

# Clinical Case Series: Treatment of PTSD With Transcendental Meditation in Active Duty Military Personnel

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**ABSTRACT** Active duty U.S. Army Service Members previously diagnosed with post-traumatic stress disorder (PTSD) were selected from review of patient records in the Traumatic Brain Injury Clinic at the Department of Defense Eisenhower Army Medical Center at Fort Gordon in Augusta, Georgia. Patients agreed to practice the Transcendental Meditation (TM) technique for 20 minutes twice a day for the duration of a 2-month follow-up period. Three cases are presented with results that show the feasibility of providing TM training to active duty soldiers with PTSD in a Department of Defense medical facility. Further investigation is suggested to determine if a TM program could be used as an adjunct for treatment of PTSD. Impact of this report is expected to expand the complementary and alternative evidence base for clinical care of PTSD.

## INTRODUCTION

Exposure to a life-threatening or horrifying event, such as combat trauma, can lead to the development of post-traumatic stress disorder (PTSD),<sup>1</sup> a chronic psychiatric illness. The essential features of PTSD may involve intense fear, hopelessness or horror,<sup>2</sup> reexperiencing the trauma, avoidance and numbing, and hyperarousal symptom clusters in the aftermath of the event.<sup>3</sup> Prevalence of combat-related PTSD in U.S. military veterans since the Vietnam War is estimated between 2% and 17%,<sup>4</sup> 12.6% for those who fought in Iraq and 6.2% for those who fought in Afghanistan.<sup>5</sup> More than one-third of PTSD cases fail to recover even after many years, showing PTSD to be a chronic disorder representing a significant and costly illness to veterans, their families, and society as a whole.<sup>3</sup>

Drugs and/or psychotherapeutic interventions are typically used for treating combat-related PTSD.<sup>6</sup> There is a strong emphasis on providing evidenced-based treatment (e.g., Prolonged Exposure Therapy, Cognitive Processing Therapy, and Eye Movement Desensitization and Reprocessing) as a first-line treatment. Drugs used for PTSD are not without adverse side effects, not all patients respond optimally or benefit equally from these approaches, and treatment success may be limited by complicated comorbidities (e.g., traumatic brain injury, substance abuse, sleep and mood disorders). Many with PTSD are hesitant about seeking help, or receive inadequate treatment.<sup>7</sup> Reasons for not seeking treatment may include the perceived stigma of PTSD and its potential impact on career advancement.<sup>8</sup>

There is a strong need for multidisciplinary collaborative care models of treatment in primary care to better address the

full spectrum of postwar physical and neurocognitive health concerns.<sup>9</sup> Nontraditional approaches may be an adjunctive treatment option. Options for effective treatments that are easily accessible and perceived as nonstigmatizing are needed. An adjunctive approach, such as meditation, can be learned privately without the stigma that may be associated with seeing a mental health provider. Combat veterans with PTSD have been shown to have increased chronic cardiovascular arousal,<sup>10</sup> higher circulating catecholamines, other neuroendocrine agents implicated in arterial damage, and more frequent abnormal electrocardiographic readings.<sup>11</sup> PTSD patients exhibit higher skin conductance, heart rate, plasma cortisol, and catecholamines at baseline, and exaggerated combat sound responses in skin conductance, heart rate, plasma epinephrine, and norepinephrine compared to controls.<sup>12</sup> Chronic sympathetic nervous system (SNS) arousal and SNS hyperactivation to stressors are potent risk factors for adverse cardiovascular events.<sup>13</sup> Meditation techniques have been shown to reduce SNS arousal but have been found to differ<sup>14</sup> with regard to the sensory and cognitive processes they require,<sup>15</sup> their neurophysiological effects,<sup>16</sup> and their behavioral outcomes.<sup>17</sup>

The Transcendental Meditation (TM) program has shown a remarkably wide range of health benefits<sup>18–20</sup> and has been studied and implemented worldwide<sup>21</sup> including findings with two studies showing reduced PTSD in veterans that provide a rationale for introduction of the TM program in active duty soldiers.<sup>22,23</sup> A meta-analysis of 32 studies found consistent evidence for reductions in SNS activation with the TM program, seen in acute reductions during TM practice in respiratory rate, plasma lactate, and increased basal skin resistance compared with control subjects sitting with eyes closed. TM subjects also had lower baseline levels of heart rate, respiratory rate, plasma lactate, and spontaneous skin resistance responses outside of meditation.<sup>24</sup> Related studies have found reduced turnover of norepinephrine and epinephrine reflecting reduced SNS activity because of TM practice. These factors may contribute to

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This article was presented in poster format at the Second Augusta Research Symposium on Advances in Warrior Care in Augusta, GA, October 2012.

The article has received Department of Defense, Eisenhower Army Medical Center publication clearance.

doi: 10.7205/MILMED-D-12-00426

decreased contractility of the vascular smooth muscle and thus to reduced peripheral resistance, contributing to reduced blood pressure and cardiovascular disease risk,<sup>25</sup> and may be involved in the mechanism for reduction in PTSD.<sup>26</sup> We report on the feasibility of training and effects of TM on PTSD in active duty soldiers. The impact of this report is expected to expand the complementary and alternative evidence base for clinical care of PTSD.

## METHODS

### *Patient Characteristics*

Active duty U.S. Army service members with a PTSD diagnosis were recruited from the Department of Defense (DoD), Dwight D. Eisenhower Army Medical Center (DDEAMC) at Fort Gordon in Augusta, Georgia. PTSD patients 18 to 65 years of age, were eligible for the training. The patients were among the first group of five with PTSD to be trained in TM at the DDEAMC, selected based on compliance with the program and deemed to be clinically stable at the time of enrollment for TM training. Patients agreed to practice the TM technique for 20 minutes twice a day for the duration of a 2-month follow-up period. All TM training sessions were conducted at the DDEAMC in Augusta. All participants completed the DDEAMC Functional Recovery Program, a mind-body, psychoeducational, and therapy program before starting the TM program. Participation was voluntary, and patients were given the opportunity to discontinue participation at any time for any reason.

### *Description of the TM Technique*

The TM technique was derived from the Vedic tradition of India<sup>27</sup> and is taught in the United States by the Maharishi Foundation (a 501(c)(3) nonprofit educational organization) by certified teachers via personalized instruction. General information about the technique and its effects is presented in a 1-hour introductory lecture. More specific preparatory information is given in a second 1-hour lecture. Subjects then meet with the teacher for a 5- to 10-minute personal interview. TM is then taught in a course comprising 5 to 6 hours of instruction over 4 days.<sup>28</sup> The participant learns the TM technique in a 1-hour private session. The next three sessions consist of 1.5 hour group meetings over consecutive days in which those who learned the technique on the same occasion meet with the teacher for further instruction and have an opportunity to discuss their experience of the meditation practice. The technique is checked by the teacher to ensure correct practice.<sup>29</sup> Successful practice as determined by the teacher is based on feedback provided by the practitioner. Follow-up sessions, including group meditation and discussion of experiences, are provided in weekly meetings for the first month, bimonthly meetings for the next 2 months, and monthly meetings during the remainder of the follow-up. Personal checking of meditation is provided as needed at any time.

TM practitioners are instructed to sit in a comfortable posture, with eyes closed. The technique is prescribed to be practiced 15 to 20 minutes twice daily, at a convenient time once in the morning and once in the afternoon.<sup>28</sup> The experience of TM practice is characterized by repeated cycles of movement of attention from the active thinking level to more subtle levels, experience of a quiescent state at the subtlest thinking level, and movement of attention back to the more active levels.<sup>30</sup> This quiescent state is said to be the most silent and peaceful level of consciousness and is associated with significantly increased electroencephalogram (EEG) coherence and physiological rest.<sup>31</sup> A systematic review of 82 meditation studies support the safety and potential efficacy of meditative practices as treatments for mental illness, particularly in nonpsychotic mood and anxiety disorders.<sup>32</sup> Three representative cases selected based on compliance with the program are presented to show the types of combat trauma encountered, the major presenting symptoms, and the responses to TM training.

### *Instruments*

The following self-report instruments provided outcome-tracking scores for the cases. The Outcome Questionnaire 45 (OQ-45), a 45-item instrument, measures functioning in symptom distress (anxiety and affective disorders and stress-related illnesses), interpersonal relations (loneliness, conflicts with others, and family difficulties), and social role performance (conflicts at work and relationships).<sup>33</sup> The OQ has a range of 0 to 180. A score of 63 or more indicates symptoms of clinical significance. The OQ has good internal consistency ( $\alpha = 0.93$ ) and test-retest reliability ( $r = 0.79$ ).<sup>34</sup>

The 17-item PTSD checklist (PCL) was used to measure symptoms of PTSD including sleep disturbance, hypervigilance, estrangement, and foreshortened future.<sup>35</sup> The PCL has a range of 17 to 85. A score of 50 or more indicates symptoms of clinical significance. The PCL has high internal consistency ( $\alpha = 0.97$ ) and test-retest reliability ( $r = 0.96$ ).<sup>35</sup> Both scales have moderately high concurrent validity with a variety of standardized scales intended to measure similar variables.

### **CASE 1**

A 26-year-old African American male Army Reservist was deployed to Afghanistan in June, 2010, for 6 months. He was medically evacuated from the war theater after an improvised explosive device blew up under the vehicle in which he was riding. The explosion occurred directly under his seat area. The force of the blast propelled him upward, causing him to strike his head on the top of the vehicle. At the time he was first seen by the clinical behavioral health component of the Traumatic Brain Injury clinic, he was highly anxious. He was restricting his activities because of his fears for his safety and was using alcohol to cope with his feelings. He was having nightmares almost nightly that caused him to wake with a pounding heart and profuse sweating. He would not go out in public without a concealed firearm and had an incident

when he became hyperaroused and shot the weapon into the air. His parents were so concerned for his safety that they took the weapon and locked it up. He participated in Cognitive Processing Therapy for treatment of PTSD. As a part of that treatment, he was taught several relaxation exercises that were of limited benefit in helping him to calm himself. Because of the previous findings on TM in the reduction of anxiety,<sup>22</sup> the treatment team thought this soldier might find this strategy more helpful than the others he used previously. After completing TM training, the soldier stated that he felt calmer and more positive. He was less stressed. He said that he was getting more of his tasks done than he had in the past. He said he was more patient and less irritable. The Soldier enjoyed the practice so much that he asked to return to do follow-ups with the next groups of trainees. OQ-45 scores were reduced from 109 before TM training to 102 at 6 weeks and 93 at 4 months post training. PCL scores were reduced to 54 at 4 weeks and 41 at 6 weeks compared to 60 before TM. Compliance with TM practice was once per day 3 to 5 times per week at 6 weeks. Attendance at TM training sessions was 100%.

### CASE 2

A 30-year-old Caucasian male National Guard member was deployed to Iraq twice, first from April 2003 to July 2004 for 15 months and second from August 2010 to January 2011 for 4 months. He sustained two blast-related concussions. In September 2010, an improvised explosive device exploded about 15 m away from his vehicle, dazing him for a few minutes. The second occurred on October 3, 2011 when two RKG3 antitank grenades hit the vehicle in which he was riding. He was thrown from the front passenger seat of the vehicle into the center with a loss of consciousness for 2 to 3 minutes. The blast was so significant that the ordinance specialist who arrived on the scene assumed that the front passenger had been killed until the service member corrected him. The service member came home on leave and was so anxious and hypervigilant that his wife and father convinced him to go into an inpatient psychiatric hospital for treatment. He never returned to the war theater. At the time he was first seen by the clinical behavioral health component of the Traumatic Brain Injury clinic, he was still highly anxious and hypervigilant with ongoing flashbacks and nightmares. He participated in prolonged exposure for treatment of his PTSD. As a part of that treatment, he was taught several relaxation exercises that were helpful in reducing his anxiety but that he would not commit to using on a regular basis. Because of the structured nature of TM training, the treatment team thought it would help him begin to rely more on his inner strength and less on medication to calm himself. After finishing TM training, the soldier stated that he felt more energetic and alert than previously. His irritability decreased. His affect changed, going from somber and sad to smiling and cheerful. He began to take more interest in his grooming, getting a flattering haircut that he kept combed.

The Soldier enjoyed the practice so much that he asked to return to do follow-ups with the next groups of trainees. OQ-45 scores were reduced from 128 before TM training to 117 at 6 weeks and 117 at 4 months post training. Compared to 82 before TM, PCL scores were reduced to 67 at 4 weeks and then increased to 71 at 6 weeks. Compliance with TM practice was twice per day 3 to 5 times per week at 6 weeks. Attendance at TM training sessions was 100%.

### CASE 3

A 60-year-old Hispanic male Reservist was deployed to Iraq in 2006. He was on a forward operating base in Mosul. He sustained a blast-related concussion when a mortar round hit about 50 feet away from where he was standing. He was dazed for a few minutes. He estimated that the forward operating base sustained about 140 mortar attacks during the time he was stationed there. At the time he was first seen by the clinical behavioral health component of the Traumatic Brain Injury clinic, he was still highly anxious and hypervigilant with ongoing flashbacks and nightmares. He was restricting his activities because of his fears for his safety. He had used alcohol to cope with his feelings. He participated in Cognitive Processing Therapy for treatment of PTSD. As a part of that treatment, he was taught several relaxation exercises that he found to be quite helpful. He enjoyed them so much that he appeared to be a good candidate for the TM program. After completing TM training, the soldier stated that he felt he greatly benefited from the practice. He began using it regularly as a calming strategy. He said he felt less anxious, calmer, and less stressed. He was more energized during the day and had more restful nights. He stated that others told him that he seemed more peppy and cheerful. OQ-45 scores were reduced from 124 before TM training to 121 at 6 weeks and 115 at 4 months post training. PCL scores were reduced to 51 at 4 weeks compared to 84 before TM. Compliance with TM practice was once per day 5 to 7 times per week at 6 weeks. Attendance at TM training sessions was 100%.

### DISCUSSION

These cases suggest the feasibility of providing TM training to active duty soldiers with PTSD in a DoD medical facility, including those with traumatic brain injury, depression, or substance abuse. Reduction in PTSD and distress and improvement in social role performance symptomatology seen in these cases are similar to previously published findings.<sup>22,23</sup> A study of Vietnam War veterans with PTSD reported a significant positive treatment effect for TM as compared to psychotherapy on PTSD, including improvements on subscales for the symptoms of emotional numbness, anxiety, depression, alcohol consumption, and family problems.<sup>22</sup> A pilot study examined the effects of TM in 5 Operation Enduring Freedom/Operation Iraqi Freedom veterans with PTSD<sup>23</sup> reported that subject's PTSD symptoms improved along with quality of life after 8 weeks.

Relatively few high-quality randomized controlled trials provide evidence for PTSD treatment.<sup>5</sup> Many PTSD studies have study design problems and dropout rates ranging from 20% to 50%, which reduce the certainty of results. For these reasons, and in response to demand from the soldiers themselves,<sup>22,23,36</sup> there is an urgent need for the DoD to be informed about whether interventions such as meditation should be a treatment option for the military population suffering from PTSD. The present case study included an African American, a Caucasian, and a Hispanic of ages ranging from 26 to 60, suggesting that the program may work across a wide diversity of age and ethnicity. Although all three cases had previously received some form of relaxation exercises via individual psychotherapy and the Functional Recovery Program before participating in the TM program, it is unknown how this might have influenced the results. It is possible that the prior training may have increased willingness to begin the TM program. Research via a controlled randomized clinical trial design is warranted to control for this and other factors such as medication and psychotherapeutic treatment.

### **Proposed Mechanism for Reduction of PTSD**

The stress response involves increased sympathetic nervous system activation characterized by complex neuroendocrine changes. Since PTSD is associated with persistent symptoms of increased arousal<sup>1</sup> and an exaggerated sympathetic response to stimuli,<sup>12</sup> it is proposed that meditation might be effective in counteracting this response, e.g., through deep relaxation provided by the practice. The hypothalamic–pituitary–adrenal axis provides mechanisms by which emotions and stress produce hormones that impact the body. For example, elevated baseline levels of plasma cortisol, a major stress hormone in humans, have also been associated with PTSD.<sup>37</sup> Prospective and randomized studies of the TM technique indicate that it has acute as well as longitudinal effects on reducing baseline cortisol, as well as average cortisol across stress sessions.<sup>38</sup> The implications are that PTSD will be benefited by reduced levels of stress hormones via TM practice. Lower sympathetic and higher parasympathetic tone, higher levels of frontal EEG alpha coherence (8–12 Hz) and frontal parietal phase synchrony,<sup>39</sup> as seen during TM practice, may contribute better, large-scale neural communication and integration necessary for mental health,<sup>40</sup> and may be the neurophysiological basis of beneficial, physiological, and clinical effects of TM.<sup>16</sup>

This is the first case study to examine feasibility of TM training in active duty personnel with PTSD, and together with findings from previous studies, suggest that this training warrants further research investigation. The findings suggest that the TM program could not only be used as an adjunct for treatment but also potentially may have an impact on soldier's health via reduction of stress and prevention of PTSD symptomatology, if provided as part of soldier resilience training before deployment. Future investigation will

be needed to answer questions about the efficacy of this program for active duty soldiers with PTSD and whether the results apply to the many PTSD sufferers who have multiple conditions. If proven to be efficacious, this is one of a small number of interventions whose benefits could be immediately translated into improved care, and that could have a significant health impact if widely disseminated with considerable potential to improve quality of life for military personnel.

### **ACKNOWLEDGMENT**

Funding for Transcendental Meditation training was provided by the David Lynch Foundation Operation Warrior Wellness.

### **REFERENCES**

1. American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorder DSM-IV-TR, Ed 4. Washington, DC, American Psychiatric Association, 2004.
2. Ballenger JC, Davidson JR, Lecrubier Y, et al: Consensus statement update on posttraumatic stress disorder from the international consensus group on depression and anxiety. *J Clin Psychiatry* 2004; 65(Suppl 1): 55–62.
3. Kessler RC, Sonnega A, Bromet E, Hughes M, Nelson CB: Posttraumatic stress disorder in the National Comorbidity Survey. *Arch Gen Psychiatry* 1995; 52(12): 1048–60.
4. Richardson LK, Frueh BC, Acierno R: Prevalence estimates of combat-related post-traumatic stress disorder: critical review. *Aust N Z J Psychiatry* 2010; 44(1): 4–19.
5. Berg A, Breslau N, Goodman S, et al: Treatment of Posttraumatic Stress Disorder: An Assessment of the Evidence. Washington, DC, National Academies Press, 2008.
6. Friedman MJ: Posttraumatic stress disorder among military returnees from Afghanistan and Iraq. *Am J Psychiatry* 2006; 163(4): 586–93.
7. Spont MR, Murdoch M, Hodges J, Nugent S: Treatment receipt by veterans after a PTSD diagnosis in PTSD, mental health, or general medical clinics. *Psychiatr Serv* 2010; 61(1): 58–63.
8. Tanielian T, Jaycox LJ (editors): *Invisible Wounds of War: Psychological and Cognitive Injuries, Their Consequences, and Services to Assist Recovery*. Santa Monica, CA, Rand Corporation, 2008.
9. Wilk JE, Herrell RK, Wynn GH, Riviere LA, Hoge CW: Mild traumatic brain injury (concussion), posttraumatic stress disorder, and depression in U.S. soldiers involved in combat deployments: association with postdeployment symptoms. *Psychosom Med* 2012; 74(3): 249–57.
10. Buckley TC, Holohan D, Greif JL, Bedard M, Suvak M: Twenty-four-hour ambulatory assessment of heart rate and blood pressure in chronic PTSD and non-PTSD veterans. *J Trauma Stress* 2004; 17: 163–71.
11. Boscarino JA, Chang J: Electrocardiogram abnormalities among men with stress-related psychiatric disorders: implications for coronary heart disease and clinical research. *Ann Behav Med* 1999; 21: 227–34.
12. Liberzon I, Abelson JL, Flagel SB, Raz J, Young EA: Neuroendocrine and psychophysiological responses in PTSD: a symptom provocation study. *Neuropsychopharmacology* 1999; 21(1): 40–5.
13. Curtis BM, O'Keefe JHJ: Autonomic tone as a cardiovascular risk factor: the dangers of chronic fight or flight. *Mayo Clin Proc* 2002; 77(1): 45–54.
14. Sedlmeier P, Eberth J, Schwarz M, et al: The psychological effects of meditation: a meta-analysis. *Psychol Bull* 2012; 138(6): 1139–71.
15. Shear J: *The Experience of Meditation: Experts Introduce the Major Traditions*. St. Paul, MN, Paragon House, 2006.
16. Travis F, Shear J: Focused attention, open monitoring and automatic self-transcending: categories to organize meditations from

- Vedic, Buddhist and Chinese traditions. *Conscious Cogn* 2010; 19(4): 1110–8.
17. Orme-Johnson DW, Walton KG: All approaches of preventing or reversing effects of stress are not the same. *Am J Health Promot* 1998; 12(5): 297–9.
  18. Chalmers R, Clements G, Schenkluhn H, Weinless M (editors): *Scientific Research on the Transcendental Meditation Program: Collected Papers, Vols. 2–4*. Vlodrop, The etherlands, MVU Press, 1990.
  19. Orme-Johnson DW, Farrow J (editors): *Scientific Research on the Transcendental Meditation Program: Collected Papers, Vol. 1*. Rheinweiler, West Germany, MERU Press, 1977.
  20. Wallace RK, Orme-Johnson DW, Dillbeck MC (editors): *Scientific Research on the Transcendental Meditation Program: Collected Papers, Vol. 5*. Fairfield, IA, MIU Press, 1990.
  21. Barnes VA, Orme-Johnson DA: Prevention and treatment of cardiovascular disease in adolescents and adults through the Transcendental Meditation Program®: a research review update. *Curr Hypertens Rev* 2012; 8(3): 227–42.
  22. Brooks JS, Scarano T: Transcendental Meditation in the treatment of post-Vietnam adjustment. *J Couns Dev* 1985; 64: 212–5.
  23. Rosenthal JZ, Grosswald S, Ross R, Rosenthal N: Effects of transcendental meditation in veterans of Operation Enduring Freedom and Operation Iraqi Freedom with posttraumatic stress disorder: a pilot study. *Mil Med* 2011; 176(6): 626–30.
  24. Dillbeck MC, Orme-Johnson DW: Physiological differences between Transcendental Meditation and rest. *Am Psychol* 1987; 42: 879–81.
  25. Schneider RH, Grim CE, Rainforth MA, et al: Stress reduction in the secondary prevention of cardiovascular disease: randomized controlled trial of Transcendental Meditation and health education in blacks. *Circ Cardiovasc Qual Outcomes* 2012; 5(6): 750–8.
  26. Walton KG, Pugh NDC, Gelderloos P, Macrae P: Stress reduction and preventing hypertension: preliminary support for a psychoneuroendocrine mechanism. *J Altern Compl Med* 1995; 1(3): 263–83.
  27. Alexander CN: Transcendental Meditation. In: *Encyclopedia of Psychology*, Ed 2. Edited by Corsini RJ. New York, Wiley Interscience, 1993.
  28. Roth R: *Maharishi Mahesh Yogi's Transcendental Meditation*. Washington, DC, Primus, 1994.
  29. Ospina MB, Bond TK, Karkhaneh M, et al: Meditation practices for health: state of the research. *Evid Rep Technol Assess (Full Rep)* 2007; 155: 1–263.
  30. Travis FT: Transcendental Meditation technique. In: *The Corsini Encyclopedia of Psychology and Behavioral Science*, Ed 2, pp 1705–6. Edited by Craighead WE, Nemeroff CB. New York, John Wiley & Sons, 2001.
  31. Travis F, Olson T, Egenes T, Gupta HK: Physiological patterns during practice of the Transcendental Meditation technique compared with patterns while reading Sanskrit and a modern language. *Int J Neurosci* 2001; 109(1–2): 71–80.
  32. Arias AJ, Steinberg K, Banga A, Trestman RL: Systematic review of the efficacy of meditation techniques as treatments for medical illness. *J Altern Complement Med* 2006; 12(8): 817–32.
  33. Beckstead DJ, Hatch AL, Lambert MJ, et al: Clinical significance of the Outcome Questionnaire (OQ-45.2). *Behav Anal Today* 2003; 4(1): 79–90.
  34. Lambert MJ, Morton JJ, Hatfield D: *Administration and Scoring Manual for the OQ®-45.2 Outcome Questionnaire*. Salt Lake City, UT, American Professional Credentialing Services, LLC, 2004.
  35. Weathers FW, Litz BT, Herman DS, et al: The PTSD Checklist (PCL): Reliability, validity, and diagnostic utility. Paper presented at Annual Conference of the International Society for Traumatic Stress Studies, 1993; San Antonio, TX.
  36. Bormann JE, Thorp S, Wetherell JL, Golshan S: A spiritually based group intervention for combat veterans with posttraumatic stress disorder: feasibility study. *J Holist Nurs* 2008; 26(2): 109–16.
  37. Pitman RK, Orr SP: Twenty-four-hour urinary cortisol and catecholamine excretion in combat-related posttraumatic stress disorder. *Biol Psychiat* 1990; 27: 245–7.
  38. Walton KG, Schneider RH, Nidich SI, Salerno JW, Nordstrom CK, Bairey Merz CN: Psychosocial stress and cardiovascular disease Part 2: effectiveness of the Transcendental Meditation program in treatment and prevention. *Behav Med* 2002; 28(4): 106–23.
  39. Travis F, Haaga DA, Hagelin J, et al: Effects of Transcendental Meditation practice on brain functioning and stress reactivity in college students. *Int J Psychophysiol* 2009; 71(2): 170–6.
  40. Palva S, Palva JM: New vistas for alpha-frequency band oscillations. *Trends Neurosci* 2007; 30(4): 150–8.