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# Medical Aspects of Disability

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## Complementary and Alternative Medicine

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According to a 2007 government survey (Nahin, Barnes, Stussman, & Bloom, 2009; National Center for Health Statistics, 2009), Americans spent \$33.9 billion out of pocket on complementary and alternative medicine (CAM) over the past 12 months. To put these figures in context, the \$14.8 billion spent on nonvitamin, nonmineral, natural products is equivalent to approximately one-third of total out-of-pocket spending on prescription drugs, and the \$11.9 billion spent on CAM practitioner visits is equivalent to approximately one-quarter of total out-of-pocket spending on physician visits.

CAM is a group of diverse medical and health care systems, practices, and products that are not generally considered to be part of conventional medicine. Although scientific evidence exists for some CAM therapies, for most there are key questions that are yet to be answered through well-designed scientific studies—questions such as whether these therapies are safe and whether they work for the purposes for which they are used (National Center for Complementary and Alternative Medicine [NCCAM], 2009).

*Integrative medicine*, also called integrated medicine, combines treatments from conventional medicine and CAM for which there is evidence of safety and effectiveness. The NCCAM groups CAM practices into four domains (mind–body medicine, biologically based practices, manipulative and body-based practices, and energy medicine), recognizing that there can be some overlap. In addition, NCCAM studies CAM whole medical systems, which cut across all domains. Although it is not practical to present a comprehensive overview of all CAM practices in this chapter, we will review representative therapies for each NCCAM domain.

### **MIND–BODY MEDICINE DOMAIN**

Mind–body medicine uses various techniques designed to enhance the mind’s capacity to affect bodily function and symptoms. Some techniques that were considered CAM in the past have become conventional (e.g., patient support groups and cognitive-behavioral therapy). Other mind–body techniques are still considered CAM, which include meditation (a conscious mental process using certain techniques—such as focusing attention or maintaining a specific posture—to suspend the stream of thoughts and relax the body and mind), prayer, mental healing, and therapies that use creative outlets such as art, music, or dance.

### Example: Meditation

The term *meditation* (from the Latin *meditari*: to measure, to study) refers to a group of techniques, such as mantra meditation, relaxation response, mindfulness meditation, and Zen Buddhist meditation. Most meditative techniques started in Eastern religious or spiritual traditions. These techniques have been used by different cultures throughout the world for thousands of years. Today, many people use meditation outside of its traditional religious or cultural settings for health and wellness purposes.

In meditation, a person learns to focus attention. Some forms of meditation instruct the practitioner to become mindful of thoughts, feelings, and sensations and to observe them in a nonjudgmental way. This practice is believed to result in a state of greater calmness and physical relaxation, and psychological balance. Practicing meditation can change the way in which a person relates to the flow of emotions and thoughts in the mind.

Most types of meditation have four elements in common:

- *A quiet location.* Meditation is usually practiced in a quiet place with as few distractions as possible. This can be particularly helpful for beginners.
- *A specific, comfortable posture.* Depending on the type being practiced, meditation can be done while sitting, lying down, standing, walking, or in other positions.
- *A focus of attention.* Focusing one's attention is usually a part of meditation. For example, the meditator may focus on a mantra (a specially chosen word or set of words), an object, or the sensations of the breath. Some forms of meditation involve paying attention to whatever is the dominant content of consciousness.
- *An open attitude.* Having an open attitude during meditation means letting distractions come and go naturally without judging them. When the attention goes to distracting or wandering thoughts, they are not suppressed; instead, the meditator gently brings attention back to the focus. In some types of meditation, the meditator learns to "observe" thoughts and emotions while meditating (NCCAM, 2009).

A 2007 national Government survey (Barnes, Bloom, & Nahin, 2008) that asked about CAM use in a sample of 23,393 U.S. adults found that 9.4% of respondents (representing more than 20 million people) had used meditation in the past 12 months—compared with 7.6% of respondents (representing more than 15 million people) in a similar survey conducted in 2002. The 2007 survey also asked about CAM use in a sample of 9,417 children: 1% (representing 725,000 children) had used meditation in the past 12 months.

People use meditation for various health problems (Bonadonna, 2003), such as anxiety, pain, depression, stress, insomnia, and physical or emotional symptoms that may be associated with chronic illnesses (such as heart disease, human immunodeficiency virus/acquired immune deficiency syndrome, and cancer) and their treatment. Meditation is also used for overall wellness.

Practicing meditation has been shown to induce changes in the body (Newberg & Iversen, 2003). Some types of meditation might work by affecting the autonomic nervous system. This system regulates many organs and muscles, controlling functions such as the heartbeat, sweating, breathing, and digestion. It has two major parts:

- The *sympathetic nervous system* helps mobilize the body for action. When a person is under stress, it produces the "fight-or-flight response": the heart rate and breathing rate go up and blood vessels narrow (restricting the flow of blood).
- The *parasympathetic nervous system* causes the heart rate and breathing rate to slow down, the blood vessels to dilate (improving blood flow), and digestive juices to increase.

It is thought that some types of meditation might work by reducing activity in the sympathetic nervous system and increasing activity in the parasympathetic nervous system.

In one area of research, scientists use sophisticated tools to determine whether meditation is associated with significant changes in brain function (Davidson & Lutz, 2007). These changes include alterations in patterns of brain function assessed with functional magnetic resonance imaging (fMRI), changes in the cortical evoked response to visual stimuli that reflect the effect of meditation on attention, and alterations in amplitude and synchrony of high-frequency oscillations that may play an important role in connectivity among widespread circuitry in the brain. A number of researchers believe that these changes account for many of meditation's effects.

It is also possible that practicing meditation may work by improving the mind's ability to pay attention (Jha, Krompinger, & Baime, 2007; Lutz, Slagter, Dunne, & Davidson, 2008). Since attention is involved in performing everyday tasks and regulating mood, meditation might lead to other benefits.

A 2007 NCCAM-funded review of the scientific literature found evidence suggesting that meditation is associated with potentially beneficial health effects (Ospina et al., 2007). However, the overall evidence was inconclusive. The reviewers concluded that future research needs to be more rigorous before firm conclusions can be drawn.

## **BIOLOGICALLY BASED PRACTICES DOMAIN**

Biologically based practices in CAM use substances found in nature, such as herbs, foods, and vitamins. Some examples include dietary supplements, herbal products, and the use of other so-called natural but as yet scientifically unproven therapies (e.g., using shark cartilage to treat cancer).

Acupuncture (a family of procedures involving the stimulation of anatomical points on the body using various techniques [NCCAM, 2009]) is a commonly used biologically based practice and also part of the traditional Chinese medicine whole medical system (see below). Acupuncture will not be covered in detail here because the evidence accumulated to date is extensive and a comprehensive review requires at least a separate chapter and probably a dedicated manuscript.

### **Example: Prolotherapy**

Prolotherapy is a technique that involves the injection of various fluids into joints, ligaments, tendons, and muscles (Reeves, 2000). The goal is stimulation of endogenous growth factors thereby initiating tissue repair and healing. The proliferants are thought to strengthen and "reorganize" injured tissue and decrease pain by creating an irritation that alters the inflammatory process (Jensen, Rabago, Best, Patterson, & Vanderby, 2008). Materials used for injections may include dextrose, glycerin, phenol, and lidocaine. George S. Hackett, MD, is reported to have developed the technique, which was subsequently popularized by Gustav Anders Hemwall, MD.

Prolotherapy is used to treat tendonopathies such as lateral epicondylitis and Achilles tendonitis, general musculoskeletal conditions, coccygodynia, osteoarthritis (OA) of the hand, sacroiliac disorders, various types of neck pain, temporomandibular joint (TMJ) dysfunction, cervicogenic headaches, chronic headaches, and foot problems.

A Cochrane review of prolotherapy injections for chronic low-back pain (LBP) found that when combined with spinal manipulation, exercise, and other cointerventions, it may improve chronic LBP and disability (Dagenais, Yelland, Del Mar, & Schoene, 2004). Conclusions were confounded by clinical heterogeneity among studies and by the presence of cointerventions.

Another interesting retrospective study of patients with TMJ pain found that prolotherapy can be an effective therapeutic modality that reduces TMJ pain and joint noise in most patients who have reached a plateau using an intraoral appliance, physical therapy, or home care (Hakala, 2005).

In an analysis of evidence of using prolotherapy in musculoskeletal disorders, data from 34 case reports and case series and two nonrandomized controlled trials suggested that prolotherapy is efficacious for many musculoskeletal conditions (Rabago, Best, Beamsley, & Patterson, 2005). However, results from six randomized controlled trials (RCTs) were conflicting. Two RCTs on OA reported decreased pain, increased range of motion, and increased patellofemoral cartilage thickness after prolotherapy. Two RCTs on LBP reported significant improvements in pain and disability compared with control subjects, whereas two did not. All studies had significant methodological limitations. Another group of authors concluded that on the basis of the scarce body of literature critically reviewed to date (Kim, Stitik, Foye, Greenwald, & Campagnolo, 2004), the clinical efficacy of prolotherapy in treating OA remains inconclusive.

Several placebo-controlled studies, together with uncontrolled studies, suggest that regenerative injection therapy is effective in treating painful cervical ligament and tendon pathology (Linetsky, Miguel, & Torres, 2004).

## MANIPULATIVE AND BODY-BASED PRACTICES DOMAIN

Manipulative and body-based practices in CAM are based on manipulation (the application of controlled force to a joint, moving it in an effort of restoring health). Manipulation may be performed as a part of other therapies or whole medical systems (see following text), including chiropractic medicine, massage, and naturopathy. Some examples include chiropractic or osteopathic manipulation (a type of manipulation practiced by osteopathic physicians that is combined with physical therapy and instruction in proper posture), and massage (pressing, rubbing, and moving muscles and other soft tissues of the body, primarily using the hands and fingers, aiming to increase the flow of blood and oxygen to the massaged area).

### Example: Massage

Massage is the stimulation of soft tissue by applying pressure on them for therapeutic purposes, and is one of the oldest forms of medical treatment in the world, with origins in various societies. Chinese writings dating back to 2700 B.C. and 2598 B.C. mention massage in religious documents and a medical work, respectively. The depiction of massages were found on the wall of an Egyptian physician's tomb in Saqqara, ca. 2330 B.C. Massage was also mentioned and approved in the Indian medical work, *Ayurveda*, written around 1800 B.C. as well as the book *On Articulations* by Hippocrates in 400 B.C.

Since its origins, the popularity of massage as a form of medical treatment has fluctuated, particularly in Western civilizations. In Western civilizations, the acceptance and use of massage declined from the fifth century to the Renaissance. This was largely due to the influence of the Church; it condemned massage for bringing pleasure to the body. However, in 1819, massage became more acceptable in Western medicine when Piorry analyzed its physiological effects.

Modern massage came into effect when the practice became more systematic. In 1863, the French publication of Estradere's *Du Massage*, "systematically classified each massage technique according to the bodily system affected." This influenced the rise of scientific massage techniques (Tan, 2002). Such techniques include the Swedish massage developed by Per Henrik Ling in the early 19th century. In the United States, modern scientific massage therapy was introduced in the mid-1800s, where physicians utilized it until the early 20th century. After the pharmaceutical revolution occurred in the 1940s, massage therapy became less acceptable and was categorized as an alternative form of health care. In the 1960s, physical therapy began to use massage for treating musculoskeletal impairments and other physical impairments. During the same era, the growth in the movement toward

emphasizing human psychology and spirituality greatly increased massage therapy's popularity. Following the 1960s, massage therapy eventually became incorporated into the "normal," healthy lifestyle. Nursing and physical therapy have come to reincorporate massage techniques including simple backrubs, reflexology, therapeutic touch, and aromatherapy massage. Presently, surveys in the United States have indicated the growing popularity of massage; it is one of the most commonly used therapies for both the general population as well as individuals with disabilities, and it is one of the top physician referrals for alternative therapies (Tan, 2002). Several common stroke techniques can be found among the myriad of massage techniques. These include effleurage, friction, pressure, petrissage, vibration, and percussion. Effleurage involves rhythmic and gentle skin contact. Generally, the palm is used for larger body surfaces while the fingers are used for smaller body surfaces. In the friction stroke technique, moderate pressure is applied to one area with the thumbs or fingers. The pressure stroke is, "similar to the friction stroke, except that pressure strokes are made with the hands." Petrissage, also known as kneading, involves lifting and holding skin and the underlying muscle. The tissues are pushed against the bone. Tissues are supported by one hand while kneading is performed using the other hand. Kneading is generally limited to areas of the body with large muscles mass. Vibration strokes involve the use of continuous motion. For percussion strokes, the wrist is used for tapping areas of the body (Snyder, 2006).

Ernst evaluated systematic reviews of massage therapy (MT) and chiropractic effects on reduction of any type of pain (Ernst, 2004). Two systematic reviews were found, and there was equivocal evidence for effectiveness of MT in controlling musculoskeletal or other pain. However, a meta-analysis of 37 studies that used random assignment concluded that single applications of MT did not reduce immediate assessment of pain, whereas multiple applications reduced delayed assessment of pain (Moyer, Rounds, & Hannum, 2004).

Back and colleagues described a pilot program to evaluate the efficacy of employer-funded on-site MT on job satisfaction, workplace stress, pain, and discomfort (Back, Tam, Lee, & Haraldsson, 2009). Twenty-minute massage therapy sessions were provided. Evaluation demonstrated possible improvements in job satisfaction, with initial benefits in pain severity, and the greatest benefit for individuals with preexisting symptoms. A long-term effect was not demonstrated.

A number of authors addressed the prevalence of use of MT, with results ranging from 6.9% to 61% depending on the population studied. Wells studied the use of complementary and alternative therapies in 189 women with nonsmall cell lung cancer (Wells et al., 2007). MT was used by 6.9% of participants, most commonly for pain (54.8%). Women who were younger, experienced more symptoms, and who lived on the West coast or the South (vs. the Northeast) were more likely to use complementary and alternative therapies. In a nationally representative survey that sampled 2,055 adults, Wolsko and colleagues discovered that 54% of those reporting back or neck pain in the past 12 months used complementary and alternative therapies, including 14% that used MT (Wolsko, Eisenberg, Davis, Kessler, & Phillips, 2003). Fifteen percent of midlife U.S. women used massage and chiropractic medicine, most commonly for pain (Brett & Keenan, 2007).

Palinkas and Kabongo (2000) surveyed 542 patients attending 16 family practice clinics belonging to a community-based research network in San Diego, California, and found that 17.2% used MT. The results of a survey and interviews of older adults showed that the most prevalent motivation for using complementary and alternative therapies was pain relief (54.8%), and that MT was used by 35.7% (Williamson, Fletcher, & Dawson, 2003). Prevalence of MT use in a large military family practice clinic was found to be 36%, most commonly used for back or other musculoskeletal pain (Drivdahl & Miser, 1998). In a telephone interview survey of Chicago adults aged 45 years and above, Feinglass and colleagues (2007) discovered that more than half of the respondents used complementary and alternative therapies, most commonly MT and relaxation techniques. Similarly, more than half of traumatically

injured spinal cord patients with shoulder pain received MT or physical therapy (McCasland, Budiman-Mak, Weaver, Adams, & Miskevics, 2006).

Use of MT with neck, back, and other musculoskeletal pain has been studied extensively. A review by Trinh and others concluded that there is limited evidence suggesting that MT is less effective than acupuncture in chronic mechanical neck pain (Trinh et al., 2007). Ezzo et al. (2007) analyzed 19 trials of MT in neck pain and found that 12 were not designed well. Descriptions of the massage intervention, massage professional's credentials, or experience were frequently missing, while six of the trials examined massage as a stand-alone treatment. Not surprisingly, the results were inconclusive (Ezzo et al., 2007). Results were also inconclusive in 14 trials that used massage as part of a multimodal intervention because none were designed such that the relative contribution of MT could be ascertained.

Sherman and others surveyed randomly selected acupuncturists, chiropractors, and massage therapists in two states (Sherman et al., 2006). Back pain was the most common reason for visits to each of these providers, with chronic back pain representing about 12% of visits to massage therapists.

Cherkin, Sherman, Deyo, and Shekelle (2003) reviewed MEDLINE, Embase, and the Cochrane Controlled Trials Register, and included three RCTs that evaluated massage and reported that it is effective for subacute and chronic back pain.

Similarly, Furlan, Brosseau, Imamura, and Irvin (2002) conducted a systematic review of MEDLINE, Embase, Cochrane Controlled Trials Register, HealthSTAR, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and dissertation abstracts describing use of MT for lower back pain. Nine publications reporting on eight randomized trials were included. Three had low and five had high methodological quality scores. Massage was compared with an inert treatment (sham laser) in one study that showed that massage was superior, particularly if given in combination with exercises and education. In the other seven studies, massage was compared with different active treatments. They showed that massage was inferior to manipulation and transcutaneous electrical nerve stimulation; equal to corsets and exercises; and superior to relaxation therapy, acupuncture, and self-care education. The beneficial effects of massage in patients with chronic LBP lasted at least 1 year after the end of the treatment. One study comparing two different techniques of massage concluded in favor of acupuncture massage over classic (Swedish) massage.

Wright and Sluka (2001) reviewed the use of several modalities including MT in the management of painful musculoskeletal disorders, and concluded that although evidence from basic scientific research suggests that many of the therapies could have potential therapeutic effects, there is a paucity of high-quality evidence from RCTs to support the therapeutic effectiveness of these therapies.

Best, Hunter, Wilcox, and Haq (2008) reviewed evidence for using massage for muscle and soft-tissue pain and weakness after intense exercise. Analysis of 27 studies that met inclusion criteria led authors to conclude that while case series provide little support for the use of massage to aid muscle recovery or performance after intense exercise, RCTs provide moderate data supporting its use to facilitate recovery from repetitive muscular contractions. It also appears that the experience of the massage therapist may be directly related to effectiveness of MT in relieving muscle soreness after a 10-km race (Moraska, 2007).

Dryden, Baskwill, and Preyde (2004) reviewed evidence of MT's utility for orthopedic problems and concluded that it may be effective for patients with low-back problems and potentially beneficial for other orthopedic problems. MT appears to be safe and effective in reducing both pain and dysfunction with high patient satisfaction.

In a randomized, double-blind, placebo-controlled trial of 140 subjects with knee OA, physiotherapy including MT appeared no more effective in reducing pain at 12 and 24 weeks than regular contact with a therapist (Bennell et al., 2005).

Several investigators studied use of massage in cancer pain. Ferrell-Torry and Glick (1993) administered 30 minutes of therapeutic massage on two consecutive evenings to nine hospitalized males diagnosed with cancer who were experiencing cancer pain. Massage therapy

significantly reduced the subjects' level of pain perception and anxiety. In addition to these subjective measures, all physiological measures (heart rate, respiratory rate, and blood pressure) tended to decrease from baseline, providing further indication of relaxation. Building on the work of these authors, Grealish, Lomasney, and Whiteman (2000) administered 10-minute foot massage (5 minutes per foot) to 87 subjects hospitalized with cancer and found a significant immediate effect on the perceptions of pain, nausea, and relaxation when measured with a visual analog scale.

In a larger study, Currin and Meister (2008) assessed the effect of a Swedish massage intervention on 251 oncology patients' perceived level of distress. The analysis found a statistically significant reduction in patient-reported distress for both pain and physical discomfort, regardless of gender, age, ethnicity, or cancer type.

Jane, Wilkie, Gallucci, and Beaton (2008) reviewed 15 studies published in English between 1986 and 2006 for study design, methods, and massage efficacy in adult patients with cancer. Methodological issues identified included less rigorous inclusion criteria, failure to consider potential confounding variables, less than rigorous research designs, inconsistent massage doses and protocols, measurement errors related to sensitivity of instruments and timing of measurements, and inadequate statistical power.

Use of massage for postoperative pain control has been addressed by several authors.

Forchuk and colleagues (2004) evaluated the usefulness of arm massage from a significant other following lymph node dissection surgery in a randomized clinical trial that included 59 women. Participants reported a reduction in pain in the immediate postoperative period and better shoulder function.

Anderson and Cutshall (2007) reviewed benefits of massage in the reduction of pain, anxiety, and tension in cardiac surgical patients, and described a clinical case example of a patient who has experienced cardiac surgery and received massage therapy.

In a study attempting to test the effectiveness of physiotherapy-based rehabilitation starting 1 week after lumbar disc surgery, Erdogmus and coworkers (2007) compared "comprehensive" physiotherapy, "sham" neck massage, and no therapy. LBP at 12 weeks was equally improved in both the "comprehensive" and the "sham" massage groups, compared to controls.

Finally, in a randomized trial of MT in 605 veterans with acute postoperative pain after major surgery, Mitchinson and colleagues (2007) found that compared with the control group, patients in the massage group experienced very significant short-term decreases in pain (intensity  $p=0.001$ ), pain unpleasantness, and anxiety. In addition, patients in the massage group experienced a significantly faster rate of decrease in pain intensity and unpleasantness during the first 4 postoperative days compared with the control group.

Another area that deserves discussion is use of massage in patients with pain related to burn injuries. Field and coworkers (1998) randomly assigned 28 adult patients with burns before debridement to either a massage therapy group or a standard treatment control group. The massage therapy group demonstrated decreased pain on the McGill Pain Questionnaire, Present Pain Intensity Scale, and Visual Analogue Scale compared to the control group. In their review, Gallagher, Rae, and Kinsella (2000) described massage as one of nonpharmacological modalities routinely used in treating patients with burns.

Hernandez-Reif and coworkers (2001) studied 24 young children (mean age = 2.5 years) hospitalized for severe burns who received standard dressing care or massage therapy in addition to standard dressing care before dressing changes. The massage therapy was conducted to body parts that were not burned. During the dressing change, the children who received massage therapy showed minimal distress behaviors and no increase in movement other than at the torso. In contrast, the children who did not receive MT responded to the dressing change procedure with increased facial grimacing, torso movement, crying, leg movement, and reaching out. Nurses also reported greater ease in completing the dressing change procedure for the children in the MT group. MT has also been described by Schneider and coworkers (2006) as a common alleviating factor in their review of neuropathic-like pain after burn injury.

## ENERGY MEDICINE DOMAIN

Energy therapies involve the use of energy fields. They are of two types:

1. *Biofield therapies* are intended to affect energy fields that purportedly surround and penetrate the human body. The existence of such fields has not yet been scientifically proven. Some forms of energy therapy manipulate biofields by applying pressure and/or manipulating the body by placing the hands in, or through, these fields. Examples include tai chi (a component of traditional Chinese medicine and martial arts that combines movement, meditation, and controlled breathing), Reiki (a therapy in which practitioners seek to transmit a universal energy to a person, either from a distance or by placing their hands on or near that person; the intent is to heal the spirit and thus the body), and therapeutic touch (a therapy in which practitioners pass their hands over another person's body with the intent to use their own perceived healing energy to identify energy imbalances and promote health).
2. *Bioelectromagnetic-based therapies* involve the unconventional use of electromagnetic fields, such as pulsed fields, magnetic fields, or alternating-current or direct-current fields.

### Example: Tai Chi Chuan

Tai chi chuan is a martial art rooted in the philosophy of Daoism that emphasizes fluid, continuous movement. Literally translated as the “supreme ultimate fist” (Chen, 2006), tai chi chuan strives for balance and harmony in the practitioners’ movements vis-à-vis chi or qi, the metaphysical life force that Daoism believes to run through all living beings. Through the correct positioning of the body, the gracefully proper transitions between positions, as well as mental concentration, tai chi chuan aims for harmony within the practitioner and between the practitioner and the way of nature. Since the emphasis of tai chi chuan is precise and fluid motion, it can be practiced by a wide range of age groups (Wolf, O’Grady, & Xu, 2002).

The way of nature is a fundamental aspect of both Daoism and tai chi chuan. The quintessential book of Daoism, the *Dao De Jing*, states that the Dao has no set form but can be understood through the cyclical movement of nature as well as through the opposite, yet complementary forces in nature (Morton, 2004). The Dao has been described as being, “like empty space, but emptiness has been undervalued, since the hollow in the center of a bowl, the space in a wheel between rim and hub, or the empty space of a window or door in a room are the very things which give these objects their point and usefulness.” In essence, the passiveness of the Dao helps the flow of Chi in the body (Morton, 2004).

The recorded history of tai chi chuan began in the 17th century, a transition period between the Ming and Qing dynasties. The art of tai chi chuan was a secret and closely protected heirloom of the Chen family. This pattern was broken around the 19th century when Yang Luchan, the first notably nonmember of the Chen family, learned the art from Chen Changxing. Eventually Yang made his own contributions to the art, leading to the creation of the Yang style. Proliferation of tai chi chuan continued and as a result, multiple variations of tai chi chuan exist today, with the Chen, Yang, Sun, Wu and alternative Wu, as the more popular of the variations (Wolf et al., 2002).

Tai chi chuan practice is based on 10 principles created by Grand Master Yang Chen-Fu in the late 1920s:

1. Keep the head and neck straight (as if suspended from above).
2. Upper and lower back is kept in a straight line with the pelvis tucked in.
3. Waist is relaxed and rotates easily, including the muscles of the hips and groin.
4. Shoulders and elbows are relaxed and sinking down.
5. Upper and lower parts of the body always move as one coordinated unit.

6. Always differentiate between a full (solid) and an empty leg when moving (i.e., be aware to which leg a weight shifting is occurring).
7. Move using only the intention of the mind and no external muscle force.
8. Make each movement flow into the next in a smooth, continuous manner.
9. Ensure a sense of harmony between the internal and external body feeling.
10. Experience a tranquil, meditative state. (Wolf et al., 2002).

From these principles, the actual practice of tai chi chuan begins with warm-up exercises such as foot massages and gentle patting of the face, neck and arms; this is done to stimulate the movement of chi. The final part of the warm-up involves the “waiving arms” exercise; the exercise involves shifting the body weight among the legs and other parts of the body, as well as free swinging of the arms in a backward motion. After the warm-up, the exercises begin. Common to all the variations of tai chi chuan is the review. At the beginning of each session, previous motions are reviewed to ensure they have been practiced adequately and that the motions are correct. Typically, a session lasts between 60 and 90 minutes (Wolf et al., 2002).

Comprehensive benefits of tai chi were reviewed by Klein and Adams (2004). Of the more than 200 published reports examined, 17 controlled clinical trials were judged to meet a high standard of methodological rigor. Controlled research evidence was found to confirm therapeutic benefits of tai chi practice with regard to pain management.

Use of tai chi among other mind–body interventions in neurology patients was reviewed by Wahbeh, Elsas, and Oken (2008). Authors discussed applications of mind–body therapy to general pain, back and neck pain, carpal tunnel syndrome, headaches, and fibromyalgia, and concluded that the evidence for the efficacy of mind–body therapies is quite strong in some conditions, such as migraine headache.

Research-based use of tai chi for reducing pain and stress as a potential nursing intervention was summarized by Chen and Snyder (1999). Authors critically evaluated existing literature and suggested that additional studies on the effects of tai chi from a nursing perspective are needed to make clear when it is beneficial as a nursing intervention.

On the other hand, Siu, Chan, Poon, Chui, and Chan (2007) used tai chi as a control intervention in a study evaluating a 6-week Chronic Disease Self-Management Program (CDSMP) in 148 subjects with chronic illness. CDSMP subjects used more cognitive methods to manage pain and had a tendency to adopt the cognitive methods of diverting attention, reinterpreting pain, ignoring sensations, and making positive self-statements, as opposed to subjects assigned to the tai chi (control) group.

In a survey of Boston and Seattle patients with chronic LBP, Sherman and colleagues (2004) found that knowledge about complementary alternative therapies was low, except for chiropractic.

Yocum, Castro, and Cornett (2000) reviewed the role of exercise, education, and behavioral modification as alternative therapy for pain and stress in rheumatic disease. Their analysis indicated that programs using alternative therapies such as tai chi in combination with traditional medications appear to be beneficial for patients with arthritis, and that these individuals appear to live better lives and have better long-term outcomes.

A number of investigators studied the effectiveness of tai chi in patients with OA pain. Lee, Pitler, and Ernst (2008) conducted a systematic review of use of tai chi for OA on MEDLINE, AMED, British Nursing Index, CINAHL, Embase, PsycINFO, The Cochrane Library 2007, Issue 2, the UK National Research Register and ClinicalTrials.gov, Korean Medical Databases, the Qigong and Energy database, and Chinese Medical Databases (until June 2007). Hand searches included conference proceedings and author’s own files. Five RCTs assessed the effectiveness of tai chi on pain of OA. Two RCTs suggested significant pain reduction on visual analog scale and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) as compared with routine treatment and an attention control program in knee OA. Three RCTs did not report significant pain reduction on multiple sites pain.

In a prospective, pretest–posttest clinical trial, Shen and colleagues (2008) examined the effects of tai chi exercise on gait kinematics, physical function, pain, and pain self-efficacy in elderly with knee OA. After 6 weeks of tai chi exercise, knee pain was significantly decreased, whereas no change was observed in pain self-efficacy.

Lee et al. (2008) studied effects of tai chi exercise on pain and stiffness of knee joint in 46 community-dwelling elderly subjects with OA. The experimental group had significantly less pain and stiffness than the control group.

Wang and colleagues (2008) discuss the challenges of designing an RCT with long-term follow-up. Their RCT examines the effects of a 12-week tai chi program compared with an attention control (wellness, education, and stretching) on pain, functional capacity, psychosocial variables, joint proprioception, and health status in elderly people with knee OA. The challenges encountered by the authors included strategies for recruitment, avoidance of selection bias, the actual practice of tai chi, and the maximization of adherence and follow-up while conducting the clinical trial for the evaluation of the effectiveness of tai chi on knee OA.

Two studies examined comparative efficacy of hydrotherapy and tai chi in patients with OA. Lee (2006) compared the effects of tai chi, aquatic exercise, and a self-help program in 50 patients. There were significant differences in joint pain and stiffness for both the tai chi and the aquatic exercise groups compared with the self-help group. In a larger RCT, Franssen, Nairn, Winstanley, Lam, and Edmonds (2007) randomly allocated 152 older persons with chronic symptomatic hip or knee OA for 12 weeks to hydrotherapy classes, tai chi classes, or a waiting list control group. Outcomes were assessed 12 and 24 weeks after randomization and included pain and physical function (WOMAC). At 12 weeks, compared with controls, participants allocated to hydrotherapy classes and tai chi classes demonstrated significant improvements for pain scores. All significant improvements were sustained at 24 weeks. Interestingly, class attendance was higher for hydrotherapy, with 81% attending at least half of the available 24 classes, compared with 61% for tai chi. Similarly, while demonstrating significant pain reduction in the tai chi group, the drop-out rate in the study by Song, Lee, Lam, and Bae (2007) was 41%.

In contrast to these findings, Brismee et al. (2007) found that although 6 weeks of group tai chi followed by another 6 weeks of home tai chi training resulted in significant improvements in mean overall knee pain and maximum knee pain compared with controls, all improvements disappeared after stopping practice for 18 weeks.

Several studies investigated the use of tai chi in pain associated with rheumatoid arthritis. Han and coworkers (2004) attempted to assess the effectiveness and safety of tai chi as a treatment for people with rheumatoid arthritis. Cochrane Controlled Trials Register, MEDLINE, PEDro, and CINAHL databases, the Chinese Biomedical Database, and the Beijing Chinese Academy of Traditional Medicine were searched. RCTs and controlled clinical trials examining the benefits and harms of exercise programs with tai chi instruction or incorporating principles of tai chi philosophy were selected for review and included four trials encompassing 206 participants. Although the included studies did not assess the effects on patient-reported pain, the results suggest that tai chi does not exacerbate symptoms of rheumatoid arthritis.

A systematic review of MEDLINE, PubMed, AMED, British Nursing Index, CINAHL, Embase, PsycINFO, The Cochrane Library, the UK National Research Register and ClinicalTrials.gov, Korean Medical Databases, Qigong and Energy Medicine Database, and Chinese databases identified two RCTs that assessed pain outcomes and did not demonstrate effectiveness on pain reduction compared with education plus stretching exercise and usual activity control (Lee, Pittler, & Ernst, 2007).

In a controlled trial of 61 subjects with rheumatoid arthritis, Lee and Jeong (2006) found that pain and fatigue significantly decreased in the experimental group. Koh (1982) describes his personal experience with using tai chi for symptoms of ankylosing spondylitis unresponsive to conventional therapies. After 2.5 years of daily practice the author felt less pain in addition to other positive results. However, pain returned if practice was neglected for as little as 1 week.

There were also several studies that examined the effects of tai chi on pain in college students and the elderly.

Wang, Taylor, Pearl, and Chang (2004) administered a 3-month intervention of tai chi exercise to college students, and multidimensional physical and mental health scores including bodily pain were assessed using the SF-36 health survey questionnaire before and after the intervention. Bodily pain improved significantly after tai chi exercise intervention.

Reid and colleagues (2008) reviewed the evidence regarding self-management interventions for pain due to musculoskeletal disorders among older adults. After searching the MEDLINE and CINAHL databases, the authors identified 27 articles that evaluated programs including yoga, massage therapy, tai chi, and music therapy. Positive outcomes were found in 96% of the studies. Proportionate change in pain scores ranged from an increase of 18% to a reduction of 85% (median = 23% reduction). Identified issues with the generalization of subjects included limited enrollment of ethnic minority elders, as well as nonethnic elders aged 80 and above.

Another review conducted by Morone and Greco (2007) found limited support for meditation and tai chi for improving function or coping in older adults with LBP or OA. Several studies included older adults, but did not analyze benefits by age. Tai chi, yoga, hypnosis, and progressive muscle relaxation were significantly associated with pain reduction in these studies. Ross, Bohannon, Davis, and Gurchiek (1999) evaluated effects of tai chi exercise on 11 elderly women. Findings included significant improvement ( $p=0.05$ ) in pain perception as measured by the visual analog scale. Ho and coauthors compared health-related quality of life in 140 elderly practicing tai chi and 560 age- and sex-matched control subjects taken from the general population (Ho et al., 2007). The authors found no significant difference in the bodily pain scales between tai chi and control groups.

Despite these findings, in a larger study using similar design, Kin, Toba, and Orimo (2007) found that when the 804 elderly participants who participated were further subdivided in age cohorts, the 70- to 80-year-old subjects practicing tai chi had significantly better bodily pain scores ( $p < 0.05$ ) than the age- and sex-matched national average.

Finally, in a fascinating study involving 112 healthy older adults aged 59–86 years, Irwin, Olmstead, and Oxman (2007) set out to evaluate the effects of tai chi on resting and vaccine-stimulated levels of cell-mediated immunity (CMI) to varicella zoster virus (VZV) and on health functioning. In this prospective RCT, the subjects were vaccinated with the live attenuated VZV vaccine licensed to prevent varicella. The tai chi group showed significant improvements in SF-36 scores for bodily pain, vitality, and mental health.

## WHOLE MEDICAL SYSTEMS

Whole medical systems are built upon complete systems of theory and practice. Often, these systems have evolved apart from and earlier than the conventional medical approach used in the United States (NCCAM, 2009). Examples of whole medical systems that have developed in Western cultures include

1. Homeopathic medicine: A whole medical system that originated in Europe, homeopathy seeks to stimulate the body's ability to heal itself by giving very small doses of highly diluted substances that in larger doses would produce illness.
2. Naturopathic medicine: A whole medical system that originated in Europe, naturopathy aims to support the body's ability to heal itself through the use of dietary and lifestyle changes together with CAM therapies such as herbs, massage, acupuncture, and so on.

Examples of systems that have developed in non-Western cultures include

1. Traditional Chinese Medicine, which is a whole medical system that originated in China, based on the concept that disease results from disruption in the flow of qi and imbalance

in the forces of yin and yang. Practices such as herbs, meditation, acupuncture, and Qi Gong comprise an elegant system of preventing, diagnosing, and treating somatic and emotional illness.

2. Ayurveda, which is a whole medical system that originated in India that aims to integrate the body, mind, and spirit to prevent and treat disease. Therapies used include herbs, massage, and yoga.

## CONCLUSION

Complementary and alternative practices are well established in our society and may be able to address various health-related issues.

Only by holding CAM modalities to the highest standards of evidence will we best facilitate the creation of an integrated health care delivery system in which conventional physicians and CAM practitioners work as an interdisciplinary team. As the Prince of Wales commented in 1998, "This isn't a question of orthodox medicine taking over, or of CAM diluting the intellectual rigor of orthodoxy. It is about reaching across the disciplines to help and to learn from one another for the ultimate benefit of the patients you all serve" (Prince of Wales, 1998).

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