

SWACSM Abstract

The Effects of Meditative and Mindful Walking on Mental and Cardiovascular Health

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ABSTRACT

BACKGROUND: Global health is threatened by the double burden of mental and cardiovascular diseases. One-fifth of adults have a diagnosable mental disorder in one year, and one-third of adults have such a disorder in their lifetimes¹. More adults live with a disability and die prematurely because of cardiovascular diseases (CVDs) than any other non-communicable disease^{2,3}. Treating diseases with exercise as medicine is a major goal of the American College of Sports Medicine (ACSM). The ACSM is in the vanguard of identifying non-pharmacological treatments for mental and cardiovascular diseases. A related novel treatment is mindful exercise. Mindful exercise is “physical exercise executed with a profound inwardly directed contemplative focus^{4,5}.” Popular modalities are tai chi, qigong, and yoga. These modalities improve mental and cardiovascular health in some healthy and clinical populations, sometimes more than traditional (i.e., non-mindful) exercise modalities⁶⁻¹⁴. However, there is no consensus on the efficacy of two other mindful exercise modalities, meditative and mindful walking. This is because there is not a published synthesis of the relevant literature. Traditional walking is walking without cultivating a profound inwardly directed contemplative focus, thus letting the mind wander. Meditative and mindful walking are walking while applying an accepting, non-judgmental, and present-moment awareness to the bodily sensations, emotions, and thoughts and the walking environment. A person who is walking meditatively or mindfully watches and acknowledges the contents of the mind as they come and go. This practice is called noting, which is not an inherent feature of mind-wandering. Meditative and mindful walking are similar practices, but meditative walking typically involves repeating a word or sound, called a mantra, in the mind or aloud. Determining the

effects of meditative and mindful walking on mental and cardiovascular health is important. First, walking is an accessible exercise modality because it is a natural human behavior that most people can do without intense effort or specialized training. Second, traditional walking without applying mindfulness reduces symptoms of depression and anxiety^{15,16}, increases aerobic capacity¹⁷, and decreases CVD risk factors¹⁷ and all-cause mortality¹⁸. A natural question is whether meditative and mindful walking improve mental and cardiovascular health more than traditional walking. **PURPOSE:** We conducted the present study to synthesize the primary literature on meditative and mindful walking to determine their efficacy relative to traditional walking. Our purpose was also to assess the quality of the relevant published research studies. **METHODS:** To achieve our purpose, we conducted a replicable and methodologically rigorous systematic review, as per the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. The full protocol is registered in the international prospective register of systematic reviews called PROSPERO (Registration #: CRD42021241180) and will soon be in press (we submitted minor revisions). The full protocol explains our populations, interventions, comparators, outcomes, and study designs (PICOS criteria); eligibility criteria; search strategy; eligibility screening; data extraction; and risk of bias assessment. Briefly, a five-member review team searched five online databases for primary research articles published in peer-reviewed journals. The five databases were Academic Search Premier, APA PsycInfo, Google Scholar, PubMed, and SPORTDiscus. The risk of bias in parallel and crossover randomized controlled trials (RCTs) was assessed via the corresponding versions of the Cochrane Risk of Bias 2 (RoB 2) tool¹⁹. The risk of bias in non-randomized controlled studies was assessed via the Cochrane Risk of Bias in Non-randomized Studies - of Interventions (ROBINS-I) tool^{20,21}. Our protocol did not include a meta-analysis because the studies included in the systematic review were not homogeneous. The included studies were clinically heterogeneous, meaning they reported diverse populations, interventions, comparators, outcomes, and settings. This heterogeneity prevented a valid meta-analysis, as per published guidance on conducting systematic reviews and meta-analyses²². **RESULTS:** To our knowledge, our systematic review is the first synthesis of the meditative and mindful walking literature. Using our search combination in the five databases returned 2,800 hits. Of these hits, 158 sources were included by title. These sources were narrowed to the 14 peer-reviewed journal articles included in the systematic review (Figure 1). Searching the references of the included articles did not lead us to any more relevant articles. The included articles were published

between 2013 and 2021 and described studies conducted in Brazil, Germany, the Netherlands, South Korea, Taiwan, Thailand, and the United States. Each study recruited adults who were at least 18 years of age from apparently healthy and clinical populations. Six studies used an intervention called meditative walking/walking meditation. The other eight studies used an intervention called mindful walking/walking while practicing mindfulness/breathing-based walking. Eight studies had participants walk only alone, one study had participants walk only in groups, and one study had participants do both. Another study had participants walk alone or in groups, depending on the study phase. Whether participants walked alone or in groups was unclear in three studies, but participants likely walked alone in two of the studies and in groups in the other. Meditative and mindful walking took place indoors in six studies, outdoors in five studies, and both indoors and outdoors in two studies. The setting was not specified in one study. Nine studies reported only mental health outcomes, and one study reported only cardiovascular health outcomes. The other four studies reported both mental and cardiovascular health outcomes. Four studies provided a short-term intervention (called short-term studies; provided up to two sessions of meditative or mindful within one week; three of the four studies were RCTs). The other 10 studies provided long-term interventions (called long-term studies; provided up to 40 sessions over eight weeks; eight of the 10 studies were RCTs). In 13 of the 14 studies (93%), the interventions significantly improved at least one mental or cardiovascular health outcome. Four short-term studies reported significant improvements in affect, anxiety, attentional focus, distress, enjoyment of physical activity, happiness, perceived activation, self-esteem, overall state mindfulness, and state mindfulness of the body. Eight short-term studies reported significant improvements in affect, anxiety, depression, distress, emotional awareness, perceived stress, post-traumatic thoughts, quality of life, ruminative thoughts, self-worth, overall state mindfulness, and stress. One study showed that one bout of meditative walking in South Korean young-adult females significantly decreased anxiety pre- to post-walk by 25-32% ($p < 0.05$)²⁰. A separate study showed that 12 weeks of mindful walking in adults with chronic obstructive pulmonary disease (COPD) significantly decreased anxiety and depression by 57% and 62%, respectively ($p < 0.05$)²³. No short-term study reported effects on cardiovascular health, but four long-term studies reported significant improvements in aerobic capacity, C-reactive protein, total and low-density lipoprotein cholesterol, cortisol, fasting blood glucose, glycated hemoglobin, flow-mediated dilation of the brachial artery, interleukin-6, nitric oxide, percent body fat, pulse-wave velocity, self-reported physical

activity, six-minute walk distance, systolic and diastolic blood pressure (SBP and DBP), and triglycerides. One study showed that 12 weeks of meditative walking in adults with type 2 diabetes significantly decreased SBP and DBP by 12% and 8%, respectively ($p < 0.05$)²⁴. A separate study showed that 12 weeks of mindful walking in adults with COPD significantly increased the six-minute walk distance (meters) in as little as eight weeks ($\beta = 32.7$ [95% CI: 12.7, 52.8], $p = 0.002$)²¹. Across all the short- and long-term studies, eight of the nine parallel RCTs and both crossover RCTs had some concerns or a high risk of bias. The two non-randomized studies included in the systematic review had a serious risk of bias. **DISCUSSION:** The primary purpose of the present systematic review was to synthesize the primary literature on meditative and mindful walking and determine their efficacy relative to traditional walking. Meditative and mindful walking consistently and significantly improve mental and cardiovascular health outcomes. Often, the improvements are better than those caused by non-mindful walking or not walking. This finding is consistent with a meta-analysis that shows yoga reduces anxiety more than non-mindful exercises (small significant effect)⁹. The findings of the present systematic review must be interpreted cautiously for three reasons. First, few of the included studies required meditative or mindful walking as an independent intervention: Many of the studies also required group discussions, physical exercises, or seated meditation that could have confounded the relationship between walking and the outcomes. Second, nearly every study that shows significant improvements in at least one outcome has a high or serious risk of bias and notable methodological limitations. The risk of bias was most commonly high in the randomization process, measurement of the outcomes, and selection of the reported results. Third, the meaningfulness of the improvements to the participants is unclear. This is because population-specific minimal clinically important differences (MCIDs) have not been established for most of the outcomes measured in the studies of meditative and mindful walking. Population-specific MCIDs for these outcomes should be established so researchers can determine if improvements by meditative or mindful walking are clinically meaningful for participants' societal function, morbidity, and mortality. The present systematic review should also be interpreted cautiously because of its limitations. A meta-analysis was not conducted because the included studies were clinically heterogeneous. Relevant studies not written in English or indexed in the five selected databases may have been missed. Relevant unpublished data were also possibly missed. Finally, studies of labyrinth walking were not included. Labyrinth walking is a unique form of meditative walking that should be considered separately. The first

author reviewed the relevant literature recently in a separate narrative review²³. **CONCLUSION:** The present systematic review is a comprehensive and rigorous synthesis of the primary literature on meditative and mindful walking. Collectively, published studies of meditative and mindful walking show that both mindful exercise modalities significantly improve mental and cardiovascular health outcomes better than non-mindful walking and non-walking control interventions. The accuracy of this conclusion should be determined by new RCTs that are methodologically rigorous, minimize bias, and require meditative or mindful walking as an independent intervention without added physical or mental exercises.

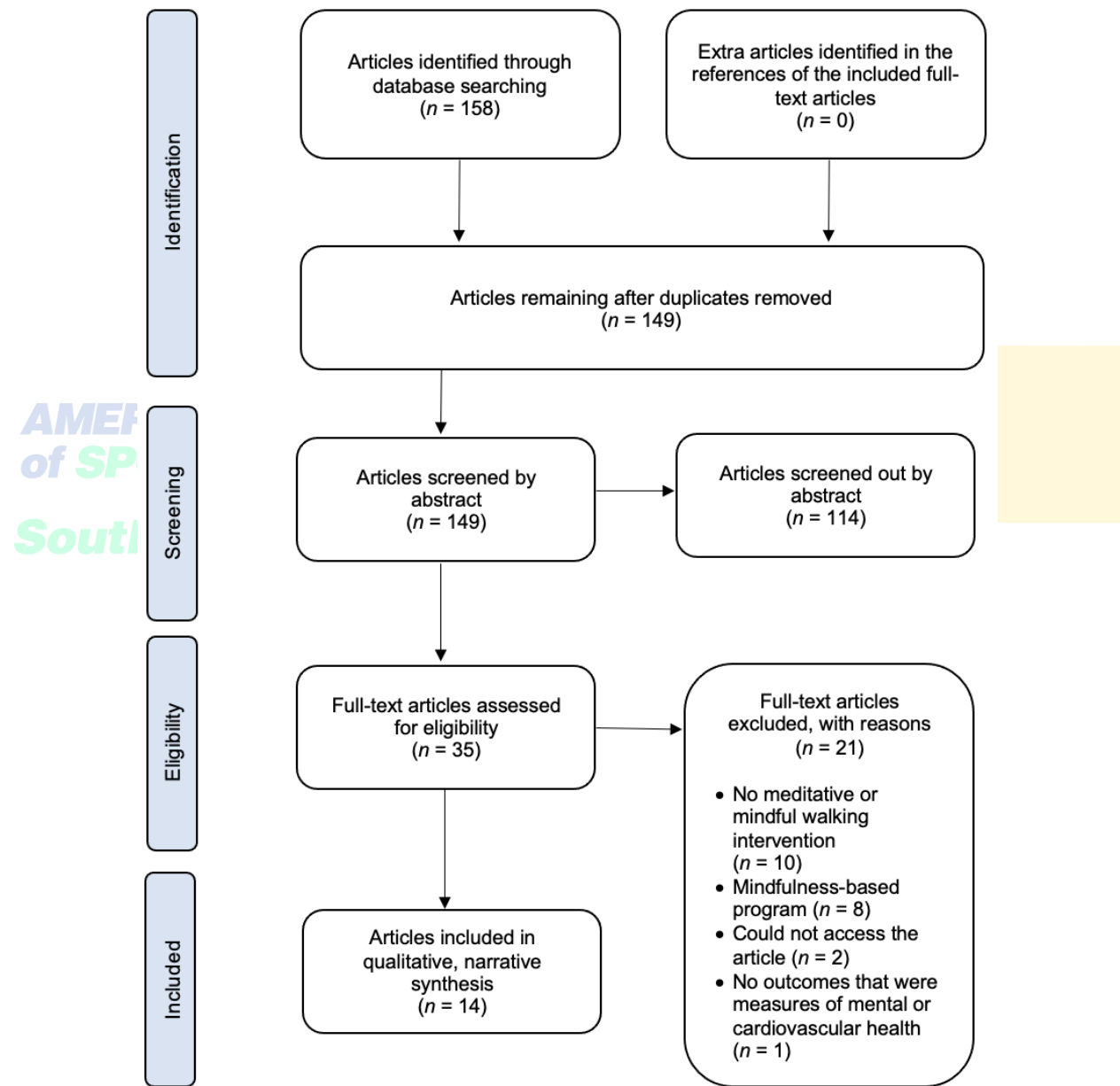


Figure 1. Flow diagram that illustrates how articles were screened for inclusion.

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