

Impact of Religion-Based Mindful Walking Meditation on Cardiometabolic and Mental Health

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TANAKA, H. and D. SUKSOM. Impact of religion-based mindful walking meditation on cardiometabolic and mental health. *Exerc. Sport Sci. Rev.*, Vol. 52, No. 4, pp. 126–131, 2024. *Walking meditation or mindful walking is a widely performed form of Buddhist practice that focuses on mind-body interactions. We have found that this particular form of exercise was highly effective in eliciting improvements in cardiometabolic and functional fitness measures in a number of clinical populations. In some key measures, the magnitudes of benefits were greater than the traditional walking program.* **Key Words:** meditation, religion, Buddhism, walking, mind-body interaction, faith-based

KEY POINTS

- There has been growing attention and interest in spiritual or religious matters in the management of overall health and quality of life.
- Buddhist walking meditation was highly effective in eliciting improvements in a variety of cardiometabolic and functional fitness measures in various clinical patient populations.
- The health-enhancing benefits of Buddhist walking meditation were more effective in many key measures than the traditional walking programs.
- This particular form of mind-body exercise can be performed in a variety of settings (on the field, fitness gym, or at home) using various ways to modify exercise intensity.

INTRODUCTION

At first glance, religion and exercise may appear to be awkward pairing. However, there are many similarities between the two. Both religion and exercise are often organized as a group or community in social settings but can be practiced alone or in private. Both practices require a consistent commitment, dedication, and discipline to adhere and be compliant. Individuals often seek personal growth and transformation through exercise and religion. Taking care of one's body has been considered by many religions to be one of the most impor-

tant sacred duties. Such purpose is also one of the primary motivating factors for many exercisers. There have been growing attention and increasing interest in spiritual or religious matters in the management of overall health and quality of life (1). In particular, there have been many attempts to incorporate religion or faith in physical activity and exercise programs in research studies (2–5). We have been conducting such clinical trials at African American churches in the United States (6,7) and in Buddhist populations in Thailand (2,3,8). In the present review, the relations between exercise and religion are discussed first. The primary focus is placed on exercise intervention studies targeted at addressing the efficacy of Buddhist walking meditation. The overall hypothesis addressed in these studies is that Buddhist walking meditation would elicit improvements in cardiometabolic and mental health in a variety of clinical populations (Fig. 1).

Physical Activity in Religion

Although the specific modes of physical activity or exercise may not be mentioned in the original teaching of major religions in the world, the broader messages of preserving health and wellness through regular exercise and physical activity can be seen in the principles of most religious practices. For example, the Hadith (sayings and actions) of Prophet Mohammad stated that “a stronger (*i.e.*, physical strength, actions, and strong eemaan or faith) believer is better than a weak believer.” He actively participated and engaged in running races, wrestling, and walking with his companions. In Christianity, the concept of the body was taken as a temple of the Holy Spirit, and caring for physical health and well-being is in harmony with the spiritual teaching. Maimonides, the Jewish medieval authority in the 12th century, stated that “*the best kind of physical exercise is one which tires the body while straightening the soul and making it happy, as for instance hunting or playing with the ball. Such psychological effects may even cure diseases.*” Moreover, the voice of this great medieval scholar emphasizes the body-mind

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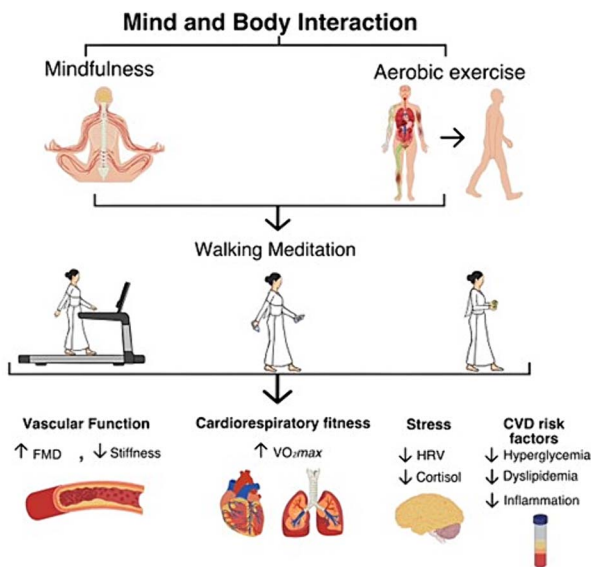


Figure 1. The graphical representation of Buddhist walking meditation on major outcome variables. CVD, cardiovascular disease; HRV, heart rate variability, VO_{2max} , maximal oxygen consumption.

interaction. In the realm of the “Exercise is Medicine” advocated by the American College of Sports Medicine, Moimonides’ statement that “Whoever is always seated and does no physical exercise — even if he eats only healthy food and follows medical advice — will always be sickly and weak” would echo most exercise professionals. In Buddhism, Buddha performed a considerable amount of walking himself and recognized the benefits of regular physical activity through Cankama or walking meditation. Buddha communicated with his disciples “Monks, there are five benefits of walking meditation. What five? One is fit for long journeys, one is fit for striving in meditation, and one has little disease. What’s eaten, drunk, chewed, and tasted goes through proper digestion. The composure attained by walking meditation is long-lasting. These are the five benefits of walking meditation.” In our exercise intervention studies described below (2,3,8), this form of walking meditation intervention was gradually and progressively modified to fit with the current exercise guidelines.

Religion in Physical Activity

Given the emphasis of preserving health through physical activity in most major religions, it is not surprising that religious involvement is a good predictor of lifestyle choices and health outcomes in a variety of populations. Cross-sectional and longitudinal studies have found much greater participation in both moderate and vigorous physical activity among those who attend religious services frequently (9). A measure of the degree of religious devotion, beliefs, practices, and adherence to religious principles is referred to as religiosity. Frequently, religiosity is measured on multiple-item scales that include such items as intrinsic religiousness (e.g., my religious beliefs are what really lie behind whole approach to life) and service attendance in frequency. The relation between religiosity and physical activity behavior has also been observed in many different religions including Buddhism (10). For instance, in a 12-week cardiac rehabilitation program, both overall religiosity at baseline and the change in religiosity during the 12-week program are associated positively with energy expenditure and exercise time completed by patients (11). Yoga has become a very popular mode

of mind-body interaction exercise practiced by people of all ages (12–14). Most people, including students and teachers, initially adopt yoga practice primarily for exercise benefit and stress relief but gradually shift their primary motivating reason to spirituality as they continue the practice in the long term (15).

Mindfulness

The use of complementary and alternative medicines has become prevalent and widespread in recent decades as a method of managing stress and improving overall health (16). Among them, mind-body medicine can be prescribed and practiced in the form of meditation, relaxation, hypnosis, guided imagery, faith, prayer, and laughter (16,17). It can also be combined into a form of exercise, including yoga, tai chi, and qigong (13,16). In particular, meditation is a broader term that encompasses a variety of practices for training the mind. Mindfulness is a specific type of meditation or a mental practice that involves cultivating purposeful awareness and attention to the present moment (18). Mindfulness has its roots in Buddhist meditation practices but has been secularized to fitness industries in more recent years. The use of mind-body medicine has been gaining momentum since the dual efficacy simultaneously influences mental and physical functions (16). In this context, the prevalence of people living with more than one clinical condition known as multiple long-term conditions or multimorbidity is rapidly increasing in recent years (19).

Buddhist Walking Meditation: Research Evidence

Buddhist walking meditation is a religious practice that incorporates mindfulness into physical movement and focuses on mind-body interactions. It incorporates the basic principle of traditional meditation performed in the sitting position, including breathing, awareness, concentration, and relaxation, with the rhythmic exercise of walking. While walking at a slow and deliberate pace, the practitioners maintain a straight posture and pay special attention to the physical sensations of walking. Typical walking meditation that is practiced by Buddhist monks is characterized by very slow movements and does not appear to tax physiological systems to induce adaptations typically observed with traditional exercise programs (20,21). Additionally, a walking meditation program that does not emphasize the religious aspect does not appear to produce beneficial impact as much as a traditional walking program (20,21) as no benefits were seen in patients with heart failure (20) and in older adults with history of falls (21). Accordingly, we created the customized walking meditation exercise to incorporate the spiritual movements of arm swing while praying “Budd-Dha” during walking (2,3,8). In this practice, each step is taken after each breath, being aware of the alternating intervals of contraction and relaxation involved with walking exercises. People perform walking exercises while rhythmically swinging both arms while voicing “Budd-” with arm swing up and “-Dha” with arm swing down and are instructed to practice mindfulness while walking (2,3,8).

Mind-body exercises have been shown to confer both physical and mental health benefits concurrently (22). Given this, individuals suffering from mental health problems would be a suitable target for Buddhist walking meditation. Among the most prevalent mental health issues, depression is a significant risk factor for the development and progression of coronary heart disease. Additionally, most depressed patients have a

sedentary lifestyle due to low motivation and energy (23). Accordingly, depressed patients are a clinical population that could gain the most benefits from mind-body exercises. As an initial step to evaluate the impact of Buddhist walking meditation, we recruited and studied female elderly (60–90 yr of age) adults with mild-to-moderate depression (3). A traditional walking program was implemented as a comparison group to gauge the relative efficacy of the walking meditation compared with one of the most familiar physical exercise modes. We also reasoned that this comparison could provide insight into separating the effects of walking meditations into the physical components (*i.e.*, walking) and mental components (*i.e.*, meditation).

Although exercise intensity was mild to moderate (20–39% of heart rate reserve in weeks 1–6 and 40–50% in weeks 7–12) at best, both traditional walking and Buddhist walking meditation programs produced significant reductions in plasma concentrations in total cholesterol, triglyceride, and high-sensitivity C-reactive protein and significant improvements in brachial artery flow-mediated dilation (FMD; an index of endothelium-dependent vasodilation). However, a reduction in depression score and decreases in plasma concentrations in cortisol (stress hormone) and interleukin-6 (inflammatory marker) were only observed in the Buddhist walking meditation group (3) (Fig. 2). The results of this first study are consistent with the notion that Buddhist walking meditation is effective in reducing depression, improving functional fitness and vascular reactivity, and confers greater overall improvements than the traditional walking program.

Type 2 diabetes is also a disease that is characterized by both physical and mental dysfunctions (19). Diseases involving large blood vessels, including coronary artery disease and peripheral

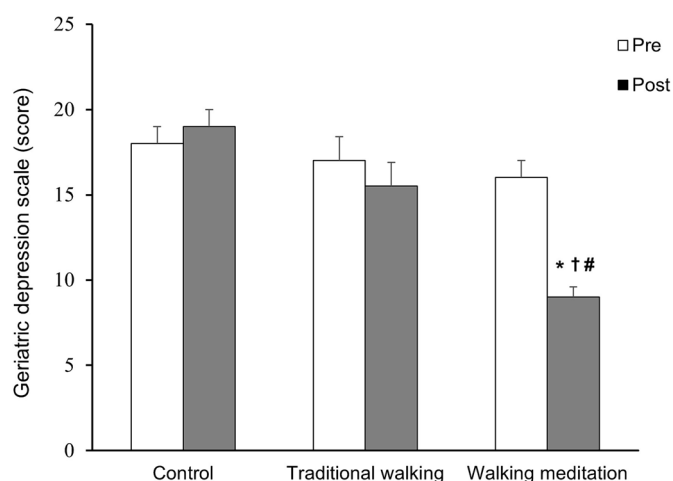


Figure 2. The geriatric depression scale scores before (Pre) and after (Post) 12 wk of exercise interventions in elderly patients with mild-to-moderate depressive symptoms (3). Three groups are the nonexercising control group, the traditional walking exercise group, and the Buddhist walking meditation group. The scale consists of 30-item questions with “yes” or “no” answers and has a score range of 0–30, with the scores 0–12 indicating no depression, 13–18 mild depression, 19–24 moderate depression, and 25 or more severe depression (24). In this study, the subjects with mild-to-moderate depression (*i.e.*, scores 13–24) were recruited. Data are means \pm SEM (Reprinted from Prakhinkit S, Suppaitiporn S, Tanaka H, Suksom D. Effects of Buddhist walking meditation on functional fitness, depression, and endothelium-dependent vasodilation in the elderly with depressive symptoms. *J Alternat Complement Med.* 2014;20 (5):411–6. Copyright © 2014 Mary Ann Liebert, Inc. Used with permission.)

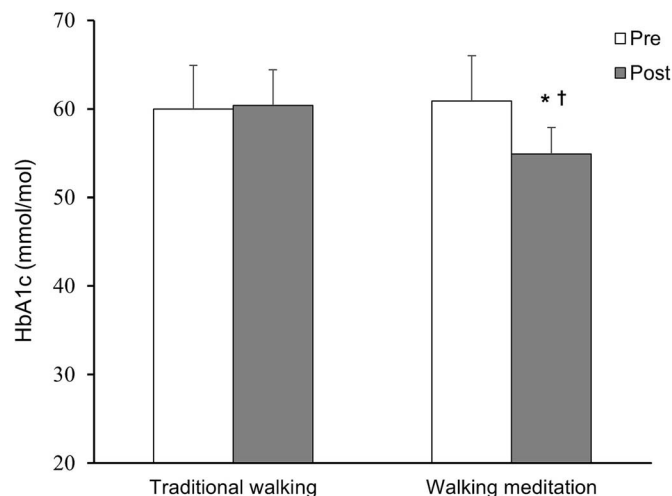


Figure 3. Changes in glycated hemoglobin (HbA1c) before and after the traditional walking and Buddhist walking meditation interventions in patients with type 2 diabetes mellitus (2). A significant reduction was observed only in the walking meditation group. Data are means \pm SEM [Adapted from Gainey A, Himathongkam T, Tanaka H, Suksom D. Effects of Buddhist walking meditation on glycemic control and vascular function in patients with type 2 diabetes. *Complement Ther Med.* 2016;26:92–7. Copyright © 2016 Elsevier Ltd. Used with permission.]

artery disease, are highly prevalent in patients with diabetes (25). The prevalence of depression, anxiety, and stress is markedly higher among patients with type 2 diabetes (19). As a next step to evaluate the efficacy of Buddhist walking meditation, we addressed the impact on glycemic control, vascular reactivity, and arterial stiffness in middle-aged and older patients with type 2 diabetes (2). Similar to the previous study in depressed elderly patients (3), we used the traditional walking program as a comparison group to assess its relative efficacy. In this study, the exercise intensity was increased to moderate intensity (60–70% of maximal heart rate) to be more consistent with the current exercise prescription guidelines (26).

Both traditional walking and Buddhist walking meditation reduced fasting blood glucose concentration and increased maximal oxygen consumption in patients with type 2 diabetes. However, the Buddhist walking meditation intervention was the only intervention that reduced glycated hemoglobin (HbA1c), blood pressure, arterial stiffness as assessed by pulse wave velocity (27), and plasma cortisol concentration as these significant changes were not observed in the traditional walking program (2) (Fig. 3). Thus, Buddhist walking meditation may be a more favorable therapeutic option for improving glycemic control and vascular function in patients with type 2 diabetes.

Cancer treatment-associated cardiotoxicity is a growing concern among breast cancer patients treated with chemotherapy including anthracycline (28). Breast cancer is a highly stressful event particularly during the treatment, often resulting in a high incidence of depression (28). We implemented walking meditation in breast cancer patients receiving anthracycline chemotherapy (8). In the nonexercising control group, anthracycline chemotherapy reduced neutrophil count and increased high-sensitivity C-reactive concentration. Additionally, it rapidly and persistently reduced endothelium-dependent vasodilation as assessed by brachial artery FMD. These effects have been attributed to anthracycline causing apoptosis of vascular

endothelial cells (29) resulting in reduced bioavailability of nitric oxide (30).

Walking meditation exercises performed at a moderate intensity for 30–45 min, 3 times per week at home during the chemotherapy improved FMD significantly to a level that was not different from the baseline and normalized the endothelial dysfunction (8) (Fig. 4). Interestingly, significant changes in FMD (a “functional” indicator of endothelium-dependent vasodilation) were not associated with the corresponding changes in total nitric oxide concentration (a “biochemical” indicator of endothelial function) or shear rate (presumed stimuli for FMD) as we did not observe significant changes in these variables. Moreover, significant arterial stiffening caused by anthracycline chemotherapy that was observed in the nonexercising control group was absent in the walking meditation group. Additionally, walking meditation exercises produced significant improvements in peak oxygen consumption. Consistent with the Fick equation, the increase in peak oxygen consumption was associated with the corresponding increases in peak cardiac output and peak stroke volume. Collectively, these results indicate that walking meditation exercise that incorporates physical exercise of walking and mental meditations mitigated cardiotoxicities associated with anthracycline chemotherapy in patients with breast cancer. More importantly, these effects were accomplished in the home-based exercise settings.

Physiological Mechanisms Underlying the Benefits of Walking Meditation

The inclusion of the traditional walking program in our previous studies was not intended to perform a direct head-to-head comparison with the walking meditation but to gauge the efficacy

of the walking meditation relative to the familiar physical exercise mode. However, this comparison could provide insight into separating the effects of walking meditations into the physical components (*i.e.*, walking) and mental components (*i.e.*, meditation). One clear distinction between walking meditation and the traditional walking program is the meditation. The physiological effects of meditations are not well studied. However, their benefits have been attributed to a variety of factors, including stress reduction, enhanced immune function, and improved cognitive function. In the aforementioned study in patients with diabetes, the walking meditation program alone was effective in reducing arterial stiffness (2). One possible reason may be due to walking incorporated with meditation can extenuate sympathetic vasoconstrictor tone and promote vascular relaxation (31). Most patients with diabetes have more psychological stress resulting in the development of endothelial dysfunction (32). The sympathetic nervous system activity, which is induced by stress, is well-known to promote the renin-angiotensin-aldosterone system as a result of vasoconstriction hormones associated with increased tension in the vascular wall. Cortisol is the major adaptive signaling regulator of stress. In this context, only the walking meditation group showed a significant decrease in plasma cortisol concentration. It is possible that walking meditation may have decreased cortisol secretion leading to reduced inflammatory process. In our previous research study in depressed elderly patients, changes in blood concentrations of cortisol, C-reactive protein, and interleukin-6 were only observed in the walking meditation group (3). Consistent with other mindfulness studies, yoga-based lifestyle intervention reduces the markers of stress and inflammation (33), and mirthful laughter induces beneficial effects on arterial stiffness (17).

Walking meditation is a mind-body interaction exercise that involves both physiological and psychological interventions. The holistic approach used in walking meditation addresses the interconnectedness of the mind and body, promoting overall health benefits. Could some of the benefits associated with walking meditation be due to the placebo effects? As in any other exercise training study, it is not possible to conduct double-blind studies to eliminate the placebo effects. However, the expectations and beliefs of participants could influence their experience as well as their performance similar to religious practitioners, although this should be investigated in future studies.

Buddhist Walking Meditation: Exercise Programmatic Considerations

One element of walking meditation that is difficult to execute is the progression of exercise intensity required to fulfill the overload principle of exercise training. In the first study involving depressed elderly patients, exercise was conducted on the oval-shaped indoor track in the supervised setting (3). In the traditional walking program, the participants are able to increase walking speed easily as they get fitter. This is not possible in walking meditation because the faster cadence (step rate) would interfere with the proper timing/duration of Buddhist meditations or chants. In an attempt to match both exercise programs for exercise intensity, we added arm swinging by holding water bottles in each hand for the walking meditation group to increase upper limb workloads (3). One may argue that

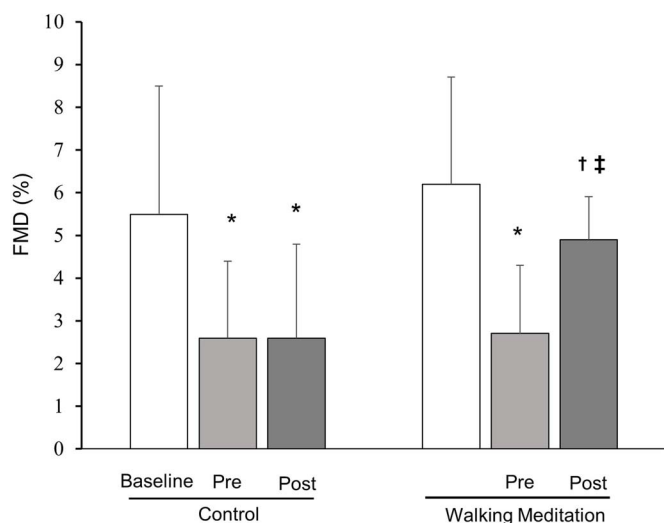


Figure 4. Changes in endothelium-dependent vasodilation as assessed by brachial artery flow-mediated dilation (FMD) in the nonexercising control and walking meditation groups (8). The measurements were conducted 3 times: before anthracycline chemotherapy (Baseline), before the exercise intervention and 2 wk after the initiation of anthracycline chemotherapy (Pre), and after the exercise intervention and 2 wk after the completion of anthracycline chemotherapy (Post). Data are means \pm SEM (Reprinted from Siripanya S, Parinyanitkul N, Tanaka H, Suksom D. Home-based Buddhist walking meditation mitigates cardiotoxicity of anthracycline chemotherapy in breast cancer patients: A randomized controlled trial. *J Integr Complement Med.* 2023;29 (9):562–73. Copyright © 2023 Mary Ann Liebert, Inc. Used with permission.)

greater effects of the walking meditation on cardiovascular function could be attributed to the additional upper body resistance load applied to aerobic exercise in the walking meditation group.

In the subsequent study in patients with type 2 diabetes, exercise training was conducted on the treadmill because it is possible to adjust exercise intensity without increasing cadence (step rate) on the treadmill by simply raising grades/slopes (2). Although the target population was different, the overall findings are consistent in that the walking meditation program produced similar or even greater benefits than the traditional walking program.

In order for any exercise program to gain greater acceptance and exposure, exercise should be able to be conducted at home as the adherence and compliance are much greater at home than the supervised settings (34,35). In the research study involving breast cancer patients receiving anthracycline chemotherapy, we constructed a home-based walking meditation program (8). To make the program suitable for performing at home, the participants listened to a sound audio rhythm at 25 beats/min, voiced “Budd-” and “-Dha” and concentrated on squeezing rubber balls in both hands rhythmically and simultaneously. A format of home-based walking meditation has been adopted by other investigators to evaluate and demonstrate the beneficial impact on disease severity in Parkinson disease (36). Taken together, these results suggest that Buddhist walking meditation can be performed in a variety of settings (on the field, fitness gym, or at home) using various ways to modify exercise intensity.

Potential Application to People With Different Religions

As described, Buddhist walking meditation would produce improvements in a number of cardiometabolic and cognitive measures that are similar to or greater than traditional exercise programs in clinical populations (2,3,8). Buddhist walking meditation is performed at mild-to-moderate exercise intensity and can be performed in a variety of settings. This form of exercise is amenable to a modern lifestyle and can be practiced easily by the elderly and patients who have a number of limitations. The walking meditation described in the present paper was based on Buddhist practices and was prescribed to Buddhist believers as the majority of Thai practice Buddhism. It is currently unknown if this would also be effective when applied to non-Buddhist practitioners or people with different religions. However, this novel form of walking meditation can be modified and applied to believers of different religions. For instance, instead of “Budd-” and “-Dha” used in our previous studies, Christians could choose to chant “Je-” and “-Sus” and Muslims “All-” and “-Lah.”

In recent years, an increasing number of fitness programs have been incorporating faith, especially Christian faith into their programs. A typical workout is accompanied by hymns and other Christian music and Bible verses painted on the walls (37). Similarly, faith-based organizations can play an important role in reaching marginalized populations (e.g., racial and ethnic minorities and immigrants) that carry a large burden of chronic degenerative diseases. One of these populations, African Americans, consider spirituality to be an acceptable and motivational concept to be included in a physical activity

program regardless of the religious beliefs (5). Predominantly Black churches have more favorable physical activity implementation outcomes than predominantly White churches (4). We are currently conducting a church-based and resilience-based clinical trial focused on lifestyle behavior changes in African American adults with type 2 diabetes at Black churches (6,7), and the results of this clinical trial are forthcoming. A similar faith-based physical activity intervention has been evaluated in Latinas belonging to Catholic churches (38). Thus faith-based exercise programs may be promising strategies for reducing health disparities affecting marginalized populations.

Arguably the biggest issue facing exercise professionals is a lack of adherence and compliance to the exercise program (35). In patients with Parkinson disease, 3 month of Buddhist walking meditation achieved a 100% adherence rate (36). This adherence rate is impressive given the previous observation that the exercise dropout rates are very high and exercise adherence rates are low in patients with Parkinson disease (39). Considering that religious practice is often a lifelong commitment for most believers, it would be a worthwhile attempt to combine them with exercise training that is characterized by high dropout rates and low adherence rates. Indeed, in the Christian faith-based exercise program named the Body & Soul, most participants chose to remain in the program due to the faith-based elements of the exercise class (37).

There are a number of survey data showing that the frequency of attendance to religious practices is decreasing over recent years. An important research question is whether secular individuals may be at a fundamental disadvantage as they will unlikely receive anticipated benefits from religion-based exercise interventions. Potentially, atheists could engage in these practices without invoking a belief in a higher power, focusing instead on the psychological and physiological effects of meditation and mindfulness. However, this question remains to be answered in future research studies.

CONCLUSION

In summary, Buddhist walking meditation was highly effective in eliciting improvements in cardiometabolic and functional fitness measures and mental health in a number of clinical populations. In some key measures, the magnitudes of benefits were greater than the traditional walking program. Because of the added benefits of incorporating a religion (e.g., enhanced adherence), more research is needed to evaluate the impact of religion-based exercise interventions in human health.

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