



Pilates for women with breast cancer: A systematic review and meta-analysis

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ARTICLE INFO

Keywords:

Breast cancer
Meta-analysis
Review
Women
Pain
Quality of life

ABSTRACT

Objectives: To identify and evaluate the characteristics and methodological quality of the studies that have proposed Pilates as a rehabilitation strategy for women with breast cancer and to determine its benefits on health outcomes in this population.

Methods: A systematic review and meta-analysis were conducted. Medline/PubMed, Pedro, SPORTDiscuss, Scopus and Web of Science were systematically searched up to January 2017. The methodological quality was evaluated by means of the Jadad Scale and the Quality Assessment Tool for Before–After Studies with No Control Group. Risk of bias was assessed by means of the Cochrane Collaboration's tool.

Results: Five randomized controlled trials and two un-controlled studies were selected. Four of the randomized controlled trials were pooled in the meta-analysis for effects of Pilates on shoulder range of motion, quality of life, pain, and self-reported upper extremity function. According to the findings reported in the studies analysed in the review, Pilates had a positive and significant effect on the aforementioned variables, as well as on functional status, mood, fitness and upper extremity circumference. The meta-analysis carried out showed that the effects that Pilates had on shoulder range of motion and quality of life, was not significantly greater than those resulting from other exercise programs.

Conclusions: Pilates relieves the impact of breast cancer-related symptoms. These effects are not significantly greater than those derived from the performance of other therapies, with the exception of pain and self-reported upper extremity function.

Systematic review registration number: PROSPERO CRD42018076852.

1. Introduction

Breast cancer (BC), the most prevalent cancer in women, is now considered as a form of chronic illness with longer survivorship years.¹ However, improved survival rate of BC also comes with numerous side effects from cancer and from its treatment. Indeed, it has been estimated that more than 15 million of women live with disabilities caused by this malignancy.² Scientific evidence has suggested that high-risk lifestyle behaviors exacerbate the health of BC survivors and increase their mortality rate; therefore, the promotion of a healthy lifestyle among this population is an important rehabilitation strategy.³ In this regard, the performance of physical exercise has been proposed as an important form of adjuvant treatment in BC care.^{4,5} Indeed, the results of multiple meta-analysis and of systematic reviews have demonstrated that in women with BC, exercise attenuates the treatment-related morbidity and optimizes the quality of survival through improvements in their physical and psychosocial state.⁶

Nevertheless, exercise adherence is still a challenge for this population⁷ and further research into alternative exercise modes is required.⁸ With regard to the foregoing, it has been observed that catering to exercise preferences, as well as having positive beliefs regarding the effects of the exercise therapy proposed are essential to encourage cancer survivors to engage in physical training programs.^{9,10} In this context, the promotion of Pilates, a mind-body exercise approach that can be considered a complementary and alternative medicine therapy,¹¹ emerges as an interesting strategy for people with BC for several reasons. Firstly, because it is considered an attractive mainstream form of exercise for women.¹² Secondly, because its performance combines light-moderate intensity physical exercise with mindfulness, thus having the potential to improve both physical and psychological sequelae of BC treatment.¹³ Finally, because in comparison with conventional therapeutic exercise training, Pilates offers the potential to reduce the biomechanical dysfunction that can occur as a result of cancer therapy, through improvements in body and kinesthetic

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<https://doi.org/10.1016/j.ctim.2018.09.011>

Received 26 May 2018; Received in revised form 23 August 2018; Accepted 14 September 2018

Available online 15 September 2018

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awareness.¹⁴ However, before Pilates could be established as a standard BC care treatment, the existing scientific evidence supporting its safety and efficacy should be critically reviewed, as has recently been the case for other alternative exercise therapies.^{15,16}

To the author's knowledge, only one review article regarding the effects of Pilates on women with BC has been published so far.¹⁷ This work included only randomized controlled trials (RCT) on the bases that they are considered as the gold standard for evaluation. However, the inclusion of non-RCTs when performing systematic reviews of therapeutic interventions should be considered for a number of reasons. First of all, when the number of RCT's found regarding the effects of non-pharmacological therapies is small, it is difficult to draw firm conclusions. Therefore, the inclusion of non-RCTs might be useful to get a better overview of what is known so far and to inform about future research.¹⁸ Secondly, when reviewing the feasibility of novel therapies, non-RCTs can provide useful data to evaluate safety and to inform about the existence of adverse effects or response rates.¹⁹ Finally, non-RCTs can include important and detailed information regarding the characteristics of the intervention that has been carried out (i.e., number and duration of sessions, Pilates modality performed, types of exercise proposed or rejected, adverse effects). Thus, they can be useful for health professionals, who are in need of basic guidelines that allow them to prescribe exercise efficiently, which is the final purpose of this persistent work. Under these circumstances, this study aims to systematically review the characteristics and methodological quality of the studies that have proposed Pilates as a rehabilitation strategy for women with BC, as well as to determine its benefits on health outcomes in this population.

2. Methods

This systematic review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.²⁰ The selected search strategy and methods of analysis were registered at the PROSPERO database (ref: CRD42018076852).

2.1. Search strategy

Five electronic databases (Medline/PubMed, Pedro, SPORTDiscuss, Scopus and Web of Science) were searched from the inception of each database to January 2017. The following search terms, Boolean operators, and combinations were used: "Cancer" OR "Neoplasm" OR "Lymphoedema" AND "Pilates" OR "Core stability" or "Motor control".

2.2. Eligibility criteria

Studies that provided information regarding the effects of Pilates interventions on women with early to later stage (Stage O–III) BC or who had undergone BC surgery with or without adjuvant cancer therapy, were considered eligible. Studies were excluded if a) the study included cancers other than BC, unless separate data were available for the BC subgroup; b) the study used qualitative methodology; c) the full-text of the study was not available in English and d) the study was a review, a case report, a letter to the editor or an abstract from a congress.

2.3. Study selection

Two researchers screened the titles and abstracts of the identified studies for eligibility and removed all the duplicated references. Additionally, all of the full-texts of the studies that met the inclusion criteria were manually screened for any additional possibly relevant investigations. After independently reviewing the selected studies for inclusion, these were compared by both researchers to reach an agreement. Once the agreement had been reached, a full-text copy of every potentially relevant study was obtained. If it was unclear whether

the study met the selection criteria, advice was sought from a third researcher and a consensus of opinion made.

2.4. Data extraction

Information on participants' characteristics, Pilates program, adverse events, drop-outs and outcomes were extracted from the original reports by one researcher and checked by a second researcher. Missing data were obtained from the study authors, whenever possible.

2.5. Quality appraisal

The methodological quality of the selected studies was assessed by one researcher. In case of doubt, advice was sought from a second researcher. The selected studies were heterogeneous in terms of study design. Therefore, two different quality appraisal tools were used. The methodological quality of the randomized controlled trials (RCT) was evaluated and summarized using the Jadad Scale²¹ which is based on three criteria: description of randomization, blinding, and dropouts or withdrawals (the score ranges from 0 to 5). Risk of bias for these studies was assessed by means of the Cochrane Collaboration's tool.²² For rating the methodological quality of the uncontrolled studies, the Quality Assessment Tool for Before–After Studies with No Control Group²³ was used. This tool assesses the risk of bias with 12 questions. These comprise the risk for different types of bias, such as selection bias, reporting bias or observer bias. Quality assessment criteria were further assessed using the Oxford Centre for Evidence-Based Medicine (CEBM) Levels of Evidence²⁴ for all the included studies. The CEBM, grades the methodological rigor of investigations from level 1 or grade A (systematic review of RCTs, 1a; individual RCT with narrow confidence interval, 1b) to level 5 or grade D (expert opinion).

2.6. Data analyses

A meta-analysis restricted to RCTs was intended to be carried out, provided that the same outcomes had been assessed in at least two studies in a comparable way, and pre and post data were presented for the control and Pilates groups^{25,26}

For this purpose, the standardized mean differences (SMD) and their 95% CI were calculated to assess the change in the Pilates group compared to the control group, for each selected variable. The SMD is the mean divided by the standard deviation (SD), and its calculations incorporated Pilates and control groups post-intervention sample sizes, pre- and post-intervention means, and standard deviations for each of the selected outcome measures.²² To obtain the pooled effects, a fixed-effect model and a random-effects model according to DerSimonian & Laird²⁷ were performed, selecting therefore, the most adequate model for each analysis according to the heterogeneity level (random-effects model if $I^2 > 30\%$). Forest plots displaying SMD and 95% CIs were used to compare the effects between intervention and control groups. SMDs were significant when their 95% CIs excluded zero, while pooled SMD values of less than ± 0.2 , or ranging from ± 0.2 to ± 0.8 , or greater than ± 0.8 indicated the existence of small, medium or large effects respectively. All statistical analyses were performed using Stata 13.

3. Results

3.1. Designs and samples

Out of the 485 references initially obtained, a total of seven studies (five randomized controlled trials^{28–32} and two un-controlled studies^{33,34}) were finally selected (Fig. 1). Four RCTs were pooled in the meta-analysis given that they included comparable pre and post information for both the control and Pilates groups regarding the effects of Pilates on shoulder range of motion, quality of life (QOL), pain, and upper extremity function (UEF).^{28,30–32}

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