

T'ai Chi Chih—An Evidence-Based Mindfulness Practice: Literature Review

Marilyn Anita Vestal, PhD

Abstract

T'ai chi chih (TCC) is a moving meditation associated with improvements in physiological and psychological conditions, such as immunity to shingles virus, reduction in inflammatory markers, decrease in sympathetic nervous system activity, and reductions in geriatric depression and chronic diseases in cancer survivors. Consisting of 19 repetitive movements and one pose, TCC is easy to learn and particularly accessible to the aging population. It is taught by accredited instructors who have completed an intensive training that is standardized worldwide. This review includes published randomized controlled trials focused on TCC to date. Results are summarized, and methodology is described. Of particular interest are researchers' notes stating why TCC was selected as the control intervention and how the study participants responded. As an accredited teacher of TCC, the author comments on the usefulness of the practice as an evidence-based mindfulness practice. Furthermore, ongoing studies suggest using TCC for quality of life and life-style issues' social, emotional and psychological conditions; and research on specific populations that may benefit from TCC.

Keywords: *T'ai chi chih*, moving meditation, mindfulness, alternative therapy, relaxation

Introduction

There is a growing body of evidence showing meditative movement practices are capable of improving various physiological and psychological conditions. In this review, research is focused on a moving meditation known as *t'ai chi chih* (TCC). TCC is a contemporary discipline that originated in 1974 that has demonstrated efficacy in 12 or more controlled trials over a 20-year period. The studies reviewed in this article position TCC as an evidence-based intervention for physical conditions, including chronic diseases in cancer survivors,^{1,2} immunity to the shingles virus,^{3–5} reduction in inflammatory diseases,^{6,7} physical functional performance,⁸ sleep quality,^{9–12}

and others. In addition, the literature review demonstrates efficacy of TCC with respect to improvement of psychological and mental health conditions such as depression,¹³ stress, and general well-being.¹⁴

What Is TCC?

Developed in 1974 by Justin Stone, a *t'ai chi chuan* master, the practice consists of movements focused on circulating and balancing of *qi*, the body's intrinsic energy. TCC consists of 19 standalone movements and one pose that can be done by almost anyone: Rocking Motion, Bird Flaps its Wings, Around the Platter, Around the Platter variation, Bass Drum, Daughter on the Mountaintop, Daughter in the Valley, Carry the Ball to the Side, Push Pull, Pulling in Energy, Pulling Taffy, Pulling Taffy-Anchor, Pulling Taffy-Wrist Circles, Pulling Taffy-Perpetual Motion, Working the Pulley, Light at the Top of the Head, Joyous Breath, Passing Clouds, Six Healing Sounds, and Cosmic Consciousness Pose.¹⁵ While the form was developed in the mid-1970s, it is founded upon and incorporates ancient energy movement principles (called *yin-yang* principles). Stone originated TCC movements because he believed more Westerners would benefit from moving meditation practices if the movements were easy to learn and do.¹⁶

For the purposes of this review of the research literature, definitions and descriptions from researchers who have used TCC as an intervention in randomized controlled trials (RCTs) are summarized. For the most part, descriptions by researchers frame TCC as a health management intervention that incorporates meditation and repetitive movement to promote well-being.^{6,9,13,14} It is also described as a movement-based relaxation practice.^{14,17} Researchers refer to the balance and shifting of body weight to obtain focused, fluid physical movements that are coordinated with imagery to relax the mind and improve the flow of *qi* or life energy.¹ Detert describes the relaxation of the body as a major component, stating, "soft, slow and continuous movement creating circles, ovals, and arcs are used not only to activate and balance the intrinsic energy of the body, but to create a strong mental focus."¹⁴

Mindful Movement Meditation

Meditative movement is defined as those practices that utilize movement or posture and a meditative state to achieve deep states of relaxation. It includes practices such as *qigong*, *t'ai chi*, and others.¹⁸ Physical movement has long been employed as a foundation for cultivating mental skills such as attention, self-control, or mindfulness, with recent studies documenting the impact of mindful movement training on focus, attention, and cognitive functioning.^{18–22}

TCC is considered meditative movement because it combines physical activity with meditation.¹ As a form of moving meditation, TCC uses a series of fluid, continuous, and repetitive movements integrated by mind concentration, balance and shifting of body weight, muscle relaxation, and breath.³ The mental concentration makes the practice a moving meditation.¹⁴

Kabat-Zinn offers an operational definition of mindfulness as an awareness that emerges by way of paying attention on purpose, in the present moment and nonjudgmentally, to the unfolding of experience moment by moment.²³ Recent studies in neuroscience affirm that awareness is a key target in contemplative practices.²⁴ Justin Stone attributes “awareness as the root of TCC, which is essentially inner oriented.”¹⁶

Lavretsky adds that the practice incorporates meditation and physical activity to promote a sense of well-being and to foster control over negative symptoms associated with depression.¹³ TCC derives from ancient practices of *qigong* and *t'ai chi*. According to Rogers et al., *t'ai chi* consists of “...graceful movements linked together in a continuous sequence so that the body is constantly shifting from foot to foot, with a lower center of gravity.”²⁵

Movements incorporate deep breathing and mental concentration to achieve harmony between the body and brain. Both *t'ai chi* and *qigong* movements can be practiced standing, walking, sitting, or lying down. TCC can be practiced standing or seated; it can also be practiced mentally.

Qigong and TCC teach balanced standing and movement accompanied by spatial, proprioceptive, and interoceptive awareness. This brings conscious awareness to the processes of grounding, orientation, and correct relation of the body to gravity. Regular practice brings about a calm, centered state in which one is responding to the actual present condition rather than preparing for past or future events like the outcome described in mindfulness meditation.^{22,26,27}

Meditative movement forms, such as TCC, are holistic in nature and have increased in popularity over the past few decades. Several RCTs have evaluated these interventions from multiple perspectives.²⁵ A number of these studies are discussed in the following sections.

TCC Practice Improves Physical and Mental Health

To date, researchers have published more than 12 studies using control groups that show TCC's efficacy. All except

two^{8,28} are RCTs. One additional study used pre and post tests but no control group.¹⁴ All of these studies were focused on the effects of TCC practice on physical and/or mental-emotional conditions. Findings of the TCC-specific studies are summarized through several lenses: sleep quality, immunity and reduction of inflammation, exercise and physical performance, and stress, quality of life, and mental-emotional functioning.

Sleep quality

Compared to control groups receiving an educational sleep seminar, participants in a TCC group had improved sleep quality and diminished fatigue.^{9,10} In a later study using cognitive-behavioral therapy for insomnia (CBT-I), both groups had statistically meaningful improvements in insomnia.¹²

Sleep is intended to be restorative for living systems. Disruptive sleep patterns affect the normal diurnal rhythm of many regulatory systems, including negative effects on glucose, lipids, inflammation, and blood pressure. Poor sleep quality is a common difficulty for older adults and remains untreated in the majority (85%) of people,⁹ increasing risks of depression, anxiety, and pain problems. The current standard of care in conventional medicine, for those who receive treatment, is sedative-hypnotic medication. Unfortunately, these pharmaceutical medications may have serious effects on older adults, including daytime confusion, drowsiness, falls, and fractures, in addition to adverse interactions with other medications.⁹

Researchers at Cousins Center for Psychoneuroimmunology at University of California, Los Angeles (UCLA) tested a hypothesis that an intervention of relaxation therapy and moderate exercise would positively impact sleep quality in older adults with moderate sleep complaints using TCC compared to a control group in Health Education (HE) class.⁹ The RCT consisted of 16 weeks of either TCC or HE classes, followed by practice for nine additional weeks. The Pittsburgh Sleep Quality Index (PSQI) was used on the volunteer sample of 112 healthy adults aged between 59 and 86 years. Results showed that after 25 weeks, subjects in the TCC group were more likely to achieve a treatment response, as defined by $PSQI < 5$, compared to those in HE class ($P < 0.05$). Subjects in the TCC group with poor sleep quality also showed significant improvements in PSQI global score ($P < 0.001$), as well as in the sleep parameters of rated sleep quality ($P < 0.05$), habitual sleep efficiency ($P < 0.05$), sleep duration ($P < 0.01$), and sleep disturbance ($P < 0.01$).⁹

An additional trial by multidisciplinary researchers at Cousins Center, the Division of Geriatrics at UCLA and the Department of Psychology at University of Arizona compared groups randomly assigned to TCC, cognitive-behavioral therapy (CBT), or sleep seminar (SS), measuring multiple biomarkers of disease risk in 109 older adults with insomnia.¹⁰ Participants received two-hour group sessions weekly for four months. The eight biomarkers measured using clinical lab cutoffs defined as abnormal were: high-density lipoprotein, low-density lipoprotein, triglycerides, hemoglobinA1c, glucose, insulin, C-reactive protein, and fibrinogen. Results of this randomized controlled efficacy trial found both TCC

($P = 0.04$) and CBT ($P = 0.001$) reduced risk scores significantly among older adults, with high multisystem biological risk at entry after one year. Given that these clinical biomarkers are associated with cardiovascular, metabolic, and inflammatory disease risk, improving sleep quality has the potential to reduce the risk of chronic disease in older adults with insomnia.¹⁰

In 2017, Irwin et al. published results from a randomized, partially blinded, non-inferiority trial that involved survivors of breast cancer with insomnia.¹² In this trial, 90 participants were assigned to either CBT-I or TCC. At 15 months into the treatment, both groups showed clinically meaningful improvements in insomnia. Tests of non-inferiority showed that TCC was found to be statistically non-inferior to CBT-I, which has been considered the “gold standard” for behavioral treatment of insomnia.¹²

Immunity and reduction of inflammation

Incidence and severity of herpes zoster (shingles) increase markedly with increasing age in association with a decline in varicella-zoster virus (VZV)-specific cell-mediated immunity (CMI). Irwin's study examined whether TCC affects VZV-specific immunity and health functioning in older adults who, on average, show impairments of health status and are at risk for shingles.⁵ Thirty-six men and women aged ≥ 60 years were assigned randomly to a 15-week program of TCC instruction or a wait list control group. VZV-specific CMI was measured at baseline and at one week post intervention. Health functioning (Medical Outcome scale: SF-36) was assessed at baseline, and at 5, 10, and 15 weeks during the intervention, and at one week post intervention. Findings were that VZV-specific CMI increased 50% from baseline to one week post intervention in the TCC group ($P = 0.05$) but was unchanged in the wait list control group. Older adults who had impairments of physical status at baseline showed the greatest increases of SF-36 role-physical ($P = 0.01$) and physical functioning ($P = 0.001$) during the TCC intervention. Participation in TCC for 15 weeks led to an increase in VZV-specific CMI. Gains in health functioning were found in participants who received TCC and were most marked in those older adults who had the greatest impairments of health status.⁵

An RCT was conducted to evaluate the effects of TCC on circulating markers of inflammation in older adults.⁶ Inflammation plays an increasingly prominent role in health and well-being as people age. Circulating levels of inflammatory markers rise with age, even in healthy individuals, and the proportion of people with elevated levels of IL-6 rises markedly among those > 70 years of age. In the elderly, many of the diseases that contribute most to disability, morbidity, and mortality stem in part from aberrant inflammation. Eighty-three healthy older adults aged 59–86 years were assigned to either TCC or HE. Measurements included circulating levels of interleukin 6 (IL-6), C-reactive protein (CRP), soluble IL-1 receptor antagonist (sIL-1R), sIL-6R, soluble intercellular adhesion molecule (sICAM), and IL-18.

Results showed that among those older adults with high levels of IL-6 at entry, TCC produced a drop of IL-6 levels comparable to those found in TCC and HE subgroups who had low levels of IL-6 at entry, whereas IL-6 in HE remained higher than the TCC and HE subgroups with low entry IL-6. The conclusion of the researchers was that TCC can be considered a useful behavioral intervention to reduce circulating levels of IL-6 in older adults who show elevated levels of this inflammatory marker and are at risk for inflammation-related morbidity.⁶

Exercise and physical performance

Three studies have concluded that TCC is a beneficial exercise option for older adults.^{8,28,29} These studies focused on the feasibility and acceptability of TCC as a form of exercise that seniors would be willing to do. Campo's group studied female cancer survivors ($n = 63$) with some limitations in physical functioning.²⁹ Shaller's sample was drawn from a community senior center ($n = 46$).²⁸ Zacharia studied healthy, inactive women between the ages of 45 and 65 years ($n = 38$).⁸ Shaller and Zacharia had a comparison group that was instructed to do their normal daily activities without adding any additional exercise for the duration of the study. Campo organized a control group that attended HE class with no exercise.

Zacharia's team from the University of Oklahoma and the University of Northern Colorado were interested in physical functional performance and used a battery of 10 measurements, the Continuous Scale Physical Functional Performance (CS-PFP-10).⁸ Scores were calculated for five domains: upper body strength, upper body flexibility, lower body strength, balance/coordination, and endurance. Improvements in the TCC group from pre to post intervention ranged from a low of 19.1% positive change in endurance to 32.5% positive change in lower body strength. All five domains showed strong effects, supporting the conclusion that TCC participation resulted in meaningful improvements in physical functioning and physical reserve.

Shaller's study also focused on balance and flexibility in addition to mood, health status, and blood pressure.²⁸ Participants in the TCC group practiced one hour per week for 10 weeks or a total of 10 hours of teacher-directed group practice. This is a considerably less managed intervention than one-hour sessions twice a week for eight weeks (Zacharia) and one hour sessions three times a week for 12 weeks (Campo).^{8,29} Shaller used a battery of five measurements but did not control for group differences at baseline. In spite of some limitations, Shaller's study was the first to report an improvement in balance after a TCC intervention for older adults. The other four factors measured in Shaller's study did not show significant differences from pre to post tests.^{8,28,29}

While the primary purpose for the Campo study was to determine the feasibility and acceptability for senior cancer survivors of a 12-week TCC intervention compared to a HE class, researchers also explored the effects of TCC

on mental and physical health, which is discussed in the next section.

Stress, quality of life, and mental-emotional functioning

Detert et al. conducted a pilot study using a single sample pre-post design to inquire into the effects of TCC on the physical symptoms of stress and general well-being.¹⁴ Twenty-three teachers, predominantly females aged between 25 and 32 years, completed 15 hours of instruction with four additional weeks of unsupervised practice. The methods included both a qualitative component and pre-post tests using the Schedule of General Well Being (GWB) and the Taylor Manifest Anxiety Scale (TMAS). The six subscales of the GWB, which include general health, vitality, positive well-being, depression, anxiety, and self-control, all showed significant positive change from pre to post test. The TMAS results also showed significant improvement at the 0.0001 level at post test. The qualitative data analysis revealed four major themes: general physical benefits, physical ailment benefits, psychological/mental benefits, and spiritual benefits. In spite of the limitations of the research design, the researchers from University of Wisconsin-LaCrosse concluded that TCC is easy to learn and has potential to enhance well-being and reduce stress symptoms of teachers.¹⁴

The Campo research team from University of Utah, UCLA, Huntsman Cancer Institute, and Semel Institute for Neuroscience used both quantitative measurements and a qualitative component.²⁹ Results found no significant differences between the TCC group and the HE group on the SF36 v1 Health Survey. Researchers suggested that with a low functioning group such as cancer survivors, longer and more intense TCC intervention might be needed to help improve quality of life. Researchers reported that the qualitative analysis indicated that the participants were very satisfied with the trial and commented on both physical and mental benefits they felt they had gained from TCC.²⁹

Lavretsky et al. at UCLA conducted the first RCT to test the efficacy of TCC versus HE as an adjunct to standard antidepressant medication treatment of geriatric depression.¹³ There were 73 participants aged ≥ 60 years who had a diagnosis of major depression. The battery of tests administered included evaluations of depression, anxiety, resilience, health-related quality of life, cognition, and inflammation at baseline and during the 14-week follow-up. The groups were randomly assigned to 10 weeks, two hours per week, of TCC or HE class. Their results reported greater improvements in depression, health-related quality of life, and memory in the TCC group of older depressed participants compared to the HE group. The researchers concluded that TCC is a relatively simple mind-body exercise that can provide substantial additional benefits not only for depression, but also for physical functioning, cognition, quality of life, and resilience. They further commented that very few interventions in late-life depression improve cognitive functioning in this population.¹³

An RCT conducted by Motivala et al. from UCLA and the National Institutes on Aging, Baltimore, MD, found that practicing TCC acutely decreased sympathetic nervous system activity in their sample.¹⁷ One distinguishing factor in the Motivala study is that 9/19 participants in the TCC arm were men. Most of the TCC studies to date have had primarily women participants. The control group (eight TCC-naïve adults) watched a video on the benefits of exercise (passive rest). Autonomic assessments were taken prior to and after the 20-minute period, in addition to blood pressure and heart rate. Electrocardiography and impedance cardiography signals were measured. Results showed that practicing TCC significantly decreased sympathetic activity, as indexed by pre-ejection period ($P = 0.01$). In contrast, there was no change in pre-ejection period following passive rest or slow-moving physical activity. Neither blood pressure nor heart rate changed after TCC practice.

TCC Is Well Suited to RCT Research

Compared to the extensive body of work on mindfulness-based practices, few scientific studies have examined the mechanisms underlying movement-based embodied contemplative practices. However, movement-based practices have been shown to alleviate the symptoms of various clinical conditions and elicit measurable changes in physiological stress markers, cognitive functioning, sensorimotor acuity, as well as emotional states. An important challenge for contemplative scientists is to advance understanding of the mechanisms underlying these complex practices.²¹

Davidson and Kazniak offer a guide for comparison treatment using a mindfulness-based intervention.²⁴ They suggest the following criteria for constructing a rigorous control condition:

- Structural matching of dosage: the interventions should be equivalent in length.
- Matching of homework/daily practice: the interventions should require the identical amount of practice.
- Participants should not know which is the “experimental” intervention: participants should be blinded to which intervention the experimenter is targeting for study. Examiners who are engaged in data collection should be blind to the intervention to which the participant has been assigned.
- Expertise and confidence of the instructors should be matched: the comparison intervention should be taught by instructors who are comparably trained in comparison to the mindfulness teachers and who genuinely believe that the intervention they are teaching will produce beneficial change.²⁴

Michael Irwin at UCLA Cousins Center for Psychoneuroimmunology has led the way with using TCC as an experimental intervention in medical RCTs. He is involved with

more than half of the published articles on TCC in medical journals.^{2-7,9,11,12,17} Irwin considers TCC as “particularly suitable for evaluation in randomized controlled trials, as TCC is a standardized series of ... simple, repetitive non-strenuous movements.”³ Because of its moderate intensity, steady rhythm, and low physical and mental tension, TCC has been suggested as an appropriate intervention for elderly patients who are not otherwise able to adhere to physical exercise. TCC offers standardized training and practice schedules, lending an important advantage over prior relaxation response based therapies, according to Irwin. It requires no equipment or special clothing and can be done on a relatively flat surface outside or inside. It is taught by accredited teachers and is considered to be fairly standardized and easy to learn and can be done by almost anyone standing or sitting.¹⁵

Qualitative Comments From TCC Study Participants

Campo and Detert reported on a qualitative segment of their studies that participants in the TCC groups felt that they derived mental-emotional and physical benefits from the practice.^{29,14} In regard to what they liked specifically about TCC, participants commented on the mental (25%) and physical benefits (19%) gained from TCC. Participants reported that TCC helped them feel more relaxed, less stressed, and better emotionally. Physically, they reported that TCC helped with balance, increased energy, and improved sleep. Additionally, TCC participants enjoyed the opportunity to interact and practice TCC with other female cancer survivors (19%).²⁹

From the Detert study, participants offered the following comments:¹⁴

- “I have experienced an increase in my daily energy levels and endurance.”
- “It refreshes me and makes it easier to focus on my next task.”
- “When I practice *t'ai chi [chih]*, I experience periods of relief from this tension.”
- “I am more open and connected in my personal relationships and feel much less stress in my daily life.”
- “The quality of my mornings, my attitude for the day beginning, my eating habits, my sleeping ease and much more are all positively changed ... and in such a short time.”
- “I noted ... having increased energy, less achiness in joints and the beginnings of more flexibility.”
- “Steps 3, 10, and 11 seemed to melt the frozen stiffness of my neck and shoulders ... I have less cracking sensations and much more mobility in the rotation of my head. My ankle, heel problem is virtually gone.”
- “Previous to doing *t'ai chi [chih]*, I have often had digestive troubles, and one very good benefit I've

noticed is that I have not been bothered by constipation.”

- “On an internal level, I have begun to experience new and different levels of inner calmness, control, focus, purpose of mind, enhanced concentration, intent alertness, and spiritual depth.”
- “This seems to center me and increases my inner peace.”
- “I have ... a sense of grace, energy, and calmness.”
- “There is always a sense of calmness and joy that increased as the practice time continues.”

Conclusions and Recommendations

TCC is a “user friendly” practice that can be easily taught to a wide range of populations, for example ages ranging from pediatrics to geriatrics, individuals with physical limitations, emotional concerns, and mental health issues. It is learned in a relatively short period of time, making it a perfect modality for research studies. No special equipment is needed, and participants can do TCC standing or seated.

The studies reported here affirm TCC's efficacy as an evidence-based intervention for a variety of physical and mental conditions. Additional studies are needed to determine its effectiveness as an intervention for life-style changes such as smoking cessation, substance abuse prevention, truancy prevention, and anger management. Furthermore, TCC studies are recommended with specific populations, such as prison populations, individuals with early-onset dementia, adults and youth with epilepsy, and at-risk youth.

Resources

Reading/viewing list

- Stone JF. *T'ai Chi Chih! Joy Thru Movement*, 3rd ed. Albuquerque, NM: Good Karma Publishing, 1996. Available from www.gkpub.com
- Stone JF. *Spiritual Odyssey: Selected Writings: 1985–1997*, 2nd ed. Albuquerque, NM: Good Karma Publishing, 2010. Available from www.gkpub.com
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- Stone JF. *Seijaku—Advanced T'ai Chi Chih!* DVD. Available from www.gkpub.com
- Towne P. *T'ai Chi Chih—Serenity in the Midst of Activity*. DVD. Available from www.taichi9.com
- McAlister S. *Seated T'ai Chi Chih*. DVD. Available from www.sandymcalister.com
- Brocklehurst CL. *T'ai Chi Chih Joy Thru Movement*. DVD.

To Contact Dr. Vestal:**Marilyn Anita Vestal, PhD**

Nova Southeastern University College of Arts, Humanities
and Social Sciences, Fort Lauderdale, FL 33314
Aptdo 172-8000, San Jose, Perez Zeledon, San Isidro 11901
Costa Rica
Phone: (506) 8918-2908 (mobile); (863) 288-8688
E-mail: mvestal@nova.edu

Websites:

- www.taichichih.org—community website for teachers, students, and interested others, which includes an international directory of accredited TCC teachers sorted by name and location.
- www.tcccommunity.net—community website for teachers, students, and interested others.

Acknowledgments

The author acknowledges several accredited *t'ai chi chih* instructors for their generous help with preparing this article: Deanna Rasch, MA-LIS, Instruction and Reference Librarian at Colorado Mesa University, Grand Junction, CO and TCC Teacher at Regis University, Denver CO; Richard Detert, PhD, Professor Emeritus at University of Wisconsin-LaCrosse and long-time TCC instructor throughout the Midwest; Mary Case, medical transcriptionist and editor and TCC instructor at senior centers and assisted living facilities in California; April Leffler, MA, instructor of TCC and Physical Education at Widener University, Chester, PA and the YMCA of Philadelphia, PA; Stephen Thompson, TCC Instructor at North Mississippi Medical Center, Tupelo, MS; Bruce Eisenmenger, MA, ABD, LP, psychotherapist at the Center for Integrative Therapies, St. Paul, MN, and TCC teacher; Leya Cragin, MA, who teaches TCC in the Lakewood and Denver, Colorado area; and Lisa Otero, JD, who teaches TCC and yoga in Oxford and Ventura, CA.

Author Disclosure Statement

No competing financial interests exist. ■

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Marilyn Anita Vestal, PhD, is an Adjunct Professor at Nova Southeastern University College of Arts, Humanities and Social Sciences, in Fort Lauderdale, FL.

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Addendum to *T'ai Chi Chih*—An Evidence-Based Mindfulness Practice: Literature Review

Marilyn Anita Vestal, PhD

Depression, Mood, Cognition, Brain Connectivity

Since publication of the Literature Review in 2017 (8), several scientific articles have been added addressing geriatric depression, mood, brain connectivity and neural pathways. At least six articles published from 2018 to 2023, have reported results from research of Dr. Helen Lavretsky of UCLA using *T'ai Chi Chih* (TCC) as the experimental condition. (1-5, 7)

Prevention and treatment of late life depression (LLD) may be aided by movement-based mind body therapies (MBTs) such as TCC and *T'ai Chi Qigong* (TCQ). A review of the efficacy of such interventions for late-life mood and cognitive disorders concluded that MBTs such as yoga and tai chi may outperform conventional physical exercise with regard to effects on mood, Quality of Life (QOL), and cognitive functioning. The review of the neural mechanisms of movement-based vs. stationary meditation found that TCC and TCQ affect multiple common brain regions including those involved in attention, memory, awareness, and emotional processing. Furthermore improvement of hypothalamic–pituitary–adrenal (HPA) axis regulation can alleviate depressive symptoms in older adults with depression as well as non-depressed older adults. (2)

A randomized controlled trial (RCT) of 178 participants followed a pilot study, both led by Dr.

Lavretsky, to study the efficacy and safety of TCC in combination with standard antidepressant therapies for improved outcomes in geriatric depression, mood and cognitive functioning. In the pilot study, TCC improved treatment response to the antidepressant, escitalopram, compared to an active control group receiving health education and wellness training (HEW). In the pilot, those receiving TCC and escitalopram had greater rates of remission, greater clinical, health, and cognitive improvement, and reduced markers of inflammation. On the other hand, the RCT of the same design and objectives concluded that both TCC and HEW combined with a standard antidepressant treatment improved symptoms of depression in older adults. Both groups improved significantly on the HAM-D at 3 and 6 months. TCC demonstrated a greater improvement in general health compared to HEW. (2)

Classes (TCC or HEW) were held in person for 60 minutes per week for 12 weeks and were taught by two different TCC instructors and six different HEW instructors. Groups of six to eight participants were formed for each intervention. The last recruited cohort was switched to a virtual administration following COVID-19 quarantine order and received the 6 remaining classes virtually along with virtual assessments through November of 2020. Homework assignments were equal in both groups and asked for at least 20 minutes of either TCC (accompanied by the training CD), or computer searches on the topics of wellness at home. Regular supervisions with the therapists and inter-rater reliability sessions with behavioral and

cognitive raters assured compliance with the study protocol. Biweekly follow ups were conducted for the first three months of the study to document changes in depression severity, adherence to practice, and adverse events. In addition, monthly follow-ups were conducted at 4, 5 and 6 months. (2) Patients were informed that TCC constitutes a health management intervention, which incorporates meditation and physical activity to promote a sense of well-being and control over negative symptoms associated with depression. The standard detailed protocol for TCC is adapted from "Tai-Chi Chih! Joy Through Movement" and has been used in several studies by UCLA'S research group and others. HEW participants were informed that the intervention was designed to help reduce the severity of depressive symptoms. The trained study staff implemented the HEW protocol using a manual of educational information and learning objectives and patient activities to promote integration of material. Recidivism and attendance were comparable in the two arms. (2)

A related study looked at connectivity among brain regions in older depressed adults. (5,7) Using the same methods as the RCT reported above, namely a TCC and a HEW group meeting for 12 weeks, forty participants received MRI scans to measure connectivity pre and post intervention. The HEW cohort showed few significant increases while the TCC group show increased connectivity of all pairwise connections. There were significant group differences in the Default Mode Network (DMN).

This study had seven authors, with Lisa Kilpatrick as lead author. Helen Lavretsky is among the researchers who authored the study. They concluded that Tai Chi (Chih) in addition to antidepressants is effective in reorganizing the brain toward greater global connectivity, especially affecting DMN connectivity, in older depressed adults. Findings support the importance of the DMN in depression and suggest that non-pharmacological adjuncts can also enhance DMN functional reorganization in geriatric depression. (5,7)

Inflammation

Drs. Helen Lavretsky and Michael Irwin, of UCLA, have led numerous studies using TCC as an experimental condition. Both researchers have concentrated on older adults with Lavretsky fo-

cused primarily on geriatric depression and brain health while Irwin has studied sleep quality, immunity, and cellular inflammation.

Using the same general methods and design of the RCT led by Lavretsky, eight researchers including Lavretsky, studied the role of inflammatory biomarkers in antidepressant response in depressed older adults. There were two randomized groups, TCC and HEW, for 12 weeks under training conditions outlined above in Lavretsky's RCT. A panel of 19 cytokine /chemokines was measured at baseline and at 12 weeks. The scores did not differ significantly between the two groups. (4)

Dr. Irwin has published at least one RCT that was not included in the 2017 Literature Review, *T'ai Chi Chih: An Evidenced Based Mindfulness Practice*. Black, Irwin and six additional researchers studied the effects of TCC practice on a nuclear factor (NF-κB) signaling in lonely older adults. From prior research, they noted that "Tai Chi Chih (TCC), is thought to act on stress response pathways that may be sensitized in lonely individuals due to hypervigilance for social threat and feelings of vulnerability." Findings show that TCC and other meditation forms reduce markers of inflammation and the expression of genes bearing NF-κ B response elements. Based on prior findings, they hypothesized that TCC would reduce stress and slow the rate of increase in NF κ B levels in lonely older adults, as compared to those who receive a stress and health education (SHE) intervention. (6)

Twenty-six participants were computer-randomized 1:1 to a 12-week group-based program delivered weekly in 2 -hour sessions. The TCC group did the 20 guided meditative movements while the SHE group session format was educational with guest presenters on health, stress, aging, exercise and nutrition. Findings from the study show that among lonely older adults in the SHE group levels of psychological stress persisted, and these elderly showed significant increases in nuclear levels of activated NF-κ B from pre to post intervention time points. Conversely, among lonely older adults who received TCC, psychological stress decreased, while NF-κ B levels remained constant. Researchers concluded that the meditation intervention, Tai Chi Chih, significantly reduced psychological stress and attenuated the rise of NF-κ B activation that is otherwise found in lonely older adults. (6)

Concluding Remarks

In conclusion, this addendum to a Literature Review written by Dr. Vestal and published in 2017 by *Alternative and Complementary Therapies* summarizes medical studies that used T'ai Chi Chih as the experimental intervention. Most of the studies were initiated by either Dr. Helen Lavretsky or Dr. Michael Irwin of UCLA. Both have studied the effects of various mind-body therapies in recent years.

My intention for this addendum is to bring the Lit Review up-to-date with current information about how T'ai Chi Chih has contributed to medical research on mind body therapies. TCC is in many ways unique among TCQ practices. Researchers have noted and described the practice in many ways. For example, T'ai Chi Chih is...

- “a brief manualized version of TCQ (Lavretsky & others (3))
- “a multidimensional behavioral therapy” (Black, Irwin, et al (6))
- “a mind-body intervention” (Kilpatrick, Krause, Siddarth & others (5))
- “A meditation technique that integrates moderate physical activity, deep breathing and meditation.” (Black, Irwin, et al (6))

In early studies using TCC, authors described the practice as a standardized series of simple, repetitive non-strenuous movements of moderate intensity, steady rhythm, with low physical & mental tension making it appropriate for elderly individuals otherwise unable to do physical exercises. These factors, standardization, adaptive, appropriate for elderly, etc contribute to the success of using TCC for randomized controlled trials.

Tai Chi Chih may be considered as “standardized” by researchers due to the accreditation process which has maintained quality standards and goals for new teachers since the practice was originated in the 70's by Justin Stone. There is a standard set of movements adapted from the manual, *T'ai Chi Chih: Joy Thru Movement* that serves as the basis for teacher training. The 20 movements are normally practiced in a specific succession, however accredited teachers often teach movements in the order most adaptive to the needs and abilities of the students. The practice consists of slow, circular, repetitive movements that are bilateral. It is evidence-based for many physical and mental/cognitive functions. The studies summarized in the 2017 and 2023 Literature

Reviews indicate that with regular practice TCC increases immunity, improves sleep, reduces inflammation, leads to superior brain connectivity and regulation of emotional and affective responses to stress.

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