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Meditative Movement as a Category of Exercise: Implications for Research

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Introduction: Meditative Movement (MM) is proposed as a new category of exercise defined by (a) some form of movement or body positioning, (b) a focus on breathing, and (c) a cleared or calm state of mind with a goal of (d) deep states of relaxation. ***Review:*** Two forms of exercise meeting this definition, Qigong and Tai Chi, are reviewed to examine health benefits found in the research literature, recap elements that should be assessed in MM research, and suggest where aspects of MM intersect with, and are distinguished from, conventional forms of exercise. ***Results:*** Relevant dimensions of the key elements of MM, such as frequency, duration, type of movement, degree of exertion, description of breathing, and achievement of relaxed state are recommended to be clearly described and measured to consistently define the category across studies and clarify how MM may affect health outcomes in similar, and perhaps different, ways than conventional exercise. ***Conclusions:*** If these suggested standards are used, we will gain a better understanding of which elements are necessary for achieving targeted outcomes. Over time, as MM is studied as a category of exercise, research may progress more efficiently to define the domains of physiological and psychological benefit.

Keywords: stress, breathing exercises, Tai Chi, Taiji, Qigong

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Mind–body approaches to health are those practices (eg, meditation, breathing techniques) that generate states of mental and physical relaxation or those (eg, psychotherapy, support groups) that strive to improve attitudes and emotions regarding health.[1] Some mind–body practices incorporate movements that could be considered physical exercise at varying levels of exertion. Mind–body practices that incorporate movement are increasingly being used as complementary approaches to health and healing,[2] and the body of research that theorizes and tests how these practices may work to affect health is growing. What most distinguishes these mind–body practices from traditional forms of exercise is that they generally include a focus of the mind on the body and breathing as vehicles for accomplishing deep states of relaxation. These include, but are not limited to, familiar forms such as yoga, Tai Chi, Qigong, and other less familiar forms such as Sign-Chi-Do,[3] Neuromuscular Integrative Action,[4] and Eurhythmy.[5]

Just as aerobic exercise has become defined over the years as an umbrella construct that incorporates many different forms of exercise, there is a need to begin to define an umbrella construct for emerging forms of exercise that incorporate meditation and breath practice to initiate and sustain purposeful states of relaxation. Aerobic exercise is defined as any form of physical activity that generates increased heart rate and breath volume to meet the oxygen demands of the muscles being activated.[6] The equivalency of many different forms of aerobic exercise has been established based not only on the level of exertion generated in the activity, but also on the underlying similarity in mechanisms of action and related outcomes on cardiovascular functioning. Disparate activities such as bicycle riding, jogging, and dancing then could be treated as equal partners in research on aerobic-exercise effects on health outcomes as long as the dimensions of the aerobic activity were measured and accounted for in the analyses.

In developing a definition of a new category of exercise that focuses on a different set of required dimensions such as meditation and focused breathing, those dimensions should also be described, measured,

and assessed so that they can be consistently examined relative to health outcomes. This is a first step in establishing a working definition of this category of exercise and in developing an understanding of possible mechanisms of action.

Our goals for this article are threefold. First, we will present a working definition of Meditative Movement (MM), which is proposed as a new category of exercise. Second, we will provide evidence that 2 forms of MM, Tai Chi and Qigong, are associated with a number of common health benefits. By so doing, our intent is to demonstrate that although Tai Chi and Qigong have unique characteristics that may differentiate them, their similar effects in terms of health outcomes point to the need for guiding research that cuts across MM forms. Third, we recommend ways to measure the defining components of MM. Our goal is to provide guidance for researchers to more clearly describe, define, and operationalize the key components of their MM activity so that in the future we will have available the necessary information to begin to compare findings across studies.

Meditative Movement: A Working Definition

Our definition of MM begins with a requirement for focus of the mind (ie, attention, awareness) in meditative practice. Meditation forms vary widely, making standardized research on meditation challenging,[7] but most include either keeping the awareness focused on a specific target such as an image, an ideal, a mantra, or the breath itself or, conversely, clearing the mind to the point of quiet emptiness. Often in forms of MM, it is recommended that the mind be engaged in the movement practice in the present moment, to the exclusion of all other thoughts. Any of these forms are considered valid versions of meditation in our definition of MM.

In addition to meditation, MM usually includes some form of body movement that is typically described as slow, relaxed, and flowing, but may range from a high level of dynamic movement to quiescent static postures, with or without specific choreography. Dynamic practice without specific choreography includes such practices as Spontaneous Qigong, in which all body parts are shaken in spurious movements, whereas other forms of Qigong and Tai Chi are highly choreographed dynamic practice. Examples of static postures include Qigong standing meditation and hatha yoga in which the body is held in a variety of stationery positions for a period of time.

MM also includes a focus on breathing to bring the mind and consciousness to a restful state but also to bring additional oxygenation and/or "energy" to the body. The breathing may be passive with a simple reminder to keep the mind in a state of watching the breath. In other forms, breathing is prescribed in very specific ways, either for patterning with the movement (eg, inhaling as arms slowly rise and exhaling as they float downward), or for breathing-only exercises in which patterns of quick or slow, deep or short breaths are combined to create specific effects.

Finally, the last element that is important to these practices is the deep state of relaxation, not only a suggested goal, but a required element, intrinsic to the practices. In some forms, vigorous movement is used to create a state of relaxation after the movement is slowed or stopped. In other forms, the movement or postures are intended to generate relaxation concurrent with the movement. In either case, going into a deep state of physical and mental relaxation is a key element of MM.

These practice elements taken together, a focus of the mind, movement, a focus on breathing, and the attainment of a deeply relaxed state, comprise the dimensions we use to define MM. Single elements, such as breathing techniques or meditation, have demonstrated beneficial effects related to stress reduction.[7,8] When these components are combined (as in yoga, Qigong, or Tai Chi), the broader practices have been shown to be predictive of a wide range of health benefits that may or may not be achieved with any single element.

In an effort to begin to delineate some of the possible implications of grouping such forms together into one category of exercise and to examine what defines them, what benefits may arise, and how these might differ from other forms of exercise, 2 closely related forms, Qigong and Tai Chi, will be presented as examples of forms of MM that have been demonstrated to result in the same health effects.

Two Forms of MM With Common Health Benefits

Qigong and Tai Chi are close relatives having common theoretical roots and much overlap in the components of practice. Teachings of Qigong and Tai Chi (both components of Traditional Chinese Medicine, or TCM) recommend, "Mind the body and the breath, and then clear the mind to distill the Heavenly elixir within."[9] That is, the combination of awareness and correction of the posture, the flow of breath, and stilling of the mind to achieve deep states of relaxation is thought to comprise a state of being required for the proper practice of Qigong, and these guidelines similarly characterize the correct practice of Tai Chi. Thus, both of these practices are clearly representative of the category of exercise MM, as proposed.

There continues to be skepticism among mainstream exercise physiologists and sports medicine researchers regarding the degree to which the efficacy of these forms of exercise relative to fitness and overall health outcomes has been established. However, the growing evidence from research on the health benefits of Qigong and Tai Chi (including more than 70 randomized, controlled

trials[10]) and the commonalities in the findings make them excellent examples to use to support our contention that MM should be considered a new category of exercise.

Although the underlying mechanisms of action may not currently be understood for how these 2 representative forms of MM may achieve results, Qigong and Tai Chi have fairly consistently been shown to have similar health benefits. Four categories of outcomes will be reviewed briefly in turn, demonstrating similar effects of both Qigong and Tai Chi. These particular domains of research have been selected for brief review relative to the accumulating evidence of effects as a result of both Qigong and Tai Chi. Other outcomes, particularly cardiovascular, respiratory function, and fitness effects,[11,12] have been studied in the empirical literature, some using strong study designs reported in critical reviews.[13,14] However, these are less useful because studies on these outcomes are predominated by either Qigong or Tai Chi, thus negating our ability to compare findings for the 2 forms of MM.

Furthermore, the selection of outcomes to be reviewed is based on the existence of high-quality evidence that supports these common health benefits. Thus, for this discussion, we have limited our selection of empirical articles to those that give adequate detail on research design and control methods and that use randomized, controlled trials (RCT) or some form of control group (ie, matched controls). A few pre–post intervention designs are cited and are described as such. Very few published studies of Tai Chi or Qigong are based on stringent design elements such as establishing an effective placebo control, blinding study staff, or presenting intent-to-treat analyses, so these were not set as criteria for inclusion nor will they be reported. Because several reviews of the research literature on Qigong and Tai Chi have been recently published, some of these review articles are used as a basis of discussion, supplemented by our updated review of original research.

Blood Pressure

In a recent review of Tai Chi research among older adults, 3 studies included blood pressure (BP) as a key outcome variable, demonstrating evidence for a reduction of BP in response to Tai Chi practice, suggesting it "is probably as beneficial as aerobic exercises in reducing blood pressure."[15] Other studies with similar quality of design (randomized or matched controls) also showed that BP is reduced significantly for those practicing Tai Chi compared with no-exercise controls[16,17]; this reduction is similar to the effects of aerobic exercise.[18]

A recent review[19] addressed the large body of literature on effects of Qigong on hypertension, most of which is published in Chinese and provides limited information on study design. Meta-analysis conducted on 2 criterion-selected studies of Qigong as an adjuvant to hypertensive medications compared with drug therapy alone[20,21] suggests significant reduction in systolic blood pressure. Additional evidence for Qigong effects on BP parallels the findings for Tai Chi, including reports that a significant reduction can been achieved with Qigong compared with wait-list controls[22,23] and that significant reductions are obtained for Qigong at similar levels to conventional exercise.[24]

Mental Health

Four RCTs have demonstrated potential for Tai Chi to improve various aspects of mood or psychological state. In 1 study, Tai Chi was found to reduce stress after an acute stressor,[25] and in 2 others, effects of Tai Chi were examined over time, resulting in significant declines in depression/anger[26] and anxiety[17] and improved mental health.[27] A pre–post Tai Chi design (no control group) suggested a reduction in depression and anger and correlations with predicted reductions in salivary cortisol levels and increased noradrenaline excretion in urine.[28]

In a previously mentioned study that primarily tested effects of Qigong on blood pressure, emotions were found to be significantly improved for those practicing Qigong compared with wait-list controls.[23] In patients with fibromyalgia, the practice of Qigong resulted in reductions of depression compared with a control group,[29] and significant reductions in depression were found in hypertensive patients practicing Qigong or conventional exercise compared with controls.[24] Finally, in a recently completed RCT, Qigong was found to have the same effects on enhancement of mood as a conventional walking group control, providing similar support for the concept that Qigong improves mood to the extent that it imitates mild to moderate aerobic exercise effects.[30]

Functional Balance

Wang, Collet, and Lau[14] provide an extensive review of 11 studies examining the effects of Tai Chi on physical function and balance, factors implicated in preventing falls (see conclusions of the FICSIT analyses).[31] In general, all of these studies demonstrated improvements in factors related to risk for falls as a result of practicing Tai Chi. Among these studies, 2 RCTs showed significant improvements in balance, strength, and stability in a younger population (age 20 to 45)[32] and these same factors plus flexibility in older adults (mean age of 76) after practicing Tai Chi for 12 to 15 weeks.[33] Additional recent empirical evidence has demonstrated the superiority of Tai Chi over conventional stretching exercises for improving functional balance,[34] and in a study of sedentary, middle-age women, Tai Chi performers demonstrated improved balance over controls matched on age and body size.[16]

The potential of Qigong for preventing falls has only begun to emerge. In a RCT of elderly patients with coronary artery disease, balance (as assessed by

performance on the 1-leg stance) and coordination were significantly improved in the group practicing Qigong over usual-care control patients.[35] Furthermore, a group of fibromyalgia patients demonstrated significantly greater improvements in "movement harmony," a proxy for balance, after practicing Qigong and as compared with a control group.[36] In a RCT that combined Qigong and Tai Chi in a 6-month intervention, several mechanisms purportedly related to balance were significantly improved in the treatment group compared with wait-list controls, including vestibular ratios of the Sensory Organization Test and quiet stance Base of Support.[37] One of the theorized mechanisms for improving balance is through leg strengthening resulting from the leg-bent position of many Tai Chi exercises; many Qigong forms include similar soft lunges and leg bending in the series of movements, making it rather likely that if more studies were to be conducted for Qigong, a similar result might be found.

Immune Function

Research examining the effects of Tai Chi on immune function is growing, with existing empirical evidence supporting the benefits of Tai Chi for this outcome. In a recent RCT, the effects of a modified form of Tai Chi practice on immune function were examined in patients with exposure to varicella zoster and subsequently vaccinated (shingles). Results demonstrated that those in the Tai Chi group showed significantly improved cell-mediated immunity (CMI) to varicella zoster virus (VZV) compared with a health education control group.[27] This study extended the findings of an earlier study of older adults performing Tai Chi, resulting in significant improvements in CMI to VZV compared with wait-list controls.[38] Improvements in thyroid-stimulating hormone, follicle-stimulating hormone, triiodothyronine,[39] and lymphocyte production[40] have been noted in response to Tai Chi groups as compared with control groups, providing indication of homeostasis supportive of immune function. In addition, pre–post Tai Chi intervention designs have shown an improvement in levels of IgG[41] and natural killer cells,[42] thus suggesting an impact on immune function.

Similar results have been found for Qigong. Qigong practice by healthy subjects and cancer patients has been shown to influence circulating numbers and functional activities of white blood cells, comprising lymphocytes, monocytes, and natural killer cells.[43,44] Studies in healthy subjects reveal enhanced immune cell-mediated delayed hypersensitivity,[45] as well as related in vitro increases in lymphocytes producing the Th1 cytokine interferon gamma (IFN-γ) versus the Th2 cytokine interleukin (IL)-10.[46] This shift infers a beneficial swing toward Th1 cell-mediated immune activation in contrast to immune suppression mediated by Th2 cytokines.[46] Most recently, a study that combined the practices of Qigong and Tai Chi found that participants randomized to the intervention receiving influenza vaccine showed a significant increase in the magnitude and duration of antibody response compared with wait-list controls.[47]

Summary

Although there is an imbalance in the number and type of studies conducted on the 4 health outcomes reviewed, the growing evidence suggests that Qigong and Tai Chi demonstrate similar outcomes for blood pressure, mental health outcomes, functional balance, and immune function. These are presented as first steps in identifying common health outcomes that may be important to explore for MM forms in general. We turn now to important parameters of MM, as informed by the more detailed examples of Qigong and Tai Chi practice and outcomes that could potentially be controlled and/or reported for purposes of standardizing and generalizing further research.

Measurement of the Defining Components of MM

The relationship between health outcomes and the various elements of Qigong, Tai Chi, or any other MM form cannot be adequately determined without clearer measures of the dimensions that compose these practices. Clues as to the mechanisms of action of Qigong and Tai Chi come from some of the outcomes-related research delineated earlier. Changes in mental health and blood pressure seem to parallel outcomes found following aerobic exercise; functional balance outcomes are similar to what might be found for mild strength training. Immune function has been variously related to conventional exercise, showing both immune-building as well as proinflammatory processes, depending on type and intensity of exercise (with moderate, regular exercise generally found to promote immune function),[48] whereas immune-related responses to Qigong and Tai chi are only beginning to be explored. To identify the common elements of MM that may be related to these important health endpoints, either as a function of conventional exercise or as unique contributors, it becomes necessary to control for and/or report the factors that may be influencing outcomes. This will serve to standardize the method in which the MM activity is described and defined and will improve our ability to compare between studies and to identify potential underlying mechanisms.

At least 3 guidelines are needed to begin the process of standardizing research in MM. First, if a protocol is developed with an exercise form considered to be MM, the required components that qualify the form as MM should be assessed as a means of defining the particular form of MM. Second, those factors that might resemble and compete with the effects of conventional exercise should be assessed to discriminate the effects

of such mediators of health benefits. Finally, additional factors drawn from the principles and theories of the particular practice should be assessed to maintain research fidelity with what is seen as unique and integral to the practice.[49] For example, we propose examining "Qi" in Qigong and Tai Chi or "Prana" in yoga to see if these are related to the achievement of health outcomes. These 3 domains of assessment to standardize research are each addressed in turn: manipulation checks of factors that define the practice, competing explanatory variables, and theoretical foundations unique to the practice.

Assessing Required Components Defining the Form of MM

Factors expected to be characteristic of MM should be assessed to standardize reporting of elements that might be relevant and to provide an indication of the degree to which the exercises are being performed with the full quality and range of requirements fitting our definition of MM. These types of measures are comparable to the testing of purity and strength of botanicals or drugs in clinical trials and should be added to MM studies. For example, in a recent study, emphasis on relaxing the mind, motion speed, and conscious control of movement were proposed as 3 important dimensions of exercise to define and compare cardiovascular versus mind–body (Tai Chi Chuan) exercise effects on memory,[50] but there was no direct assessment of these dimensions. By assessing the presence and levels of elements theorized to contribute to particular health benefits, eventually a volume of studies that collects data on similar dimensions would allow for meta-analytic review.

The measures we recommend to establish quality assurance, implementation fidelity, and assessment of elements potentially related to outcomes of MM practice include (a) type and degree of meditative focus, (b) type of movement (relaxed and flowing, static postures, spontaneous/shaking, isometric, stretching, or squeezing), (c) degree of focus on breathing and type of breathing, and (d) the achievement of deep relaxation.

Type and Degree of Meditative Focus. The first dimension considered critical to the definition of MM is the focused mind achieved through meditative practice. Generally meditation studies take this state for granted as part of the practice without direct assessment. Participants may vary greatly in their subjective interpretation of their achievement of a focused mind and meditative state. Documentation of the recommended techniques for focusing or clearing the mind[7] should be included in studies of MM. One possible way to further assess mind-focusing practices is to develop self-report instruments that require participants to rate their perceived success in whatever mental focus practice is recommended (eg, developing scales that measure degree and amount of time one was able to keep the mind from wandering).

Type of Movement. Speed of execution and emphasis on flowing motion varies by style and specific exercise across many forms of MM, but generally, the motions are flowing and gentle. In a recent test of a sham Qigong protocol compared with true Qigong, Larkey and colleagues[51] developed a 9-item scale for observers to rate movement for such characteristics as flowing movement and relaxed appearance (alpha coefficient = .87). This instrument may form a basis for the further development of observational tools to assess the type of movement used in a MM practice. Furthermore, these components may also be assessed using self-report measures that have not yet been developed. Other aspects of movement that are peculiar to some forms of MM should be regularly described and assessed, such as the shaking motions recommended as warm-ups in Qigong and yoga or static postures that stretch and squeeze parts of the body.

Degree of Focus on Breathing and Type of Breathing. Breathing practices vary greatly among the myriad forms taught in yoga, Tai Chi, and Qigong as well as less well-known forms of MM practice. For example, some teachers of Tai Chi or the simplified practice of Tai Chi Chih do not present a unified guideline for breathing but mostly suggest that the breathing follow the movement naturally. Some Qigong practices include a number of sitting or walking exercises accompanied by breathing in specific patterns, such as the Xi Xi Hu breathing (or inhale, inhale, exhale) used in Guolin Qigong. In some yoga practice, coordinating the breath with specific dynamic movements is recommended, whereas in teachings associated with static poses, the breath is often taught as a focusing tool without a specific prescription for depth or pattern. In contrast, pranayama is a yoga practice singularly focused on breathing techniques.

What is most common, however, is a general instruction for deep abdominal breathing along with poses and movements, providing lung volumes beyond the muscular oxygen requirements of the exercise. This component of MM practices has not been well studied in terms of the differences between effects of deep breathing alone and deep breathing that is induced during intense aerobic exercise. To explore possible effects, it would be important to at least describe the breathing practice prescribed for any given intervention study. Eventually, observational, self-report, or pulmonary measures of depth, speed, volume, and other parameters of breathing and self-report measures of the mental focus on breathing could be included as research progresses in this area.

The Achievement of Deep Relaxation. Closely related to the focus of awareness on the body and breath is the attainment of deeply relaxed states, the fourth characteristic we have used to define MM. One tool for objectively measuring what is believed to be correlated with the deep, relaxed state of meditation is brain wave activity. Although it is expensive and often not feasible to

add such an assessment to studies, measurement studies could be conducted to find the self-report assessments most closely correlated to electroencephalographic readings of slower brain wave activity, generally, *alpha* or even *theta* waves as indicative of meditative states being reached.[52] In addition, the neurotransmitter profile associated with relaxation, also expensive, could be used as a clinical metric to assess status of the autonomic function. Measures of perceived relaxed states would complement the objective measures of brain function and neurotransmitter profiles in relaxation. Together, a deep state of reverie and a profound state of physical relaxation would be important to assess to qualify a practice as MM.

MM Resembling and Competing With Conventional Exercise

Because MM includes some level of movement similar to conventional exercise, those aspects of the practice should be assessed for possible mediating effects on outcomes. These include the level of aerobic activity or exertion and strength building activities. Numerous studies have assessed energy expenditure during Tai Chi, concluding that Tai Chi is a mild to moderate form of exercise with a wide range of intensity, ranging from 1.5 to 4.6 METs (with the Yang style, at the higher end of the METs scale, being the most frequently studied).[13,53,54] Various forms of Qigong have not been as systematically evaluated, but a form of Qigong, called "Tai-Chi-Qui-Gong," has shown results similar to Tai Chi relative to the range of METs.[55] Qigong has also been demonstrated to make physiological demands similar to those of self-paced walking.[12,30]

Such studies that measure aspects of cardiorespiratory involvement should not claim that these findings represent conclusive comparisons of all forms of Qigong/Tai Chi. Just as there may be differences in the speed with which one rides a bike, or dance forms that lend themselves to more or less vigorous exertion, so also, the forms of Qigong and Tai Chi and other MM practices may vary with individual teachers and styles and in individual practitioners. Level of exertion, then, is an important factor to assess across all MM studies, including those incorporating Qigong or Tai Chi.

Target heart rate and estimated maximum heart rate are often used as a simple way to assure that exertion levels are within a moderate and effective range by aerobic exercise standards, and these might be appropriate recommended measures for MM studies. However, with the multiple comorbidities often occurring with the elderly, medications that affect heart rate may interfere with this measurement. The Borg Rating of Perceived Exertion is the preferred method to assess intensity among those individuals who take medications that affect heart rate or pulse, and given the growing popularity of these alternate forms among the elderly, this instrument would be useful across studies of MM. Thus, we recommend using Borg's Rating of Perceived Exertion (RPE)[56] as a simple tool that could be easily incorporated across studies with various populations to determine relative intensity of activity.

Other conventional exercise factors to control for and/or report in studies of MM include exposure or dose of exercise (frequency and duration) and strength training effects. As more studies reveal the potential of MM to improve more specific exercise-related factors, for example, leg strength related to balance, it may become important to specifically measure such factors. That is, measures of muscular strength (eg, 1 or 10 repetition maximum, peak torque) may need to be taken before and following MM interventions to directly assess this mechanism that might underlie improvements in balance and functional fitness, if they occur. At least, an evaluation of the proportion of movements that involve moderate or deep knee bending should be documented, along with other suspected mechanisms, to begin developing theories of how MM might affect balance.

Additional Factors Unique and Integral to Form of MM

Finally, those aspects of MM that may be unique to particular traditional practices, but are untested regarding their potential relationship to health outcomes, should be assessed. Among the proposed dimensions for defining a practice as MM, we do not include a requirement for a focus on "energy." Because some traditions treat this element as critical (such as Qi in TCM or prana in yoga) and others do not even mention it, we suggest that it would be important to find ways to identify if this is important to achieving health outcomes. Although the tools to assess the purported correlates of Qi or prana are still being developed, at least 2 such instruments have enjoyed a degree of validation and may prove useful for evaluating levels of Qi cultivation as well as balanced state of the Qi channels.

Measuring Qi, or changes in Qi, is challenging mostly because many Western scientists are unsure what Qi is or if it even exists. Even when shown to be consistently related to physiological conditions, these critics doubt that imbalances in Qi as measured by such instruments are really valid measures. However, measurement tools are currently being developed to assess Qi, and we introduce examples of these tools here with information regarding their current status.

The first method uses instruments that assess electrical conductivity along each of the 12 TCM energy channels (or pathways upon which the acupuncture points are aligned) by introducing current between 2 electrodes touching the skin at points along each of the channels. In studies incorporating such measures, a level of conductance is obtained for each organ energy channel to evaluate baseline levels and then responses are gauged relative to interventions expected to increase or balance overall Qi. The patterns of electrodermal response follow the expected theorized patterns of Qi response according to TCM, indicating that, at least,

these patterns of electrodermal measures correlate with expected patterns of Qi. For example, an increase in conductivity along acupuncture channels has been shown in response to Qigong practice.[57] Moreover, convergence of measures of electrical conductivity has been found in response to Qigong practice as predicted as an indicator of "balance" (that is, conductivity measures that are similar among each organ energy channel are considered to be reflective of approximately equal Qi flow among the channels).[58] In keeping with predictions of TCM, significantly lower electrical impedance levels have been found for many acupuncture points, compared with the surrounding nonacupuncture skin areas,[59] and conductance is higher between points on the theorized acupuncture energy channels than between points not on the channels.[60] Thus, whether evaluating overall balance, or fit to the expected changes in the Qi channels in response to certain MM practices, instruments that measure electrical impedance/conductance may prove to be useful.

Another method of evaluating theorized correlates of Qi, the Gas Discharge Visualization (GDV) device, purportedly measures the strength of each Qi channel in TCM theory and is able to compare each to normal ranges based on normalized scores of hundreds of test individuals.[61] The GDV is used to photograph biophoton emission from the fingertips. The fingers are placed on a dielectric plate while a very low microampere signal (1 ms pulse duration) is passed into the fingertip. The movement of electrons across the dielectric plate and the subsequent collision and ionization of the gas molecules surrounding the fingertip result in the production of biophotons around the finger. The camera is used to take a picture of this emission, which often appears as branch-like patterns. The emissions are "mapped," according to the principles of TCM, from acupuncture points in the fingertips to their associated body systems and organs, and the length and density of emissions are purported to represent patterns in the body's field of "energy."

The GDV parameter most representative of "balance" is an index score reflecting the composite scores of each organ energy channel's standardized distance from zero. A favorable balance index has been shown to improve among hypertensive patients after practicing a single session of Qigong.[51] Similar results were found for both healthy and chronically ill participants practicing Qigong, showing improvements in total density of emissions and balance across fingers.[62] Other GDV parameters have been shown to distinguish positive mood (as measured by Profile of Mood States) in meditators as compared with a control group[63] and in response[64] to the practice of Dahn Hak, a Qigong form of movement and meditation practiced in Korea.

The GDV potentially serves to track overall changes in response to practices expected to cultivate or balance Qi or potentially assess whether a given form of MM stimulates such change. The assessment of Qi (or prana, or other names for this energy in need of better definition and means for measurement) may eventually provide bridging evidence for the relationship between health outcomes and the meridian theory of TCM.

Conclusion

We suggest that MM should be designated as a new category of exercise based on the similar practice elements, similar underlying principles, mechanisms of action, and common health outcomes of these forms of physical activity. We present the examples of Qigong and Tai Chi as 2 practices with identical theoretical roots as a starting point for identifying defining elements and similar health outcomes. Furthermore, we suggest that as research proliferates on such forms of exercise that are clearly different from conventional exercise, particularly those based on different principles than our familiar models of aerobic exercise and strength training, methods for evaluating these forms are needed.

Researchers incorporating any form of MM should consider assessing those aspects that parallel conventional exercise parameters (ie, RPE, duration, frequency). Aspects of MM that do not parallel conventional modes and measures of exercise should also be assessed to assure quality of interventions and to begin to establish knowledge about which, if any, of these factors matter for achieving outcomes (eg, flowing and relaxed movements, patterns of breathing, meditation practices, attainment of deep states of relaxation, and balance of Qi). Given that some of the instruments proposed here to assess the unique components of MM are under development, it is clearly too soon to establish consistent measures across studies. We propose that researchers addressing these forms of exercise begin to work toward developing, validating, and standardizing measures for these factors.

In the meantime, much can be learned from a more critical evaluation of the aerobic and strength training implications of MM according to conventional models of how exercise works. In the end, we need to address the possibility that there are some similar and some different mechanisms underlying the health benefits of MM, but clearly research designs need to incorporate a broader set of measures to identify these mechanisms.

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