

Selected Research on Transcendental Meditation as a Medical Intervention for Numerous Physical and Mental Health Conditions

(The following is an excerpted list of more than 450 published studies over the last 50 years. A full bibliography of this research is available upon request)

CARDIOVASCULAR DISEASE, BLOOD PRESSURE, AND RISK FACTORS

ADULT PATIENTS

Location: New York, NY

Improved Myocardial Flow Reserve (*Journal of Nuclear Cardiology*, 2021; RCT)

Fifty-six African American coronary heart disease (CHD) patients were assigned to standard cardiac rehabilitation (CR), CR+TM (Transcendental Meditation), TM alone, or usual care. Testing was done at baseline and after 12 weeks. The primary outcome was myocardial flow reserve (MFR) assessed by ¹³N-ammonia positron emission tomography (PET). For the 37 patients who completed posttesting, there were significant MFR improvements in the CR + TM group (+20.7%; ES = 0.64) and the TM group alone (+12.8%; ES = 0.36). By comparison, the CR-alone and usual care groups showed modest changes (+ 5.8%; ES = 0.17 and - 10.3%; ES = - 0.31), respectively. For the combined TM group, MFR increased (+ 14%, ES = 0.56) compared to the combined non-TM group (- 2.0%, ES = - 0.08). These pilot data suggest that adding the TM technique to standard cardiac rehabilitation or using TM alone may improve the myocardial flow reserve in African American CHD patients.

**Research Field Site: Columbia University Medical Center
National Heart Lung and Blood Institute Grant HL 100386.**

Reference: Bokhari S, et al. Effects of cardiac rehabilitation with and without meditation on myocardial blood flow using quantitative positron emission tomography: A pilot study. *Journal of Nuclear Cardiology*, 2021 Aug;28(4):1596-1607. doi: 10.1007/s12350-019-01884-9.

Location: Augusta, GA

Decreased Systolic Blood Pressure in Blacks Exhibiting Elevated Baseline Blood Pressure (*American Journal of Preventive Cardiology*, 2021; RCT)

This randomized controlled trial evaluated the effect of stress reduction with the TM technique as compared to health education (HE) in a total of 304 Black adults with high normal blood pressure (BP) and normal BP using international classifications. BP was recorded at 3, 6, 9, 12, 24, 30 and 36 months after baseline. After an average of 19.9 ± 11.1 months follow-up, TM participants in the high-normal BP group showed significantly lower posttest SBP (-3.33 mm Hg, p = 0.045) and no difference in DBP (-0.785 mm Hg, p = 0.367) compared to HE participants; in the normal BP group, the SBP and DBP were not different between the TM and HE participants. The hazard ratio for hypertensive events was 0.52 (p = 0.15) in the high normal BP group (7 TM vs 13 HE) with no difference in the normal BP group. Authors concluded that these results may be relevant to reducing health disparities in CVD and related co-morbidities.

**Research Field Site: Medical College of Georgia
National Heart Lung and Blood Institute Grant #R01HL060703**

Reference: Schneider RH, et al. Randomized controlled trial of stress reduction with meditation and health education in black men and women with high normal and normal blood pressure. *American Journal of Preventive Cardiology*, 2021 Dec 1;8:100279. doi: 10.1016/j.ajpc.2021.100279.

Location: Los Angeles, CA

**Reduced Left Ventricular Hypertrophy (LVMI)
(Ethnicity and Disease, 2019; RCT)**

This randomized controlled trial evaluated the effects of stress reduction with the TM technique as compared to health education (HE) on preventing left ventricular hypertrophy (LVH). Eighty five African American adults with hypertension were evaluated by M-mode echocardiography at baseline and after 6 months for left ventricular mass index (LVMI), as well as for blood pressure, psychosocial stress and behavioral factors. Results at posttest indicated that (a) the TM group had significantly lower LVMI compared with the HE group (-7.55gm/m², 95% CI -14.78 to -.34 gm/m², P=.040); (b) both interventions showed significant within group reductions in BP, (SBP/DBP changes for TM: -5/-3 mm Hg, and for HE: -7/-6 mm Hg, P=.028 to <.001) although between group changes were not significant; and (c) both groups showed significant reductions in anger (P=.002 to .001).

Research Field Site: Charles R. Drew University of Medicine and Science, Los Angeles, CA
Supported in Part by National Heart Lung and Blood Institute Grant #R01 HL5159

Reference: Schneider RH, et al. Stress Reduction in the Prevention of Left Ventricular Hypertrophy: A randomized controlled trial of Transcendental Meditation and health education in hypertensive African Americans. *Ethnicity and Disease*, 2019 Oct 17;29(4):577-586. doi: 10.18865/ed.29.4.577.

Location: Milwaukee, WI

**Decreased Risk of Heart Attack, Stroke and Death
(Circulation: Cardiovascular Quality and Outcomes, 2012; RCT)**

Two hundred and one African American men and women with coronary heart disease were randomly assigned to Transcendental Meditation (TM) or health education (HE) and followed up over an average of 5.4 years. Compared to the HE group, the TM group showed a 48% decrease in heart attack, stroke or all-cause mortality (primary endpoint). A 24% decrease in the secondary composite endpoint of cardiovascular mortality, revascularizations, and cardiovascular hospitalizations was also found in TM participants compared to HE controls. Degree of regularity of practice of the TM program was positively associated with survival. Other findings included a reduction of 4.9 mm Hg in systolic blood pressure and a significant decrease in anger expression in the TM group compared to HE.

Research Field Site: Medical College of Wisconsin

National Institutes of Health - National Heart, Lung, and Blood Institute Grant R01HL48107

Reference: Schneider RH, et al. Stress reduction in the secondary prevention of cardiovascular disease: Randomized controlled trial of Transcendental Meditation and health education in blacks. *Circulation: Cardiovascular Quality and Outcomes*, 2012 Nov;5(6):750-758. doi: 10.1161/CIRCOUTCOMES.112.967406.

Location: Philadelphia, PA

Improved Functional Capacity and Decreased Depression in African American Heart Failure Patients

(*Ethnicity and Disease*, 2007; RCT)

Twenty-three African American patients hospitalized with congestive heart failure were randomly assigned to Transcendental Meditation (TM) or health education (HE) control groups. For the primary outcome of functional capacity, the TM group significantly improved on the six-minute walk test from baseline to six months compared to the HE group. The TM group also showed improvements in mental health, depression, and disease-specific quality of life. The TM group had fewer re-hospitalizations during the six months of follow-up.

Research Field Site: Department of Medicine, University of Pennsylvania National Center for Complementary and Alternative Medicine Grant P50-AT00082-05 Reference: Jayadevappa R, Johnson J, et al. Effectiveness of the Transcendental Meditation program for African Americans with congestive heart failure: A pilot randomized control study. *Ethnicity and Disease*, 2007;17(1):72-77. PMID: 17274213.

Location: Los Angeles, CA

Reduced Metabolic Syndrome

(*Archives of Internal Medicine*, 2006; RCT)

One hundred and three coronary heart disease patients were randomly assigned to Transcendental Meditation (TM) or health education (HE) control group. Over a four-month intervention period, the TM group showed a significant improvement in blood pressure and insulin resistance components of the metabolic syndrome as well as cardiac autonomic nervous system tone compared to HE. These results suggest that TM may modulate the physiological response to stress and improve coronary heart disease risk factors.

Research Field Site: Cedars-Sinai Medical Center National Center for Complementary and Alternative Medicine and other National Institutes of Health Grants R01 AT00226, 1-P50-AA0082-02, 1-R15-HL660242- 01, R01-HL51519-08 Reference: Paul-Labrador M, Polk D, Dwyer JH, Bairey Merz CN, et al., Effects of a randomized controlled trial of Transcendental Meditation on components of the metabolic syndrome in subjects with coronary heart disease. *Archives of Internal Medicine*, 2006 Jun 12;166(11):1218-24. doi: 10.1001/archinte.166.11.1218.

Location: Oakland, CA & Cambridge, MA

Reduced Mortality in Hypertensive Older Adults

(*American Journal of Cardiology*, 2005; data pooled from 2 RCTs)

Patient data were pooled from two published randomized controlled trials on high blood pressure that compared TM to other behavioral interventions (mindfulness, progressive muscle relaxation, mental relaxation procedures, health education) and usual care. A total of 202 older adults with pre-hypertension or hypertension were followed-up for vital status and cause of death over an average of 7.6 years. Compared with combined controls, the TM group showed a 23% decrease in all-cause mortality, the study's primary outcome. Secondary analyses showed a 30% decrease in the rate of cardiovascular mortality and a 51% decrease in the rate of mortality due to cancer in the TM group compared with combined controls.

Research Field Sites: The two published studies were originally conducted at the West Oakland Health Center, CA and Harvard University, MA.

Supported in Part by National Center for Complementary and Alternative Medicine Grant 1P50AT00082

Reference: Schneider RH, Alexander CN, et al. Long-term effects of stress reduction on mortality in persons > 55 years of age with systemic hypertension. *American Journal of Cardiology*, 2005 May 1;95(9):1060–1064. doi: 10.1016/j.amjcard.2004.12.058.

Location: Los Angeles, CA

**Reduced Carotid Atherosclerosis in Hypertensive Patients
(*Stroke*, 2000; RCT)**

Sixty hypertensive subjects were randomly assigned to Transcendental Meditation (TM) or health education (HE) control groups and completed post-testing after 6 to 9 months. The TM group showed a significant decrease of 0.098 mm in intima-media-thickness (IMT), as measured by B mode ultrasound, compared with an increase of 0.054 mm in the control group. This reduction was similar to that achieved by lipid-lowering drugs and extensive lifestyle changes.

Research Field Site: Charles R. Drew University of Medicine and Science, CA National Heart, Lung, and Blood Institute Grants HL-51519, HL-51519-S2 **Reference:**

Castillo-Richmond A, et al. Effects of stress reduction on carotid atherosclerosis in hypertensive African Americans. *Stroke*, 2000;31:568-573.

Location: Oakland, CA

**Decreased Blood Pressure in Hypertensive Black Patients
(*Hypertension*, 1995; RCT)**

One hundred twenty-seven hypertensive African Americans were randomly assigned to either Transcendental Meditation (TM), Progressive Muscle Relaxation (PMR), or education control (EC) groups and completed three-month post-testing. Results showed reductions of 10.7 mm Hg in systolic blood pressure (SBP) and 6.4 mm Hg in diastolic blood pressure (DBP) in the TM group; these reductions in BP were significantly greater than changes found in the other treatment groups. The BP reductions in the TM group compare favorably to the effects found with antihypertensive medication.

Research Field Site: West Oakland Health Center, CA

Private foundation funding

Reference: Schneider R, Staggars F, et al. A randomized controlled trial of stress reduction for hypertension in older African Americans. *Hypertension*, 1995;26(5):820-827.

STUDENTS

**Reduced Ambulatory Blood Pressure in Black Adolescents
(*Am J of Hypertension*, 2004; RCT)**

African American adolescents (aged 16.2 +/- 1.3 years) with high normal systolic BP were randomly assigned to either 4-month TM (n = 50) or health education control (n = 50) groups. Ambulatory 24-h BP measures were recorded at pretest, 2- and 4-month post-tests, and 4-month follow-up. Greater decreases in daytime systolic BP (P < .04) and diastolic BP (P < .06) in the TM

group compared with the control group across the visits demonstrate a beneficial impact of the TM program in youth at risk for the development of hypertension.

Reference: Barnes V, Treiber F, Johnson MH. Impact of Transcendental Meditation on ambulatory blood pressure in African American adolescents. *Am J of Hypertension*, 2004; 17(4):366-369.

Location: Augusta, GA

Improved Cardiovascular Functioning at Rest and in Reaction to Stressors in Adolescents at Risk for Hypertension

(*J Psychosomatic Research*, 2001; RCT)

Thirty-five adolescents with resting blood pressure between the 85th and 95th percentile for their age and gender were randomly assigned to either Transcendental Meditation (TM) or health education (HE) control groups, with a two-month intervention period. The TM group exhibited a significant decrease in resting systolic blood pressure (SBP) compared to controls. Greater decreases in blood pressure, heart rate, and cardiac output reactivity to stressors were further observed.

Research Field Site: Georgia Health Sciences University

Supported in Part by National Institutes of Health Grant HL62976

Reference: Barnes, Treiber, F, Davis, H. Impact of Transcendental Meditation on cardiovascular function at rest and during acute stress in adolescents with high normal blood pressure, *J Psychosomatic Research*, 2001;51:597-605.

AMERICAN HEART ASSOCIATION SCIENTIFIC STATEMENTS ON CARDIOVASCULAR RISK REDUCTION: 2017 AND 2013

***Journal of the American Heart Association*, 2017;6:e002218.**

Scientific statement from AHA discussed the body of research regarding TM and found that, given the low costs and low risks of meditation, it may be considered as an adjunct to guideline-directed cardiovascular risk reduction by those interested in this lifestyle modification. Levine GN, et al. Meditation and cardiovascular risk reduction: A scientific statement from the American Heart Association. *Journal of the American Heart Association*, 2017;6:e002218. doi: 10.1161/JAHA.117.002218.

***Hypertension*, 2013 Apr 22;61:1360-1383.**

Scientific statement from AHA found evidence that TM reduces blood pressure and states that "TM may be considered in clinical practice to lower BP." Further found that there was insufficient evidence to recommend other meditation techniques for consideration in clinical practice. Brook RD, et al. Beyond medications and diet: alternative approaches to lowering blood pressure. A scientific statement from the American Heart Association. *Hypertension*, 2013 Apr 22;61:1360-1383. doi: 10.1161/HYP.0b013e318293645f.

PTSD and DEPRESSION SYMPTOMS

VETERANS AND ACTIVE MILITARY

Location: Bayshore, NY

Decreased PTSD Symptom Severity, Depression, and Insomnia (*Journal of Traumatic Stress*, 2022; RCT)

Forty veterans diagnosed with PTSD were assigned to TM or Treatment as Usual (TAU) control group. Participants were measured at baseline and after three months. A significant decrease in PTSD symptom severity, using the Clinician-Administered PTSD Scale (CAPS-5) was found for the TM group compared to the TAU group at three-month posttest (between group effect size Cohen's $d=0.86$). Fifty percent of veterans in the TM group no longer met criteria for PTSD diagnosis at posttest, compared to 10% in the TAU group ($p=.007$). Significant reductions were also found for depression, anxiety, and sleep problems for the TM group compared to TAU (Cohen's d effect sizes ranged from .82 to 1.0).

Research Field Site: Northwell Health, LI, NY
Private foundation funding

Reference: Bellehsen M, Stoycheva V, et al. Transcendental Meditation as a treatment for PTSD in veterans. *Journal of Traumatic Stress*, 2022; 35(1), 22-31.doi.org/10.1002/jts.22665.

Location: San Diego, CA

Reduced PTSD and Depression Symptoms (*The Lancet Psychiatry*, 2018; RCT)

This randomized controlled study of 203 veterans with PTSD, funded by the Department of Defense and conducted at the San Diego VA, compared the non-trauma-focused practice of Transcendental Meditation (TM) with the "gold standard" trauma-focused prolonged exposure (PE) therapy in a non-inferiority clinical trial, and compared both treatments to a PTSD health education (HE) control. For PTSD symptom severity total scores, using the Clinician Administered PTSD Scale (CAPS-IV), both TM and PE were significantly superior to HE, with TM being non-inferior to PE over a three-month period. Similar results were found for depression using the Patient Health Questionnaire (PHQ-9). In terms of percentages of veterans exhibiting clinically significant change on the CAPS (equal to or greater than a 10-point reduction), 61% of those receiving TM, 42% of those receiving PE, and 32% of those receiving HE showed clinically significant improvements. Results indicated the effectiveness of TM in decreasing PTSD symptom severity in veterans and serving as an alternative for those who prefer not to receive or who do not respond to traditional exposure-based treatments for PTSD.

Research Field Site: San Diego VA Medical Center

Department of Defense Grants W81XWH-12-1-0576, W81XWH-12-1-0577 Reference: Nidich S, Mills P, et al. Non trauma focused meditation versus exposure therapy in veterans with post-traumatic stress disorder: a randomized controlled trial. *The Lancet Psychiatry*, 2018;5(2):975-986.

Improved PTSD Symptoms, EEG, Depression, and Quality of Life
(Psychological Trauma: Theory, Research, Practice, and Policy, 2018; Single Group pretest-posttest)

Twenty-nine veterans were recruited and instructed in the Transcendental Meditation program. From baseline to posttreatment, participants reported reductions in PTSD symptoms, experiential avoidance, and depressive and somatic symptoms, as well as increases on measures of mindfulness and quality of life. These improvements were either maintained or continued to improve through the 2-month follow-up. Compared to baseline, EEG spectral power during meditation states increased in low-frequency bands (1–7 Hz) at posttreatment and follow-up and suggesting TM-specific changes in brain state associated with the intervention. **Private funding**
Reference: Kang SS, et.al. Transcendental meditation for veterans with post-traumatic stress disorder. *Psychological Trauma: Theory, Research, Practice, and Policy*, 2018 Nov;10(6):675-680. doi:10.1037/tra0000346. Epub 2018 Jul 19.

Location: Fort Gordon, GA

Reduced Anxiety and PTSD Symptoms and Decreased Usage of Medication
(Military Medicine, 2016; Controlled, non-randomized)

This study included 74 active-duty military with documented PTSD or anxiety disorder not otherwise specified (ADNOS), 37 who were instructed in TM and 37 who were not. At 1 month, 83.7% of the TM group stabilized, decreased, or ceased medications and 10.8% increased medication dosage; compared with 59.4% of controls who showed stabilization, decrease, or cessation of medications, and 40.5% who increased medications ($p < 0.03$). A similar pattern was observed after 2 months ($p < 0.27$), 3 months ($p < 0.002$), and 6 months ($p < 0.34$). Notably, there was a 20.5% reduction in psychological symptoms severity in the TM group compared to controls after 6 months.

Field Site: Fort Gordon, GA

Private foundation funding

Reference: Barnes VA, et al. Transcendental Meditation and psychotropic medication use among active-duty military service members with anxiety and PTSD. *Military Medicine*, 2016 Jan;181(1):56-63. doi: 10.7205/MILMED-D-14-00333.

PRISON INMATES

Location: Wilsonville, OR

Decreased PTSD Symptoms in Female Inmates
(The Permanente Journal, 2017; RCT)

Twenty-two female inmates at the Coffee Creek Correctional Facility in Wilsonville, OR, with at least 4 months of their prison term remaining, were randomly assigned to either TM or a wait-list control group. Significant reductions were found over several months on total trauma symptom severity, intrusive thoughts, and hyperarousal, using the well-validated PTSD Symptoms Checklist (PCL-C). Effect sizes ranged from 0.65 to 0.99 for all variables.

Field Site: Oregon State Prison System

Private foundation funding

Reference: Nidich S, et al. Reduced trauma symptoms and perceived stress in female prison

inmates through the Transcendental Meditation program: A randomized controlled trial. *The Permanente Journal*, 2017, 21, 16-0008.

Location: Wilsonville, OR

**Decreased PTSD Symptoms, Anxiety, and Perceived Stress in Male Inmates
(*The Permanente Journal*, 2016; RCT)**

Trauma events are four times more prevalent in prison inmates than in the general public and are associated with increased recidivism and other mental and physical health issues. One hundred eighty-one male prison inmates with a moderate- to high-risk criminal profile were randomly assigned to either the TM program or to a treatment-as-usual control group. The TM group compared to controls showed significant reductions in total trauma symptoms, anxiety, depression, dissociation, and sleep disturbance subscales, and perceived stress.

Field Site: Oregon State Prison System

Private foundation funding

Reference: Nidich S, O'Connor T, Rutledge T, et al. Reduced trauma symptoms and perceived stress in male prison inmates through the Transcendental Meditation program: A randomized controlled trial. *The Permanente Journal*, 2016;20(4):43-47.

ANXIETY AND STRESS

HEALTHCARE WORKERS

Location: Chicago, IL

Decreased Burnout and Depression Symptoms

(*Journal of Continuing Education in the Health Professions*, 2023; RCT) Forty academic physicians at a Midwest medical school and affiliated VA hospital were randomly assigned to Transcendental Meditation or usual care control group with a 4-month intervention period. Assessment was conducted at baseline, 1 month, and 4 months. Significant improvements were found for the TM group compared to controls at 4 months in total burnout ($p = .020$), including the Maslach Burnout Inventory dimensions of emotional exhaustion ($p = .042$) and personal accomplishment ($p = .018$), and depression symptom ($p = .016$). Qualitative interviews supported these outcomes.

Research Site: University of Loyola Stritch Medical School, Chicago, IL

Private foundation funding

Reference: Loiselle M, Brown C, et al. Effect of Transcendental Meditation on physician burnout, depression, and insomnia: A randomized controlled study. *Journal of Continuing Education in the Health Professions* (JCEHP), 2023 Jan. 26; doi.org/10.1097/CEH.0000000000000472.

Location: Durham, NC

**Reduced Anxiety Symptoms, Sleep Problems, and Burnout in Healthcare Workers
(*JAMA Network Open*, 2022; RCT)**

Eighty healthcare workers from a southeast medical center were randomly assigned to either Transcendental Meditation (TM) or a usual care control group (with access to wellness resources). The TM group had significant reductions in emotional exhaustion on the Maslach

Burnout Inventory (MBI) ($P = .006$); sleep difficulties, with the Insomnia Severity Index ($P = .05$); and anxiety, using the Generalized Anxiety Disorder-7 scale ($P = .01$) over 3 months. Marginally significant differences between groups were found for depression symptoms, with the Patient Health Questionnaire-7 ($P < .06$) and MBI Depersonalization scale ($P < .08$). Thirty-eight participants (92.7%) in the TM group were compliant with their home practice (defined as meditating at least once a day).

Research Field Site: Duke University Medical Center and Mind Path, NC
Private Foundation Funding

Reference: Joshi SP, et al. Efficacy of Transcendental Meditation to reduce stress among healthcare workers: A randomized clinical trial. *JAMA Network Open*, 2022 Sept 19;5(9):e2231917. doi:10.1001/jamanetworkopen.2022.31917.

Location: Boston, MA

Decreased Burnout, Sleep Difficulties, Anxiety, and Depression Symptoms (*J Am Coll Emerg Physicians Open*, 2021; Single group pretest-posttest) Thirty-one emergency clinicians (physicians, nurses, and physician-assistants) from two urban hospitals were recruited to participate in TM instruction and follow-up for 3 months in this single arm study. TM participants demonstrated significant reductions in burnout ($P < .05$; effect sizes, Cohen's $d = 0.43$ – 0.45) and in symptoms of depression, anxiety, stress, and sleep disturbance (P values $< .001$; Cohen's $d = 0.70$ – 0.87). 90.6% ($n = 29/32$) attended 6/8 TM training sessions and 80.6% self-reported meditating at least once a day on average.

Research Field Site: Brigham and Women's Hospital, Boston, MA
Private Foundation Funding

Reference: Azizoddin DR, Kvaternik N, Beck M, et al. Heal the Healers: A pilot study evaluating the feasibility, acceptability, and exploratory efficacy of a Transcendental Meditation intervention for emergency clinicians during the coronavirus disease 2019 pandemic. *J Am Coll Emerg Physicians Open*, 2021;2(6):e12619.

SCHOOL TEACHERS AND ADMINISTRATORS

Location: San Francisco, CA

Improved Burnout, Resilience, Perceived Stress, and Depression Symptoms (*Frontiers in Education*, 2021; RCT)

Seventy-eight school teachers and administrators were randomly assigned to the Transcendental Meditation program ($n = 39$) or to a wait-list control group ($n = 39$). They were administered the Maslach Burnout Inventory, Resilience Scale, Perceived Stress Scale, and the National Institutes of Health Patient-Reported Outcomes Measurement Information System fatigue and depression scales at baseline and at four-month posttest. Intention-to-treat analysis showed significant improvement in the TM group compared to controls on emotional exhaustion, the main scale of the Maslach Burnout Inventory ($p = 0.019$), resilience ($p = 0.014$), perceived stress ($p < 0.001$), fatigue ($p = 0.001$), and depression ($p = 0.091$). Eighty-seven percent were compliant with their meditation home practice.

Field Site: San Francisco Public Schools
Private foundation funding

Reference: Valosek L, Wendt S, Link J, et al. Meditation effective in reducing teacher burnout and improving resilience: a randomized controlled study. *Frontiers in Education*, 2021; 6:29.

Location: San Francisco, CA

**Improved Brain Function and Reduced Mood Disturbance
(*Brain and Cognition*, 2018; RCT)**

In a randomized controlled study, 96 central office administrators and staff at the San Francisco Unified School District were recruited to test whether TM could increase EEG brain integration and positive affect and decrease psychological distress in government employees. At four-month posttest it was found that (a) TM participants significantly decreased on the Profile of Mood States (POMS) subscales for total mood disturbance, anxiety, anger, depression, fatigue, and confusion, and significantly increased in the POMS vigor subscale (p values $<.05$); (b) TM participants in the EEG-subgroup also significantly increased in Brain Integration Scale (BIS) scores; and (c) compliance with meditation practice was high (93%).

Private foundation funding

Reference: Travis F, et al. Effect of meditation on psychological distress and brain functioning: A randomized controlled study. *Brain and Cognition*, 2018 Aug;125:100-105. doi: 10.1016/j.bandc.2018.03.011.

Location: Vermont

**Decreased Perceived Stress, Depression Symptoms, and Burnout
(*The Permanente Journal*, 2014; RCT).**

A 3-month randomized controlled study of secondary school teachers in Vermont found that TM practice significantly reduced perceived stress, depression, and overall teacher burnout. **Private foundation funding**

Reference: Elder C, et al. Effect of Transcendental Meditation on employee stress, depression, and burnout: a randomized controlled study. *The Permanente Journal*. 2014;18:19-23. doi: 10.7812/TPP/13-102.

ADOLESCENTS and YOUNG ADULTS

Decreased Psychological Distress Factors and Improved Self-Esteem in High School Students

(*Professional Counseling Journal*, 2020; RCT)

Fifty-two high school students from a high-performing academic West Coast public high school were randomly assigned to either Transcendental Meditation or silent-reading control group. Both conditions were practiced twice a day in school. Significant reductions in perceived stress, anxiety, anger, depression, and fatigue, and increased self-esteem were found in the TM group compared to controls over a four-month period.

Private foundation funding

Reference: Bleasdale J, Peterson M, et al. Effect of meditation on social-emotional wellbeing in a high-performing high school. *Professional Counseling Journal*, 2020. doi.org/10.1177/2156759X20940639.

**Improved HPA Axis Functioning in Young Adults
(*Stress*, 2020; RCT)**

In this pilot study, 34 young adults were randomly assigned to TM training followed by 8 weeks of meditation practice or a wait-list control condition. 27 participants completed the HPA outcome

assessments (41% male). To assess HPA axis functioning, salivary samples to measure cortisol awakening response (CAR) were collected in the morning, both at baseline and at week 4. Participants who were randomly assigned to TM had lower awakening salivary cortisol levels and a greater drop in CAR from baseline to week-4 than the control group, suggesting reduced stress levels.

Reference: Klimes-Dougan B. et al. Transcendental Meditation and hypothalamic-pituitary adrenal axis functioning: a pilot, randomized controlled trial with young adults. *Stress*, 2020; 23(1):105-115.

Decreased Anxiety and Improved Resilience in High School Students (*Contemporary School Psychology*, 2015; Controlled, non-randomized) Ninth-grade students participating in a Quiet Time program with Transcendental Meditation (TM) ($n = 141$) were compared to a group of ninth-grade students attending a school that did not participate in Quiet Time ($n = 53$). Results indicated that students who learned TM had significantly lower anxiety and higher resilience compared to controls. Regularity of TM practice was associated with higher resilience scores. Qualitatively, TM students expressed having better sleep and feeling more happiness and self-confidence.

Private foundation funding

Reference: Wendt S, Hipps J, et al. Practicing Transcendental Meditation in high schools. *Contemporary School Psychology*, 2015;19(4):312-319.

Location: Washington D.C.

Decreased Mood Disturbance and Blood Pressure and Improved Positive Coping Ability in College Students

(*American Journal of Hypertension*, 2009; RCT)

Two hundred ninety-eight college students were randomly assigned to either the Transcendental Meditation (TM) program or wait-list control, with a three-month intervention period. Results showed significant improvements in total mood disturbance, positive coping, anxiety, depression, and anger/hostility. Significant reductions in both resting systolic and diastolic blood pressure were also observed in the high-risk hypertension subgroup.

Research Field Site: American University

Supported in Part by National Center for Complementary and Alternative Medicine Grant #1P50AT00082

Reference: Nidich S, Haaga D, et al. A randomized controlled trial on effects of the Transcendental Meditation program on blood pressure, psychological distress, and coping in young adults. *American Journal of Hypertension*, 2009;22:1326-31.

BREAST CANCER PATIENTS

Location: Chicago, IL

Improved Quality of Life in Breast Cancer Patients (*Integrative Cancer Therapies*, 2009; RCT)

One hundred thirty breast cancer patients were randomly assigned to either the Transcendental Meditation (TM) or education control (EC) group. Measures were administered every six months over an average 18-month intervention period. Significant improvements were found in the Transcendental Meditation group compared with controls in overall quality of life, especially emotional wellbeing, social wellbeing, and mental health.

Research Field Site: St Joseph's Hospital, Chicago

Supported in Part by National Center for Complementary and Alternative Medicine Grant 1K01AT004415-01

Reference: Nidich S, Field J, et al. A randomized controlled trial of the effects of Transcendental Meditation on quality of life in older breast cancer patients. *Integrative Cancer Therapies*, 2009; 8(3):228-234.

SUBSTANCE ABUSE PATIENTS

Location: Rockville, MD

Decreased Alcohol Usage

(*Journal of Substance Abuse Treatment*, 2018; Controlled, non-randomized) Sixty adults with primary alcohol use disorder (AUD) following inpatient treatment were sequentially assigned to either TM or treatment-as-usual group. Those practicing TM twice-daily as recommended were less likely than the rest of the sample to return to any drinking (25% vs. 59%) or heavy drinking post-discharge (0% vs. 47%). Greater regularity of TM practice was inversely correlated with psychological distress, craving, and alcohol use at follow-up. **Research**

Field Site: Maryland Treatment Centers, Avery Road Clinic, Rockville, MD Private Foundation Funding

Reference: Gryczynski J, et al. Integration of Transcendental Meditation® (TM) into alcohol use disorder (AUD) treatment. *Journal of Substance Abuse Treatment*, 2018 Apr.;87:23-30. doi: 10.1016/j.jsat.2018.01.009.

MECHANISTIC RESEARCH

Brain Regional Connectivity and Perceived Stress (*Brain and Cognition*, 2020)

Using a longitudinal design, the authors combined psychometric questionnaires, structural and resting-state functional magnetic resonance imaging (RS-fMRI) to investigate the potential brain modifications underlying the psychological effects of TM. The sample included 19 naïve subjects instructed to complete two daily 20-minute TM sessions, and 15 volunteers in the control group. At 3 months meditators, but not controls, showed a decrease in perceived stress and anxiety, which correlated with the improved functional connectivity among posterior cingulate cortex (PCC), precuneus and left superior parietal lobule. Additionally, TM practice was associated with increased connectivity between PCC and right insula, likely reflecting changes in interoceptive awareness. These findings suggest that the beneficial effects of TM found in prior research may be mediated by functional brain changes.

Private funding

Reference: Avvenuti G, et al. Reductions in perceived stress following Transcendental Meditation practice are associated with increased brain regional connectivity at rest. *Brain and Cognition*, 2020;139:105517.

Brain Imaging: Blood Flow Patterns with fMRI (*Brain and Cognition*, 2018)

Blood flow patterns with fMRI were investigated in 16 long-term practitioners of Transcendental Meditation. During TM practice, blood flow patterns were significantly higher (more active) in executive and attention areas (anterior cingulate and dorsolateral prefrontal cortices) and significantly lower in arousal areas (pons and cerebellum). This pattern of heightened blood flow in attentional areas and decreased blood flow in arousal areas had not been reported for other meditation practices.

Private funding

Reference: Malone M, et al. fMRI during Transcendental Meditation practice. *Brain and Cognition*, 2018;123:30-33.

Location: Irvine, CA

Brain Reactivity to Stressful Stimulus (*NeuroReport*, 2006)

Long-term practitioners of the Transcendental Meditation technique showed lower reactivity to thermally induced pain, as measured by functional magnetic resonance imaging (fMRI), compared to healthy matched controls. After the controls learned the technique and practiced it for 5 months, their response decreased by 40–50% in the total brain, thalamus, and prefrontal cortex, and to lesser extent in the anterior cingulate cortex. The results suggest that the Transcendental Meditation technique reduces the affective/motivational dimension of the brain's response to painful stressors.

Research Field Site: University of California at Irvine

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Reference: Orme-Johnson D, Schneider R, Son YD, Nidich S, Cho ZH. Neuroimaging of meditation's effect on brain reactivity to pain. *NeuroReport*, 2006;17:1359-1363.