



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

Movement-Based Therapies in Rehabilitation



Melissa E. Phuphanich, MD, MS^{a,*}, Jonathan Droessler, MD^a, Lisa Altman, MD^{b,c}, Blessen C. Eapen, MD^{a,c}

KEYWORDS

- Movement therapy • Yoga • Pilates • Tai chi • Qigong • Feldenkrais method
- Rehabilitation

KEY POINTS

Movement-based therapies

- Decrease fear avoidance and empower individuals to take a proactive role in their own health and wellness.
- Can benefit patients of any ability; practices are customizable to the individual's needs and health.
- Are safe, cost-effective, and potent adjunct treatments used to supplement (not replace) standard care.
- Deliver patient-centered, integrative care that accounts for the physical, psychological, social, and spiritual aspects of health and illness.
- Have diverse, evidence-based benefits, including reduction in pain, stress, and debility, and improvements in range of motion, strength, balance, coordination, cardiovascular health, physical fitness, mood, and cognition.

INTRODUCTION

Movement therapy refers to a broad range of Eastern and Western mindful movement-based practices used to treat the mind, body, and spirit concurrently. Forms of movement practice are universal across human culture and exist in ancient history. Research demonstrates forms of movement therapy, such as dance, existed in the common ancestor shared by humans and chimpanzees, approximately 6 million years ago.¹ Movement-based therapies innately promote health and wellness by encouraging proactive participation in one's own health, creating community support

^a Department of Physical Medicine and Rehabilitation, VA Greater Los Angeles Health Care System, 11301 Wilshire Boulevard (117) Los Angeles, CA 90073, USA; ^b Healthcare Transformation, VA Greater Los Angeles Health Care System, 11301 Wilshire Boulevard (117) Los Angeles, CA 90073, USA; ^c University of California Los Angeles- UCLA, Los Angeles, CA, USA
* Corresponding author. Physical Medicine and Rehabilitation Department, Veterans Administration Greater Los Angeles Healthcare System, (117), 11301 Wilshire Boulevard, Los Angeles, CA 90073.

E-mail address: mphuphanich@gmail.com

Phys Med Rehabil Clin N Am 31 (2020) 577–591

<https://doi.org/10.1016/j.pmr.2020.07.002>

1047-9651/20/© 2020 Elsevier Inc. All rights reserved.

and accountability, and so building a foundation for successful, permanent, positive change.

Movement therapies used in conjunction with conventional medicine allow physicians to offer comprehensive, patient-centered treatment plans. This holistic approach embodies the essence of Physical Medicine and Rehabilitation by maximizing patient function and improving quality of life (QOL) to treat the whole person, not just the disease. The combination of modern medicine with mind-body practices offers an opportunity for “a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity,” the definition of health by the World Health Organization.²

This article described evidence supporting the concept that mindful movement is medicine. Scientific evidence supports broad benefits of movement therapy, including reduction in pain, stress, and debility, and improvements in range of motion (ROM), strength, balance, coordination, cardiovascular health, physical fitness, mood, and cognition. Compelling evidence demonstrates that movement practices promote optimal health and are integral in the prevention and treatment of many medical conditions.

YOGA

The Yoga Practice

Yoga is a practice of physical postures, breathing techniques, and sometimes meditation derived from ancient India to promote physiologic and psychological well-being. Many types of yoga have evolved and become widespread in the United States. Although all forms of yoga share a common foundation in ancient philosophy focused on mind-body connection, each style has a different emphasis (Table 1). Styles range from handstand practices that would challenge an Olympic athlete to Kundalini yoga, which involves only poses lying down. Consequently, it may be challenging for a patient to choose the style that best suits his or her needs.

Despite the large variety of yoga classes available, all forms are based in the fundamentals of yoga philosophy that nourish physical and mental wellness, which include the following:

1. Asana—physical poses
2. Pranayama—breathing techniques
3. Meditation
4. Advice for ethical lifestyle
5. Spiritual practice

Introduction to Yoga Research

There are many research studies highlighting the benefits of yoga on mental health and medical conditions. A bibliometric analysis on yoga as a therapeutic intervention from 1967 to 2013 reported 486 articles published in 217 different peer-reviewed journals and included 28,080 participants from 29 different countries and a vast variety of conditions.³ Studies in almost every field of medicine examine yoga’s benefits (Table 2).^{4–9} The most studied disorders are in (1) mental health, (2) cardiovascular disease, and (3) respiratory disease.³

Research shows that yoga improves physical fitness and cognitive function, and yoga may serve as an effective adjunct treatment of many medical and psychiatric conditions.

The literature demonstrates that yoga is more effective than waitlist control comparisons; however, yoga cannot yet be recommended as an equivalent or superior treatment to standard-of-care physical therapy or traditional exercise.⁴ All 13 Cochrane

Table 1 Commonly practiced yoga styles	
Yoga Style	Brief Description
Ashtanga	A rigorous style that requires exertion equivalent to a conventional gym workout. The same preset sequence of poses, referred to as a “series,” is practiced each session. Classes are a supervised self-practice, in which each student moves through the same series at his or her own pace and level; the teacher supervises by providing individualized adjustments to each student.
Bikram	A fixed sequence of 26 poses taught by an instructor with verbal instruction and physical example. Bikram yoga is practiced in a mirrored room heated to 105 F. The instructor gives no individualized adjustments; students are expected to correct themselves using the mirrors. The sequence does not include any poses that significantly bear weight on the hands.
Vinyasa	An athletic continuous flow through a series of poses that synchronizes one breath per movement. The sequence of poses is choreographed by the instructor, and thus every Vinyasa class is unique.
Hatha	A slower paced practice that focuses on flowing breathwork in static postures, rather than the strenuous breath-to-movement flows more commonly found in Vinyasa or Ashtanga yoga.
Iyengar	A practice that intensely focuses on proper form and precise bodily alignment of poses. An Iyengar class may consist of only a few poses, but each pose is held for a longer duration and can be individually modified with props, such as chairs. The attention to detail and customization of poses can make this style appropriate for individuals recovering from an injury.

reviews on yoga concluded that further, large-scale, methodological robust trials are required to establish evidence for yoga as a stand-alone treatment.^{6–15} Accordingly, yoga should be used as a potent therapy in addition to standard care.

Yoga for Oncologic Rehabilitation

The mind-body-spirit connection applied in yoga is particularly valuable for conditions that affect both physical and mental health, such as cancer. Oncologic patients often

Table 2 Research studies on yoga for many conditions	
Medical Field	Conditions Studied
Neurologic	Parkinson disease, multiple sclerosis, stroke, epilepsy, dementia, neuropathy, myelopathy, Guillain-Barre syndrome
Psychiatric	Anxiety, depression, stress, PTSD, eating disorders, sleep disturbance
Cardiovascular	Hypertension, primary prevention of cardiovascular disease, secondary prevention of coronary heart disease, hyperlipidemia
Chronic	Diabetes, COPD, asthma, HIV, obesity, osteoporosis, irritable bowel syndrome, chronic fatigue
Geriatric	Osteoarthritis, balance, falls
Oncological	Breast cancer, colorectal cancer, hematological malignancies
Chronic Pain	Low back pain, headaches, arthritis, fibromyalgia
Women’s Health	Urinary incontinence, pregnancy, perinatal depression

suffer from long-term psychological distress, anxiety, depression, fatigue, and chronic pain. A recent Cochrane meta-analysis on yoga for breast cancer, the most commonly diagnosed cancer in women worldwide, includes an impressive 24 randomized control trials (RCTs) involving 2166 women. The review recommends yoga as a complementary intervention for improving health-related QOL and reducing fatigue, sleep disturbances, depression, and anxiety.¹⁰ Furthermore, yoga may boost the immune system of oncology patients. Patients with breast cancer in a Hatha yoga program showed decreases in interleukin-6, tumor necrosis factor-alpha, interleukin-1beta cytokine from isolated peripheral blood mononuclear cells stimulated with lipopolysaccharide, and interferon-gamma, suggesting that yoga protects against stress-related immune suppression.¹⁶

Yoga for Mental Health

Mental health influences the effectiveness of rehabilitation treatment plans, and yoga can efficiently address these psychosocial components of care. RCTs establish that the addition of yoga to standard-of-care treatment is more effective in reducing depression symptoms than standard care alone.^{10,17} Yoga enhances mood through improved regulation of the sympathetic and hypothalamic-pituitary-adrenal systems. RCTs illustrate that these changes are mediated by decreases in cortisol and autonomic measures, such as heart rate and blood pressure, and upregulation of gamma-aminobutyric acid (GABA) levels.¹⁶ Moreover, a longitudinal study found these benefits to mood were sustained at 1 year after only an 8-week yoga intervention.¹⁸ The strongest evidence endorses yoga for depressive symptoms. The evidence on yoga for anxiety and posttraumatic stress disorder (PTSD) is also encouraging but not definitive due to lack of large-scale RCTs with high methodological and reporting quality.¹⁹

Yoga for Chronic Pain

Chronic pain syndromes are particularly susceptible to exacerbation by psychosocial factors, and yoga mitigates these negative influences by decreasing fear avoidance, increasing self-efficacy, and reducing stress and sleep disturbance.²⁰ Quality reviews show improvements in function, QOL, and pain level for chronic pain conditions, such as knee osteoarthritis (OA), rheumatoid arthritis, neck pain, headaches, and low back pain.^{4,21–24} One quality study used MRI techniques to show that yoga improves pain tolerance.²⁵ Yogis tolerated pain more than twice as long as individually matched controls and had more brain matter in areas uniquely correlated to pain tolerance and areas responsible for integrating nociceptive input and parasympathetic activation. This finding of use-dependent hypertrophy suggests a consistent yoga practice improves pain tolerance by teaching different ways to deal with sensory inputs and the potential emotional reactions attached to those inputs. An RCT of yoga for low back pain also highlighted yoga's impact on neuromodulation. This study demonstrated that yoga led to decreased pain scores, improved ROM, and higher levels of serotonin and brain-derived neurotrophic factor (known modulators of nociception).²⁶

Yoga for Spinal Conditions

More specifically, yoga may improve pain related to spinal conditions due to its focus on postural awareness and correction and subsequent reduction in excess muscle tension. RCTs demonstrated that yoga improved cervical proprioception, ROM, QOL, and mood and reduces pain and associated disability.^{21,27} Evidence also affirmed that yoga decreased headache frequency, duration, and pain intensity in patients suffering from tension or cervicogenic headaches.²³ Iyengar yoga, which

emphasizes precise body alignment, may be the most appropriate style for patients with chronic spine pain who need posture training.

Yoga for Neurologic Rehabilitation

Yoga can also effectively treat debilitating neurologic conditions that are often exacerbated by stress. Studies demonstrate yoga's alleviating effect on traumatic brain injury, stroke, spinal cord injury, Parkinson disease, dementia, multiple sclerosis, epilepsy, and neuropathies. Multiple systematic reviews reproduced improvements in function and mood, using tools such as the Berg Balance Scale, 6-minute walk, Timed Up and Go, State Trait Anxiety Inventory, Geriatric Depression Scale, Stroke Impact Scale, and Unified Parkinson Disease Rating Scale.^{4,5} Even patients with paretic neurologic conditions may benefit from yoga. A study revealed that Kundalini yoga, a style that practices only poses lying down, improved both aphasia and fine motor dexterity in stroke patients.²⁸ In addition, a case study on a man who sustained an incomplete C3-C6 spinal cord injury and underwent a 12-week Hatha yoga practice showed improvements in functional goals, balance, endurance, flexibility, posture, and muscle strength of the hip extensors, hip abductors, and knee extensors.²⁹ Yoga is also used to reduce seizures triggered by stress. Sahaja yoga, a simple form of meditation, reduced seizures and EEG changes in patients with epilepsy. The potent effect of meditation was attributed to stress reduction, as evidenced by changes in galvanic skin resistance and levels of blood lactate and urinary vanillylmandelic acid, which are objective indicators of stress.^{30,31}

Yoga for Cardiopulmonary Rehabilitation

The holistic yoga philosophy promotes a sustainably healthy lifestyle that may be useful for cardiopulmonary rehabilitation patients. A meta-analysis of 44 RCTs found that yoga improved systolic and diastolic blood pressures, heart rate, respiratory rate, waist circumference, waist/hip ratio, cholesterol, triglycerides, hemoglobin A1c, and insulin resistance.³² The improvements in autonomic measures were attributable to increased parasympathetic activity through upregulation of GABA. This modulation counteracts the excessive activity of the sympathetic nervous system that has been associated with hypertension.³³ Rigorous yoga styles, such as Ashtanga or Vinyasa yoga, are more suitable for cardiovascular fitness, as no reductions in blood pressure were appreciated with Kundalini yoga interventions, which only uses poses lying down.³⁴

Yoga Therapy in Summary

Yoga is a powerful adjunct tool for health promotion and maintenance and can be used to minimize pharmacologic treatments; alleviate chronic pain; and supplement neurologic, cardiopulmonary, and spinal cord injury rehabilitation. The diversity of yoga styles allows this therapy to be adaptable for a broad variety of ailments and physical abilities. However, this variability also makes it inherently difficult to apply the scientific method standards traditionally used for validating treatments. Clinical trials cannot blind yoga participants, which makes this research intrinsically susceptible to bias and not amenable to the gold standard of double-blinded RCTs. Yoga is highly supported as a safe and effective remedy for a plethora of conditions but cannot yet be recommended as a stand-alone treatment until stronger evidence is established. Research urges that additional high-quality RCTs are needed to improve confidence in estimates of effect, to evaluate long-term outcomes, and to provide additional information on comparisons between yoga and other exercise.

PILATES

The Pilates Method

Pilates is low-impact exercise based on holistic movement principles including concentration, centering, control, breathing, precision, and flow (Table 3).³⁵ Its mindful approach stimulates awareness of body structure, muscle recruitment, body alignment during movement, and posture awareness and control and stabilizes the core muscles during dynamic movement.³⁶ Pilates uses isokinetic exercises with resistance to strengthen deep muscle groups. In contrast to yoga, there are only 2 major forms of Pilates (Table 4).

Introduction to Pilates Research

Research supports Pilates ability to improve pain, function, psychological health, and kinesiophobia in people with disability.^{37,38} Systematic reviews have investigated the effectiveness of Pilates on health outcomes related to body compositions, low back pain, breast cancer rehabilitation, physical fitness and fall prevention in seniors, and pelvic floor muscle function.^{36,39} However, the benefits of Pilates are considerably less established in the literature when compared with the thousands of research articles examining yoga.

Pilates for Low Back Pain

Of the limited Pilates research, the strongest evidence suggests that Pilates effectively treats low back pain. This style of exercise builds lumbar stability and incorporates posture training and thus may alleviate low back pain using the same strategies as conventional evidence-based physical therapy programs. Pilates activates deep abdominal muscles for core strengthening and focuses on precise body alignment and awareness, resulting in a physique that mediates low back pain. The resultant physical changes identified in studies include increased rectus abdominis strength, elimination of muscular asymmetries in transversus abdominis and obliques, improved isolation of transversus abdominis, improved spinal stability with limb loading, improved hamstring flexibility, and improved abdominal muscular endurance.⁴⁰ The design of the Pilates method is highly compatible to the treatment of low back pain disorders. These exercises use a recruitment pattern of the abdominal muscles that may be particularly efficacious. A study examining activation of the

Table 3
Key principles of the Pilates method

Pilates Principle	Brief Description
Concentration	Focusing full attention of proper execution of Pilates exercises
Centering	Activation of deep trunk musculature such as the transverse abdominals, obliques, diaphragm, multifidus, and pelvic floor muscles. These muscles stabilize the lumbosacral spine and pelvis
Control	Performing movements and postures with careful muscular recruitment and control
Precision	Focuses on the bodily alignment and emphasizes proper technique of the Pilates movements
Breathing	Exercises are synchronized to a breathing rhythm, which stabilizes and strengthens deep abdominal muscles
Flow	Smoothness of movements with graceful transitions

Table 4 Types of Pilates	
Pilates	
Styles	Brief Description
Mat Pilates	Only equipment required is a mat and only bodyweight is used for resistance. Mat Pilates provides a foundation for learning muscle control
Reformer Pilates	Requires special equipment with springs that provide adjustable resistance. Reformer Pilates requires familiarity with a reformer machine but has the benefit of added resistance to improve strength

transversus abdominis, a primary contributor to spine stability, found Pilates practitioners performed significantly better on transversus abdominis isolation and lumbopelvic stability testing compared with the group that trained with standard abdominal crunches.⁴¹ Another RCT compared Pilates against aerobic exercise and proposed that Pilates is a more effective treatment of low back pain and disability because the exercises are targeted to the muscles of pelvis and trunk.⁴² Research also identified higher patient satisfaction and compliance with Pilates programs compared with traditional back school.⁴⁰

Pilates Therapy in Summary

Although the Pilates method was established over a hundred years ago, there is a paucity of scientific experiment examining its health effects. The existing studies, along with established biomechanical theory, suggest Pilates is an effective treatment of low back disorders; however, the current evidence is not strong enough to be conclusive.⁴³ Consequently, Pilates is recommended as a powerful supplement (not replacement) to traditional physical therapy programs for low back pain.

TAI CHI

The Tai Chi Practice

Tai chi is a Chinese, meditative, martial arts practice designed to gently strengthen and relax the body and mind. It is a system featuring coordinated movements, meditation, and purposeful breathing that is believed to help unlock the body's Qi (Table 5).⁴⁴ Qi is the energy source that is believed to flow throughout every person's

Table 5 Key characteristics of tai chi	
Tai Chi	
Characteristic	Brief Description
Circular	All movements flow in a circular path, promoting dynamic stretching and balance
Relax	Deep breathing facilitates relaxation throughout entirety of the practice. Overexertion is avoided
Calm	Calmness in movement and mind, meaning no excessive movements and the mind is clear of superfluous thoughts
Continuous	Smooth transitions with one movement flowing to the next
Intent	Mind is present and fully focused on moving with purpose
Energy	Movements are biomechanically efficient, using the least amount of effort to execute

body and accounts for physical, mental, and spiritual health. When Qi becomes “un-balanced or blocked,” pain and sickness result.⁴⁵ Tai chi is the process by which each person’s Qi can be restored, generating improved functional capacity, balance, stress reduction, and enhancement of peacefulness, healing, and life-expectancy.⁴⁶

Introduction to Tai Chi Research

Ancient tai chi is known for its complex, choreographed movement patterns that can take years to master. Given its accessibility to a wide age range, low cost, and theoretic benefit to functional ability and general health, a standardized and simplified form of tai chi was sought. In 2003, an expert panel on tai chi agreed that a simplified, standardized practice could be used for the general population.⁴⁶ There are now more than 500 trials and 120 systematic reviews over the past 45 years on the health benefits of tai chi.⁴⁴

Tai Chi for Fall Prevention

The strongest evidence supports tai chi for fall prevention. Many strategies have been investigated, including various exercise modalities, vitamin supplementation, medication reconciliation, and vision screening or cataract surgery.⁴⁷ A Cochrane review on tai chi exercise and falls found high-certainty evidence that tai chi reduces the number of falls in elderly by 20% compared with controls.⁴⁸ In addition, a systematic review comparing the most common approaches to prevent falls found that tai chi is the most cost-effective fall prevention strategy.⁴⁷ Similarly, there is strong evidence that tai chi improves balance and reduces falls in patients with Parkinson disease.^{44,49,50} Meta-analyses also suggest a possible role for tai chi in stroke rehabilitation to improve balance and gait and prevent falls.^{44,51,52} Further, studies indicate tai chi may reduce fractures, a common consequence of falls, by improving bone mineral density in osteoporosis. A clinical trial demonstrated statistically significant improvements after 9 months, with participation in at least 75% of classes, suggesting results may depend on length and compliance with intervention.⁴⁴ These promising results are attributed to tai chi’s ability to reduce the fear of falling and improve lower extremity strength, aerobic capacity, flexibility, and static and dynamic balance.^{44,53,54}

Tai Chi for Chronic Pain

Tai chi’s integrative approach is recommended in current guidelines for reducing chronic general musculoskeletal pain and associated disability.⁵⁵ Tai chi significantly reduces pain in patients with OA and is recommended by American College of Rheumatology for knee and hip OA.⁵⁶ Tai chi may also improve pain and QOL for patients with fibromyalgia. An RCT on fibromyalgia revealed that tai chi was superior to aerobic exercise, the current first-line exercise treatment.^{44,57} This advantage could be attributed to the biopsychosocial care tai chi offers over conventional aerobic exercise.

Tai Chi Therapy in Summary

The highest quality evidence supports tai chi for fall prevention in community dwelling elderly and patients with Parkinson disease. These results are especially important given that tai chi has minimal adverse events and has the potential to reduce health care costs.⁴⁴ Research suggests the benefits of tai chi may apply to a wider range of conditions, including depression, anxiety, posttraumatic stress disorder, sleep disturbance, schizophrenia, rheumatoid arthritis, spinal cord injury, traumatic brain injury, and immune disorders.^{44,58} However, there is a lack of conclusive evidence broadening the utility of tai chi due to small study size and methodological

heterogeneity. Improvements must be made in standardizing tai chi class type, length of treatment, and assessing the long-term effects.⁴⁴

QIGONG

The Qigong Practice

Qigong is another “moving” mindfulness practice that originated from traditional Chinese medicine.⁵⁸ Similar to tai chi, qigong uses the “mind” (or concentration) to coordinate breathing and smooth movements that promote the circulation of Qi.⁴⁶ There are several forms of qigong performed standing, sitting, or lying down with little to no movement. The forms make qigong adaptable to persons of any fitness level, age, income, or physical ability.⁴⁵

Qigong Research

Tai chi and qigong practices are so similar that they are often grouped together in research studies as tai chi and qigong (TCQ).⁵⁸ Correspondingly, systematic reviews on qigong establish comparable improvements in fall risk, depression, and QOL. A Cochrane review on TCQ for individuals with cancer showed an integrative approach resulted in broad benefits to both psychological and physical health. TCQ led to improvements in sleep disturbance, depression, fatigue, pain, and QOL. TCQ may even have a role in reducing the inflammatory response that causes progression of cancer.⁵⁸

Qigong Therapy in Summary

A comprehensive review by the National Institutes of Health on TCQ shows consistent, significant results for several health benefits in RCTs and infers equivalence of the 2 mindful martial arts practices.⁴⁶

FELDENKRAIS

The Feldenkrais Method

The Feldenkrais method (FM), founded by a physicist and engineer, is a system that uses movement exploration for somatic learning through 2 major techniques (Table 6).⁵⁹ Series of movements force the practitioner to use body sensation and perceptual feedback to choose between favorable (easy, comfortable) and unfavorable (painful, straining) positions. With practice, discernment between favorable and unfavorable movements improves, and movement modifications develop and become engrained. The FM fosters self-efficacy in a group setting and theoretically provides sustained health benefits.⁶⁰

Feldenkrais Research

Although often compared with TCQ, the health benefits of Feldenkrais are less established in research studies. Despite this, the FM is used to modify motor behavior of

Table 6 Feldenkrais techniques	
Feldenkrais Technique	Brief Description
Awareness through movement	Group class with participants learning through verbally guided movements
Functional integration	Individual lessons with practitioners learning by gentle touch/manipulation from an instructor to manually guide movements

people ranging in age and ability. An RCT demonstrated that Feldenkrais resulted in more relaxed supine posture due to changes in muscle tone. This study implied that Feldenkrais may alleviate chronic tension based pain.⁵⁹ A second RCT showed the FM has comparable efficacy to back school for the treatment of chronic low back pain.⁶¹ Another RCT found improvements in balance testing in middle-aged individuals with intellectual disability. Given the commonality of functional decline in this population, Feldenkrais may play a role in improving physical activity and maintaining a level of independence in patients with intellectual disability.⁶²

Feldenkrais Therapy in Summary

The FM has broad applications for changing bodily perceptions; easing function; and promoting awareness, self-efficacy, and health. Yet, there is a paucity of scientific evidence validating the benefits of Feldenkrais. At this time, clinicians may only offer Feldenkrais as a supplementary therapy to patients interested in efficient physical performance and self-efficacy.⁶⁰

DISCUSSION

Ancient philosopher Plato posed, “Lack of activity destroys the good condition of every human being, while movement and methodical physical exercise save it and preserve it.”⁶³ Current research advances this aged notion, “exercise is medicine,” and contends that mindful movement is effective whole-person medicine. Movement-based therapies (1) decrease fear avoidance and empower individuals to take a proactive role in their own health and wellness; (2) can benefit patients of any ability; practices are customizable to the individual’s needs and health; (3) are safe, cost-effective, and potent adjunct treatments used to supplement (not replace) standard care; (4) deliver patient-centered, integrative care that accounts for the physical, psychological, social, and spiritual aspects of health and illness; (5) and have diverse, evidence-based benefits, including reduction in pain, stress, and debility and improvements in ROM, strength, balance, coordination, cardiovascular health, physical fitness, mood, and cognition.

Strong Evidence for Mind-Body Therapies

Mind-body therapies facilitate a unique interaction between psychological and physiologic processes, and psychoneuroimmunology has flourished with empirical findings during recent decades. For example, studies show that psychosocial stress promotes gene transcription expressed during inflammation and impairs leukocyte function.⁶⁴ Likewise, reviews conclude that meditation and deep-breathing practices, commonly used in movement therapies, alter gene expression to protect against cell injury from chronic stress.⁶⁵ This is consistent clinically, as yoga practitioners experience significantly less depression than the groups using only physical yoga poses without the usual meditation or relaxation breathing techniques.⁶⁶ Importantly, research has suggested that mind-body practices enhance the psychoneuroimmunity against novel coronavirus disease 2019.⁶⁷

Movement Therapy Benefits

Movement-based therapies are well tolerated across diverse patient populations. International guidelines across specialties recommend these nonpharmacologic integrative approaches.^{68–70} For instance, clinical practice guidelines from the American College of Physicians makes a strong recommendation for initial treatment of chronic low back pain with exercises, multidisciplinary rehabilitation, mindfulness-based

stress reduction, tai chi, yoga, motor control relaxation, or progressive relaxation.⁷¹ The United Kingdom National Guidelines also recommends Feldenkrais, yoga, tai chi, and Pilates as exercise therapies.⁶⁹ As movement therapies become mainstream, some health insurance plans recognize the cost-effectiveness of movement practices and have begun subsidizing their cost as part of preventive care. Moreover, movement-based therapies can sometimes offer an alternative therapeutic option for populations wishing to avoid pharmacologic treatments. For example, prenatal yoga for pregnant women may be effective in partly reducing depressive symptoms. A meta-analysis showed a yoga group had lower rates of depression than comparison groups that included prenatal care, exercise, social support, and massage.⁶⁶ A systematic review deemed yoga during pregnancy as safe and more effective than walking or standard prenatal exercises based on findings of lower incidences of prenatal disorders, lower levels of pain and stress, and higher relationship scores.⁷²

Movement Therapy: Safety and Precautions

Strong evidence maintains that mind-body practices are safe or safer when compared with other exercise types.^{4,45} Nevertheless, the recommended intensity and style of movement-based therapy should be customized to the individual's needs and health. Selecting a movement therapy is analogous to pharmacologic treatment, in which medication type, dose, uses, and contraindications should be carefully reviewed. For example, patients with glaucoma should avoid exercises that increase intraocular pressure (IOP), such as inverted yoga poses that position the head below the heart. Alternatively, another yoga technique, called Tratak kriya, offers ocular exercises that may lower IOP in patients with glaucoma.⁷³ Furthermore, medical knowledge of instructors is widely variable with some teacher trainings including cadaver laboratory dissection, whereas others only include an hour lecture on anatomy.

SUMMARY

Movement therapy delivers patient-centered integrative care that includes health and wellness practices that best serve each individual. Mind-body practices include a diverse group of techniques for a wide variety of conditions. A review solely on yoga included 46 different styles of yoga practice.⁴ Although contemporary literature strongly supports mind-body practices, its adaptability does not lend itself well to the rigidity required by the scientific gold standard of randomized control trials. Consequently, movement-based therapies are recommended as potent treatments to supplement, not replace, standard care.

CLINICS CARE POINTS

- Movement-based therapies can be used to facilitate behavior change and reduce kinesiophobia.
- Movement therapies can be used to decrease pain, stress, and debility and improve ROM, strength, balance, coordination, cardiovascular health, physical fitness, mood, and cognition.
- Movement therapies can only be used as adjunct treatments to supplement the standard-of-care treatment.
- Movement therapies can be particularly valuable for conditions that affect both physical and mental health, such as cancer or chronic pain exacerbated by psychosocial factors.
- The addition of yoga to stand-of-care treatment is more effective in reducing depression symptoms than standard care alone.

- Pilates is a powerful supplement to traditional physical therapy programs for low back pain.
- Tai Chi and Qigong can be used for fall prevention in community dwelling elderly and patients with Parkinson disease.
- Movement therapies are adaptable to persons of any fitness level, age, income, or physical ability.

ACKNOWLEDGMENTS

Special thanks to Dr Dixie Aragaki for her support throughout this project.

DISCLOSURE

The authors have nothing to disclose.

REFERENCES

1. Hattori Y, Tomonaga M. Rhythmic swaying induced by sound in chimpanzees (*Pan troglodytes*). *Proc Natl Acad Sci U S A* 2020;117(2):936–42.
2. Constitution of the World Health Organization. Addendum to the Forty-Fifth Edition. *Am J Public Health* 2006;1–18.
3. Jeter PE, Slutsky J, Singh N, et al. Yoga as a Therapeutic Intervention: A Bibliometric Analysis of Published Research Studies from 1967 to 2013. *J Altern Complement Med* 2015;21(10):586–92.
4. Field T. Yoga research review. *Complement Ther Clin Pract* 2016;24:145–61.
5. Moovenanthan A, Nivethitha L. Evidence based effects of yoga in neurological disorders. *J Clin Neurosci* 2017;43:61–7.
6. Kwong JS, Lau HL, Yeung F, et al. Yoga for secondary prevention of coronary heart disease. *Cochrane Database Syst Rev* 2015;(7):CD009506.
7. Wieland LS, Shrestha N, Lassi ZS, et al. Yoga for treating urinary incontinence in women. *Cochrane Database Syst Rev* 2019;(2):CD012668.
8. Broderick J, Crumlish N, Waugh A, et al. Yoga versus non-standard care for schizophrenia. *Cochrane Database Syst Rev* 2017;(9):CD012052.
9. Hartley L, Dyakova M, Holmes J, et al. Yoga for the primary prevention of cardiovascular disease. *Cochrane Database Syst Rev* 2014;(5):CD010072.
10. Cramer H, Lauche R, Klose P, et al. Yoga for improving health-related quality of life, mental health and cancer-related symptoms in women diagnosed with breast cancer. *Cochrane Database Syst Rev* 2017;(1):CD010802.
11. Yang ZY, Zhong HB, Mao C, et al. Yoga for asthma. *Cochrane Database Syst Rev* 2016;(4):CD010346.
12. Panebianco M, Sridharan K, Ramaratnam S. Yoga for epilepsy. *Cochrane Database Syst Rev* 2017;(10):CD001524.
13. Lawrence M, Celestino Junior FT, Matozinho HH, et al. Yoga for stroke rehabilitation. *Cochrane Database Syst Rev* 2017;(12):CD011483.
14. Felbel S, Meerpohl JJ, Monsef I, et al. Yoga in addition to standard care for patients with haematological malignancies. *Cochrane Database Syst Rev* 2014;(6):CD010146.
15. Wieland LS, Skoetz N, Pilkington K, et al. Yoga treatment for chronic non-specific low back pain. *Cochrane Database Syst Rev* 2017;(1):CD010671.
16. Pascoe MC, Bauer IE. A systematic review of randomised control trials on the effects of yoga on stress measures and mood. *J Psychiatr Res* 2015;68:270–82.

17. de Manincor M, Bensoussan A, Smith CA, et al. Individualized yoga for reducing depression and anxiety, and improving well-being: a randomized controlled trial. *Depress Anxiety* 2016;33(9):816–28.
18. Kinser PA, Elswick RK, Kornstein S. Potential long-term effects of a mind-body intervention for women with major depressive disorder: sustained mental health improvements with a pilot yoga intervention. *Arch Psychiatr Nurs* 2014;28(6):377–83.
19. Meister K, Becker S. [Yoga for mental disorders]. *Nervenarzt* 2018;89(9):994–8.
20. Sherman KJ, Wellman RD, Cook AJ, et al. Mediators of yoga and stretching for chronic low back pain. *Evid Based Complement Alternat Med* 2013;2013:130818.
21. Cramer H, Klose P, Brinkhaus B, et al. Effects of yoga on chronic neck pain: a systematic review and meta-analysis. *Clin Rehabil* 2017;31(11):1457–65.
22. Lauche R, Hunter DJ, Adams J, et al. Yoga for Osteoarthritis: a Systematic Review and Meta-analysis. *Curr Rheumatol Rep* 2019;21(9):47.
23. Anheyer D, Klose P, Lauche R, et al. Yoga for Treating Headaches: a Systematic Review and Meta-analysis. *J Gen Intern Med* 2020;35(3):846–54.
24. Akyuz G, Kenis-Coskun O. The Efficacy of Tai Chi and Yoga in Rheumatoid Arthritis and Spondyloarthropathies: A narrative biomedical review. *Rheumatol Int* 2018;38(3):321–30.
25. Villemure C, Ceko M, Cotton VA, et al. Insular cortex mediates increased pain tolerance in yoga practitioners. *Cereb Cortex* 2014;24(10):2732–40.
26. Lee M, Moon W, Kim J. Effect of yoga on pain, brain-derived neurotrophic factor, and serotonin in premenopausal women with chronic low back pain. *Evid Based Complement Alternat Med* 2014;2014:203173.
27. Cramer H, Lauche R, Hohmann C, et al. Randomized-controlled trial comparing yoga and home-based exercise for chronic neck pain. *Clin J Pain* 2013;29(3):216–23.
28. Lynton H, Kligler B, Shiflett S. Yoga in stroke rehabilitation: a systematic review and results of a pilot study. *Top Stroke Rehabil* 2007;14(4):1–8.
29. Moriello G, Proper D, Cool S, et al. Yoga therapy in an individual with spinal cord injury: A case report. *J Bodyw Mov Ther* 2015;19(4):581–91.
30. Panjwani U, Selvamurthy W, Singh SH, et al. Effect of Sahaja yoga practice on seizure control & EEG changes in patients of epilepsy. *Indian J Med Res* 1996;103:165–72.
31. Panjwani U, Gupta HL, Singh SH, et al. Effect of Sahaja yoga practice on stress management in patients of epilepsy. *Indian J Physiol Pharmacol* 1995;39(2):111–6.
32. Cramer H, Lauche R, Haller H, et al. Effects of yoga on cardiovascular disease risk factors: a systematic review and meta-analysis. *Int J Cardiol* 2014;173(2):170–83.
33. Cramer H. The Efficacy and Safety of Yoga in Managing Hypertension. *Exp Clin Endocrinol Diabetes* 2016;124(2):65–70.
34. Bhavanani AB, Ramanathan M, Balaji R, et al. Comparative immediate effect of different yoga asanas on heart rate and blood pressure in healthy young volunteers. *Int J Yoga* 2014;7(2):89–95.
35. Elik M, Zgorzalewicz-Stachowiak M, Zenczak-Praga K. Application of Pilates-based exercises in the treatment of chronic non-specific low back pain: state of the art. *Postgrad Med J* 2019;95(1119):41–5.
36. Mazzarino M, Kerr D, Wajswelner H, et al. Pilates Method for Women's Health: Systematic Review of Randomized Controlled Trials. *Arch Phys Med Rehabil* 2015;96(12):2231–42.

37. Fleming KM, Herring MP. The effects of pilates on mental health outcomes: A meta-analysis of controlled trials. *Complement Ther Med* 2018;37:80–95.
38. Miranda S, Marques A. Pilates in noncommunicable diseases: A systematic review of its effects. *Complement Ther Med* 2018;39:114–30.
39. Yamato TP, Maher CG, Saragiotto BT, et al. Pilates for low back pain. *Cochrane Database Syst Rev* 2015;(7):CD010265.
40. Joyce AA, Kotler DH. Core training in low back disorders: role of the Pilates method. *Curr Sports Med Rep* 2017;16(3):156–61.
41. Herrington L, Davies R. The influence of Pilates training on the ability to contract the Transversus Abdominis muscle in asymptomatic individuals. *J Bodyw Mov Ther* 2005;(9):52–7.
42. Campos de Oliveira L, Goncalves de Oliveira R, Pires-Oliveira DA. Effects of Pilates on muscle strength, postural balance and quality of life of older adults: a randomized, controlled, clinical trial. *J Phys Ther Sci* 2015;27(3):871–6.
43. Yamato TP, Maher CG, Saragiotto BT, et al. Pilates for Low Back Pain: Complete Republication of a Cochrane Review. *Spine (Phila Pa 1976)* 2016;41(12):1013–21.
44. Huston P, McFarlane B. Health benefits of tai chi: What is the evidence? *Can Fam Physician* 2016;62(11):881–90.
45. Braddom RL, Chan L, Harrast MA. *Physical medicine and rehabilitation*. Philadelphia: Saunders/Elsevier; 2011.
46. Jahnke R, Larkey L, Rogers C, et al. A comprehensive review of health benefits of qigong and tai chi. *Am J Health Promot* 2010;24(6):e1–25.
47. Church J, Goodall S, Norman R, et al. An economic evaluation of community and residential aged care falls prevention strategies in NSW. *N S W Public Health Bull* 2011;22(3–4):60–8.
48. Sherrington C, Fairhall NJ, Wallbank GK, et al. Exercise for preventing falls in older people living in the community. *Cochrane Database Syst Rev* 2019;(1):CD012424.
49. Cwiekala-Lewis KJ, Gallek M, Taylor-Piliae RE. The effects of Tai Chi on physical function and well-being among persons with Parkinson's Disease: A systematic review. *J Bodyw Mov Ther* 2017;21(2):414–21.
50. Li F, Harmer P. Economic Evaluation of a Tai Ji Quan Intervention to Reduce Falls in People With Parkinson Disease, Oregon, 2008–2011. *Prev Chronic Dis* 2015;12:E120.
51. Wu S, Chen J, Wang S, et al. Effect of Tai Chi Exercise on Balance Function of Stroke Patients: A Meta-Analysis. *Med Sci Monit Basic Res* 2018;24:210–5.
52. Li GY, Wang W, Liu GL, et al. Effects of Tai Chi on balance and gait in stroke survivors: A systematic meta-analysis of randomized controlled trials. *J Rehabil Med* 2018;50(7):582–8.
53. Howe TE, Rochester L, Neil F, et al. Exercise for improving balance in older people. *Cochrane Database of Systematic Reviews* 2011;11:CD004963.
54. Kendrick D, Kumar A, Carpenter H, et al. Exercise for reducing fear of falling in older people living in the community. *Cochrane Database of Systematic Reviews* 2014;11:CD009848.
55. Hall A, Copesey B, Richmond H, et al. Effectiveness of Tai Chi for Chronic Musculoskeletal Pain Conditions: Updated Systematic Review and Meta-Analysis. *Phys Ther* 2017;97(2):227–38.
56. Kolasinski SL, Neogi T, Hochberg MC, et al. 2019 American College of Rheumatology/Arthritis Foundation Guideline for the Management of Osteoarthritis of the Hand, Hip, and Knee. *Arthritis Rheumatol* 2020;72(2):220–33.

57. Wang C, Schmid CH, Fielding RA, et al. Effect of tai chi versus aerobic exercise for fibromyalgia: comparative effectiveness randomized controlled trial. *BMJ* 2018;360:k851.
58. Wayne PM, Lee MS, Novakowski J, et al. Tai Chi and Qigong for cancer-related symptoms and quality of life: a systematic review and meta-analysis. *J Cancer Surviv* 2018;12(2):256–67.
59. Brummer M, Walach H, Schmidt S. Feldenkrais 'Functional Integration' Increases Body Contact Surface in the Supine Position: A Randomized-Controlled Experimental Study. *Front Psychol* 2018;9:2023.
60. Hillier S, Worley A. The effectiveness of the feldenkrais method: a systematic review of the evidence. *Evid Based Complement Alternat Med* 2015;2015:752160.
61. Paolucci T, Zangrando F, Iosa M, et al. Improved interoceptive awareness in chronic low back pain: a comparison of Back school versus Feldenkrais method. *Disabil Rehabil* 2017;39(10):994–1001.
62. Torres-Unda J, Polo V, Dunabeitia I, et al. The Feldenkrais Method improves functioning and body balance in people with intellectual disability in supported employment: A randomized clinical trial. *Res Dev Disabil* 2017;70:104–12.
63. Burnyeat M, Leavett MJ, Plato. *The Theaetetus of Plato*. Indianapolis (IN): Hackett; 1990.
64. Littrell J. The mind-body connection: not just a theory anymore. *Soc Work Health Care* 2008;46(4):17–37.
65. Muehsam D, Lutgendorf S, Mills PJ, et al. The embodied mind: A review on functional genomic and neurological correlates of mind-body therapies. *Neurosci Bio-behav Rev* 2017;73:165–81.
66. Gong H, Ni C, Shen X, et al. Yoga for prenatal depression: a systematic review and meta-analysis. *BMC Psychiatry* 2015;15:14.
67. Kim SW, Su KP. Using psychoneuroimmunity against COVID-19. *Brain Behav Immun* 2020;87:4–5.
68. Wong JJ, Cote P, Sutton DA, et al. Clinical practice guidelines for the noninvasive management of low back pain: A systematic review by the Ontario Protocol for Traffic Injury Management (OPTIMA) Collaboration. *Eur J Pain* 2017;21(2): 201–16.
69. National Guideline Centre. National Institute for Health and Care excellence: clinical guidelines. In: Ashmore K, Bartlett M, King B, editors. *Low back pain and Sciatica in over 16s: assessment and management*. London: National Institute for Health and Care Excellence (UK) Copyright (c) NICE; 2016. p. 154–758.
70. Negrini S, Giovannoni S, Minozzi S, et al. Diagnostic therapeutic flow-charts for low back pain patients: the Italian clinical guidelines. *Eur Med* 2006;42(2): 151–70.
71. Qaseem A, Wilt TJ, McLean RM, et al. Noninvasive treatments for acute, sub-acute, and chronic low back pain: a clinical practice guideline from the American College of Physicians. *Ann Intern Med* 2017;166(7):514–30.
72. Jiang Q, Wu Z, Zhou L, et al. Effects of yoga intervention during pregnancy: a review for current status. *Am J Perinatol* 2015;32(6):503–14.
73. Sankalp DT, Yadav RK, Faiq MA. Effect of yoga-based ocular exercises in lowering of intraocular pressure in glaucoma patients: an affirmative Proposition. *Int J Yoga* 2018;11(3):239–41.