily because of lack of quality studies. Till date there is no consensus operational definition of meditation that can be employed by diverse studies. Design of the studies is also a major issue in this area. Most studies employ before-and-after design which does not provide clear causal inference. So, using control group is imperative for drawing causal inference. Apart from that, consideration of effects of various confounding variables (effect modifiers) has to be taken into account. Various confounding variables such as age and gender of the practitioner, duration of the meditation, and so on can have profound effect on the results. These effect modifiers have generally been neglected in studies. Employment of large sample should also be an important consideration. Most of the present studies have utilized small sample which limits their generalization.

Beside these methodological considerations, there are great possibilities of biasness in this area. Researchers have been talking consistently about the benefits of meditation but one should be open to the possibility of negative impact of meditation also. Meditation is an important tool for the release of repressed emotional contents and this could be very disturbing to initial practitioners. Encountering such disturbing emotional contents could have adverse impact on the health of the practitioner, unless proper guidance is provided. For example, Walsh (1979) reported a number of disturbing experiences encountered during meditation, such as anxiety, tension, and anger. Researchers also posited that meditation may precipitate a psychotic episode in individuals with a history of schizophrenia (Walsh & Rauche, 1979). So, there is possibility for researcher's biasness, especially when one has preconceived notions of benefits of meditation.

Meditation is not only a technique, but also an art. Some people are predisposed towards it while others are not. Some can delve deep into the meditation and acquire all benefits while others may come out more disturbed. Such individual differences should also be considered while making any conclusion regarding the benefits of meditation. It appears that meditation may have therapeutic value, but limited to those who are psychologically healthy, well integrated and may have mild neurosis or psychosomatic disorders. These issues need serious attention from researchers in future to get firm conclusion regarding the efficacy of meditation as an adjunct to mind-body therapy.

### REFERENCES

- Alexander CN, Rainforth M, & Gelderloos P (1991). Transcendental Meditation, Self-Actualization, and Psychological Health: A Conceptual Overview and Statistical Meta-Analysis. Special Issue: Handbook of Self-Actualization. *Journal of Social Behavior and Personality*, 6, 189-248.
- Astin JA (2004). Mind-body therapies for the management of pain. *Clinical Journal of Pain*, 20, 27-32.
- Astin JA, Shapiro SL, Eisenberg DM, *et al.* (2003). Mind-body medicine: state of the science, implications

- for practice. *Journal of the American Board of Family Medicine*, 16, 131-47.
- Bagga OP & Gandhi A (1983). A Comparative Study of the Effect of Transcendental Meditation and Shavasana Practice on the Cardiovascular System. *Indian Heart Journal*, 35, 39-45.
- Ball OE (1980). *The Effect of TM and the TM-Sidhi Program on Verbal and Figural Creativity (TTCT), Auditory Creativity (S and I), and Hemispheric Dominance (SOLAT)*. Unpublished doctoral dissertation, University of Georgia.
- Barnes VA, Schneider RH, Alexander CN, *et al.* (1997). Stress, stress reduction, and hypertension in African Americans: an updated review. *Journal of National Medical Association*, 89, 464-476.
- Benson H (1976). *The Relaxation Response*. New York: William Morrow & Co, Inc.
- Bhushan B (2002). The neuropsychology of consciousness. Paper presented at Mind and Consciousness: Various approaches, January 9-11, IIT Kharagpur, India.
- Bhushan B (2004). *Current trend in cognition & consciousness research: Integrating science and spirituality in neuropsychological perspective*. National Conference on Indian Psychology, Yoga, and Consciousness, December 10-13 Pondicherry, India.
- Bilkis MR & Mark KA (1998). Mind-body medicine. Practical applications in dermatology. *Archives of Dermatology*, 134, 1437-41.
- Bono J (1984). Psychological Assessment of Transcendental Meditation. In *Meditation: Classic and Contemporary Perspectives*, eds. D.H. Shapiro and R.N. Walsh. New York: Aldine.
- Brendstrup E & Launso L (1993). Evaluation of a non-drug intervention programme for younger seniors. *Journal of Social and Administrative Pharmacy*, 10, 23-35.
- Brown D, Forte M, & Dysart M (1984a). Differences in visual sensitivity among mindfulness meditators and non-meditators. *Perceptual and Motor Skills*, 58, 727-733.
- Brown D, Forte M, & Dysart M (1984b). Visual sensitivity and mindfulness meditation. *Perceptual and Motor Skills*, 58, 775-784.
- Cardoso R, De Souza E, Camano L, *et al.* (2004). Meditation in health: an operational definition. *Brain Research Protocols*, 14, 58-60.
- Coker KH (1999). Meditation and prostate cancer: Integrating a mind/body intervention with traditional therapies. *Seminars in Urologic Oncology*, 17, 111-8.
- Cranson RW, Orme-Johnson DW, Gackenbach J, *et al.* (1991). Transcendental Meditation and Improved Performance on Intelligence-Related Measures: A Longitudinal Study. *Personality and Individual Differences*, 12, 1105-1116.
- Craven JL (1989). Meditation and psychotherapy. *Canadian Journal of Psychiatry*, 34, 648-53.
- Daniels FS & Fernhall B (1984). Continuous EEG Measurement to Determine the Onset of a Relaxation Response during a Prolonged Run. *Medicine and Science in Sports and Exercise* 16, 182.
- Davidson RJ, Kabat-Zinn J, Schumacher J, Rosenkranz M, Muller D, Santorelli SF, Urbanowski F, Harrington A, Bonus K, & Sheridan JF (2003). Alterations in brain and immune function produced by mindfulness meditation. *Psychosomatic Medicine*, 65, 564-570.
- DeBerry S, Davis S, & Reinhard K (1989). A comparison of meditation-relaxation and cognitive/behavioral techniques for reducing anxiety and depression in a geriatric hospital. *Journal of Geriatric Psychiatry*, 22, 231-247.
- Delmonte MM (1984a). Physiological Responses during Meditation and Rest. *Biofeedback and Self-Regulation*, 9, 181-200.
- Delmonte MM (1984b). Electrocortical Activity and Related Phenomena Associated with Meditation Practice: A Literature Review. *International Journal of Neuroscience*, 24, 217-231.

- Delmonte MM (1986a). Expectancy and Response to Meditation. *International Journal of Psychosomatics*, 33, 28-34.
- Divekar MV (1982). Yoga therapy for diabetes and obesity. *Yoga*, 20, 19-29.
- Domino G (1977). Transcendental Meditation and Creativity: An Empirical Investigation. *Journal of Applied Psychology*, 62, 358-362.
- Fergusson L, Bonshek A, & Boudigues J (1995). Personality and health characteristics of Cambodian undergraduates. *Journal of Instructional Psychology*, 22, 308-319.
- Ganguli H (1985). Meditation subculture and drug use. *Human Relations*, 38, 953-962.
- Gelderloos P, Hermans HJ, Ahlscrom HH, & Jacoby R (1990). Transcendence and Psychological Health: Studies with Long-term Participants of the Transcendental Meditation and TM-Sidhi Program. *Journal of Psychology*, 124, 177-197.
- Gelderloos P, Walton K, Orme-Johnson D, & Alexander C (1991). Effectiveness of the Transcendental Meditation Program in Preventing and Treating Substance Misuse: A Review. *International Journal of the Addictions*, 26, 293-325.
- Goleman D (1971). Meditation as Meta-therapy: Hypothesis toward a proposed fifth state of consciousness. *Journal of Transpersonal Psychology*, 3, 10.
- Goleman D (1976). Meditation and Consciousness: An Asian Approach to Mental Health. *American Journal of Psychotherapy*, 30, 41-54.
- Goleman D (1978). *The varieties of the meditative experience*. New York: Irvington Publishers.
- Hawks S, Hull M, & Thalman R (1995). Review of spiritual health. *American Journal of Health Promotion*, 9, 371-378.
- Heil JD (1983). Visual imagery change during relaxation meditation training. *Dissertation Abstracts International*, 43, 2338.
- Helminiak DA (1981). Meditation-Psychologically and Theologically Considered. *Pastoral Psychology*, 30, 6-20.
- Ilan K, Borysenko JZ, & Benson H (1985). Meditation and psychotherapy: A rationale for the integration of dynamic psychotherapy, the relaxation response, and mindfulness meditation. *American Journal of Psychiatry* 142, 1-8.
- Jacobs GD & Luber JF (1989). Spectral Analysis of the Central Nervous System Effects of the Relaxation Response Elicited by Autogenic Training. *Behavioral Medicine* 15, 125-132.
- Jangid RK, Vyas JN, & Shukla TR (1988). Effect of transcendental meditation in cases of anxiety neurosis. *Indian Journal of Clinical Psychology*, 15, 77-79.
- Jedrczak A, Toomey M, & Clements G (1986). The TM-Sidhi Program, Age, and Brief Tests of Perceptual-motor Speed and Nonverbal Intelligence. *Journal of Clinical Psychology*, 42, 161-164.
- Kabat-Zinn J (1990). *Full catastrophe living*. New York: Delta.
- Keithler MA (1981). The influence of the transcendental meditation program and personality variables on auditory thresholds and cardio-respiratory responding. *Dissertation Abstracts International*, 42, 1662-1663.
- Kesterson JB (1986). Changes in Respiratory Patterns and Control during the Practice of the Transcendental Meditation Technique. *Dissertation Abstracts International*, 47, 4337.
- King MS, Carr T, & D'Cruz C (2002). Transcendental Meditation, hypertension and heart disease. *Australian Family Physician*, 31, 164-8.
- Lazar SW, Bush G, Gollub RL, Fricchione GL, Khalsa G, Benson H (2000). Functional brain mapping of the relaxation response and meditation. *Neuro Report*, 11, 1581-1585.

- Linden W (1973). Practicing of meditation by school children and their levels of field dependence-independence, test anxiety, and reading achievement. *Journal of Consulting and Clinical Psychology*, 41, 139-143.
- Litscher G, Wenzel G, Niederwieser G, & Schwarz G (2001). Effects of QiGong on brain function. *Neurological Research*, 23, 501-505.
- Lou HC, Kjaer TW, Friberg L, Wildschiodtz G, Holm S, & Nowak M (1999). A <sup>15</sup>O-H<sub>2</sub>O PET study of meditation and the resting state of normal consciousness. *Human Brain Mapping*, 7, 98-105.
- Manocha R (2000). Why meditation. *Australian Family Physician*, 29, 1135-8.
- McEvoy TM, Frumkin LR, & Harkins SW (1980). Effects of meditation on brainstem auditory evoked potentials. *International Journal of Neuroscience*, 10, 165-170.
- Mikulas WL (1990). Mindfulness, self-control, and personal growth. In M. G. T. Kwee (Ed.), *Psychotherapy, meditation, and health* (pp. 151-164). London: East-West Publications.
- Nagarathna R & Nagendra HR (1980). *Therapeutic Application of Yoga: a Report*. Kanyakumari: Vivekananda Kendra Yoga Therapy and Research Centre.
- Naug RN (1975). Yoga therapy in neurotic disorders. *Indian Journal of Clinical Psychology*, 2, 87-90.
- O'Haire TD, & Marcia JE (1980). Some Personality Characteristics Associated with Ananda Marga Meditators: A Pilot Study. *Perceptual and Motor Skills*, 51, 447-452
- Orme-Johnson DW, & Granieri B (1977). The Effects of the Age of Enlightenment Governor Training Courses on Field Independence, Creativity, Intelligence, and Behavioral Flexibility. In DW Orme-Johnson & JT Farrow (Eds.), *Scientific Research on the Transcendental Meditation Program: Collected Papers, Vol. 1*, (pp. 713-718). New York: M.E.R.U. Press.
- Pagano RR, & Frumkin LR (1977). The Effect of Transcendental Meditation on Right Hemispheric Functioning. *Biofeedback and Self-Regulation*, 2, 407-415.
- Patel CH (1976). TM and Hypertension. *Lancet*, 1, 539.
- Ramamurthi B (1977). Yoga and neurology. *Journal of Rehabilitation in Asia*, 18, 16-17.
- Robertson DW (1983). The Short and Long Range Effects of the Transcendental Meditation Technique on Fractionated Reaction Time. *Journal of Sports Medicine*, 23, 113-120.
- Royer-Bounouar PA (1989). The Transcendental Meditation Technique: A New Direction for Smoking Cessation Programs. *Dissertation Abstracts International*, 50, 3428.
- Schwartz GE (1974). TM Relaxes Some People and Makes Them Feel Better. *Psychology Today*, April, 39-44.
- Schwartz G (1975). Biofeedback, Self-regulation, and the Patterning of Physiological Processes. *American Scientist*, 63, 314-324.
- Seer P & Raeburn JM (1980). Meditation Training and Essential Hypertension: A Methodological Study. *Journal of Behavioral Medicine* 3, 59-70.
- Sethi A (1989). Strategies for managing burnout. *Journal of Comparative Sociology and Religion*, 16, 46-63.
- Sethi BB, Trivedi JK, & Anand R (1981). A comparative study of the relative effectiveness of biofeedback and shavasana in tension headache. *Indian Journal of Psychiatry*, 23, 109-114.
- Sharma I & Agnihotri SS (1982). *Preliminary observations on the effect of controlled breathing in anxiety states*. Paper presented at National Symposium on Yoga, brain and consciousness, NIMHANS, Bangalore, India.
- Singh R (1992). Re-organising the experience of self and the spouse. *Indian Journal of Social Work*, 53, 220-231.

- Sudsang R, Chentanez, & Veluvan K (1991). Effect of Buddhist Meditation on Serum Cortisol and Total Protein Levels, Blood Pressure, Pulse Rate, Lung Volume and Reaction Time. *Physiology and Behavior*, 50, 543-548.
- Taimni IK (1975). Patanjali's "Yoga Sutras," Book I, verses 2-4. In *The Science of Yoga*. Wheaton, IL: Theosophical Publishing House.
- Travis F (2001). Autonomic and EEG patterns distinguish transcending from other experiences during transcendental meditation practice. *International Journal of psychophysiology*, 42, 1-9.
- Travis F, & Pearson C (2000). Pure consciousness: distinct phenomenological and physiological correlates of "consciousness itself." *The International Journal of Neuroscience*, 100, 1-4.
- Travis F, Tecce JJ, & Guttman J (2000). Cortical plasticity, contingent negative variation, and transcendent experiences during practice of the Transcendental Meditation technique. *Biological psychology*, 55, 41-55.
- Travis FT & Orme-Johnson DW (1989). Field model of consciousness: EEG coherence changes as indicators of field effects. *International Journal of Neuroscience*, 49, 203-211.
- Varma LP (1979). Yoga, meditation and mysticism. *Indian Journal of Psychiatry*, 21, 293-304.
- Verma IC, Jayashan BC, & Palani M (1982). Effect of Transcendental Meditation on the Performance of Some Cognitive Psychological Tests. *International Journal of Medical Research*, 7, 136-143.
- Wallace RK, Silver J, Mills PJ, et al. (1983b). Systolic Blood Pressure and Long-term Practice of the Transcendental Meditation and TM-Sidhi Program: Effects of TM on Systolic Blood Pressure. *Psychosomatic Medicine* 45, 41-46.
- Walsh RN (1978). Initial Meditative Experience: Part II. *Journal of Transpersonal Psychology*, 10, 1-28.
- Walsh RN (1979). Meditation Research: An Introduction and Review. *Journal of Transpersonal Psychology*, 11, 161-174.
- Walsh RN & Roche L (1979). Precipitation of Acute Psychotic Episodes by Intensive Meditation in Individuals with a History of Schizophrenia. *American Journal of Psychiatry*, 136, 1085-1086.
- Walsh R & Shapiro SL (2006). The meeting of meditative disciplines and Western psychology: a mutually enriching dialogue. *American Psychologist*, 61, 227-39.
- Wang C, Collet JP, & Lau J (2004). The effect of tai chi on health outcomes in patients with chronic conditions: a systematic review. *Archives of Internal Medicine*, 164, 493-501.
- Wolpe J (1961). The Systematic Desensitization Treatment of Neuroses. *The Journal of Nervous and Mental Disease*, 132, 189-203.

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