

REVIEW ARTICLE

Pilates Method for Women's Health: Systematic Review of Randomized Controlled Trials



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Abstract

Objective: To critically analyze the benefits of Pilates on health outcomes in women.

Data Sources: CINAHL, MEDLINE, PubMed, Science Direct, SPORTDiscus, Physiotherapy Evidence Database (PEDro), Cochrane Central Register of Controlled Trials, and Web of Science.

Study Selection: Databases were searched using the terms *Pilates* and *Pilates Method*. Published randomized controlled trials (RCTs) were included if they comprised female participants with a health condition and a health outcome was measured, Pilates needed to be administered, and the article was published in English in a peer-reviewed journal from 1980 to July 2014.

Data Extraction: Two authors independently applied the inclusion criteria to potential studies. Methodological quality was assessed using the PEDro scale. A best-evidence grading system was used to determine the strength of the evidence.

Data Synthesis: Thirteen studies met the inclusion criteria. PEDro scale values ranged from 3 to 7 (mean, 4.5; median, 4.0), indicating a relatively low quality overall. In this sample, Pilates for breast cancer was most often trialed (n=2). The most frequent health outcomes investigated were pain (n=4), quality of life (n=4), and lower extremity endurance (n=2), with mixed results. Emerging evidence was found for reducing pain and improving quality of life and lower extremity endurance.

Conclusions: There is a paucity of evidence on Pilates for improving women's health during pregnancy or for conditions including breast cancer, obesity, or low back pain. Further high-quality RCTs are warranted to determine the effectiveness of Pilates for improving women's health outcomes.

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Pilates is a form of exercise based on movement principles including whole-body movement, breathing, concentration, centering, precision, and rhythm.¹⁻⁵ Pilates is a mindful approach to exercise, stimulating awareness of body structure, muscle recruitment, and body alignment during movement.^{1,2} Joseph Pilates^{2,3} claimed that this set of corrective exercises promoted voluntary control over the body and effective posture, stabilizing core muscles during dynamic movement, and promoted physical and mental vitality.^{4,6} Pilates may be practiced on the mat using one's body weight or using Pilates equipment,^{7,8} which has resistant springs to stabilize and strengthen deep muscle groups.² Internationally, Pilates has appealed to women as a mainstream

form of exercise⁹ for improving physical health (muscular strength, endurance, core stability, breathing), psychological health (mood, motivation, body awareness), and motor functions (muscle control, dynamic postural control, balance and coordination).^{1,4}

Recent systematic reviews have investigated the effectiveness of Pilates on health outcomes related to body composition,¹⁰ breast cancer rehabilitation,¹¹ physical fitness and fall prevention in seniors,¹²⁻¹⁴ and pelvic floor muscle function.¹⁵ Aladro-Gonzalvo et al¹⁰ reported on 7 studies and concluded that there was poor empirical evidence supporting Pilates having a positive effect on body composition. Alternatively, another review¹¹ of 3 studies that applied Pilates for breast cancer rehabilitation found trends in enhanced quality of life (QOL), mood, body image, and aerobic capacity; however, sample sizes were small. Granacher

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et al¹² reviewed 20 studies and found improvement in trunk muscle strength, functional performance, and balance in healthy seniors. A similar review¹³ of 17 experimental studies found improvement in static and dynamic balance in elderly people. Currently, there is limited evidence to support Pilates' effectiveness to reduce stress urinary incontinence.¹⁵

Most studies examining Pilates have investigated individuals with chronic low back pain.¹⁶⁻²³ La Touche¹⁷ and Lim¹⁹ and colleagues found evidence that Pilates reduced pain. A review²² of 5 systematic reviews concluded that there is inconclusive evidence to support Pilates in reducing pain in people with chronic low back pain, and cautioned against the use of findings because of concerns about the heterogeneity of pooled studies and scientific rigor.

While several studies have investigated the effectiveness of Pilates for health conditions (eg, breast cancer,⁹ postmenopausal osteoporosis)²⁴ and in promoting health (eg, strengthening pelvic floor muscles,²⁵ preventing falls),^{26,27} a synthesis and evaluation of the evidence has not been conducted in the form of a systematic review. Although there is emerging evidence that Pilates may reduce chronic low back pain,^{18-21,23} these investigations were from samples of men and women. The specific effects on women's health are difficult to ascertain in these mixed samples, and the benefits are not clear. Therefore, the aim of this systematic review was to evaluate the evidence for the effectiveness of Pilates for improving health outcomes in women.

Methods

Data sources and searches

A joint search was conducted by 2 authors (M.M., H.W.). Studies were selected for review up to November 2014 by searching the following search engines: CINAHL, MEDLINE, PubMed, Science Direct, SPORTDiscus, Physiotherapy Evidence Database (PEDro), Cochrane Central Register of Controlled Trials, and Web of Science. The search strategy used the terms *Pilates* and *Pilates Method*.

Study selection

Retrieved studies were reviewed for inclusion if they met the following criteria: (1) published in a peer-reviewed journal in the period 1980 to July 2014; (2) written in the English language; and (3) the methodology included a randomized controlled trial (RCT) design, Pilates administered as the intervention, female participants with a health condition, and an evaluation that included measurement of a health outcome. The researchers adopted the World Health Organization (WHO)²⁸ definition for a health condition, which includes disease (acute or chronic), disorder, injury or trauma, and other circumstances such as pregnancy, aging, stress, congenital anomaly, or genetic predisposition. The researchers used the WHO *International Statistical Classification of*

*Diseases and Related Health Problems*²⁹ to identify health problems or diseases, as well as health conditions for individuals in a general health situation or human life cycle including pregnancy, childbirth, and aging. For high-resourced countries, the WHO³⁰ defines an older person as ≥ 60 years of age, and the researchers used this criteria to classify an aging population.

The WHO *International Classification of Functioning, Disability and Health*²⁸ was used to define health outcomes. It is a 2-level classification system for (1) body structures and functions, and (2) activities and participation. It was used as a framework to categorize health outcome metrics with health conditions. For example, pelvic floor muscle strength (eg, health outcome metric) assessment may be used to investigate stress incontinence (eg, the health condition). The following domains were used: structure related to movement; neuromuscular and movement functions; sensory functions and pain; mental functions; digestive, metabolic, and endocrine functions; functions of the cardiovascular system; and activities and participation.

For the first phase of the article selection process, 2 reviewers (M.M., H.W.) assessed all retrieved abstracts for possible inclusion. Discrepancies were resolved through discussion between the 2 reviewers. A third reviewer (D.K.) was consulted if consensus could not be reached.

Full articles were then retrieved for the second phase of the selection process to assess eligibility for inclusion in the review. Two reviewers (M.M., H.W.) individually reviewed the articles to confirm eligibility criteria. Articles that were identified as eligible for inclusion were reexamined for accuracy and consistency by the third reviewer (D.K.), who also arbitrated on discrepancies.

Rating the quality of articles

For each eligible RCT, methodological quality was assessed by 2 reviewers (M.M., H.W.) using the PEDro scale.³¹ The PEDro scale, based on the Delphi list,³² is commonly used to assess the quality of clinical trials in physiotherapy.³¹ It consists of 10 items: random allocation, concealed allocation, similarity at baseline, subject blinding, therapist blinding, assessor blinding, adequate follow-up ($>85\%$ follow-up for at least 1 key outcome), intention-to-treat analysis, between-group comparisons for at least 1 key outcome, point estimates and variability measures.³² These 10 items are each allocated a score of 1 point if the criteria satisfy the standardized score. The PEDro score ranges from 1 to 10, with higher PEDro scores corresponding to a higher quality in methodology.³³ A PEDro score ≤ 4 has been evaluated to be of lower quality.³¹ The interrater reliability has been evaluated previously³¹ and appears to be a valid measure of methodological quality for clinical physical therapy trials.^{33,34} Disagreements in PEDro scoring between the 2 reviewers (M.M., H.W.) were resolved by the third reviewer (D.K.). All PEDro scores were entered into an individual spreadsheet (table 1).

Data synthesis

For articles that met the eligibility criteria, the following data were extracted and reported in an evidence table (table 2): author/year, health condition, age, sample size, intervention, health outcome metrics, and results. Only statistically significant improvements in health outcomes, evidenced by $P < .05$, were included. Table entries were checked for accuracy and consistency by a second

List of abbreviations:

BES	best-evidence synthesis
PEDro	Physiotherapy Evidence Database
QOL	quality of life
RCT	randomized controlled trial
WHO	World Health Organization

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