

**CADTH RAPID RESPONSE REPORT:  
SUMMARY WITH CRITICAL APPRAISAL**

# Aerobic Exercise for Chronic Non-Cancer Back Pain: A Review of Clinical Effectiveness

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## Abbreviations

AHRQ	Agency for Healthcare Research and Quality
NSCLBP	non-specific chronic low back pain
PRISMA	preferred reporting items for systematic reviews and meta-analyses
RCT	randomized controlled trial

## Context and Policy Issues

Chronic pain is generally defined as pain lasting for 12 weeks or longer, or persisting beyond the time needed for normal tissue healing.<sup>1,2</sup> Chronic pain conditions include chronic back pain, chronic neck pain, chronic tension headache, osteoarthritis, and fibromyalgia.<sup>1</sup> Risk factors for developing chronic pain include female gender, older age, psychosocial factors, comorbidities, and genetics.<sup>1,2</sup>

Chronic pain is a global problem.<sup>2,3</sup> It was estimated that in Canada, 25% of adults have a chronic pain condition.<sup>3</sup> In another publication,<sup>4</sup> it was mentioned that during the period 2007 to 2008, the prevalence of chronic pain in adults over the age of 18 years was 18.9% in Canada, and ranged between 16% and 22% for the different provinces. Variability in prevalence estimates may result from differences in the population assessed, and the methods of data collection.<sup>4</sup> Chronic pain is associated with reduced quality of life, absenteeism from work, and increased healthcare costs.<sup>2,3</sup> It was estimated that in Canada, the annual direct cost to the healthcare system was over six billion dollars and the annual indirect cost due to sick days and job loss was over 37 billion dollars.<sup>3</sup> Chronic pain is a problem for the individual suffering and also a societal burden.<sup>5</sup>

Treatment options for managing chronic pain include surgery, pharmacological interventions, and non-pharmacological interventions.<sup>5</sup> Pharmacological interventions include medications such as nonsteroidal anti-inflammatory drugs, muscle relaxants, antiseizure medications, antidepressants and corticosteroids.<sup>1,6</sup> However these medications offer limited pain relief and are often associated with side effects.<sup>1</sup> There is growing interest in non-pharmacological interventions. Non-pharmacological interventions include options such as acupuncture, massage, Pilates, Yoga, and aerobic exercises.<sup>6</sup> Aerobic exercise predominantly depends on the aerobic energy-generating process and includes various types of exercises such as walking, running, and cycling.<sup>5</sup>

A Summary of Abstracts report published by CADTH in 2017 included 46 systematic reviews (12 with meta-analysis) that evaluated the clinical benefits and harms of exercise for adults with back pain.<sup>7</sup> Various exercise programs (such as aerobic, strengthening, range of motion, motor control, balance, endurance, Pilates, yoga, McKenzie method) were investigated. Comparator interventions were variable and not always clearly defined. Overall, the abstracts indicated that exercise may be effective for symptom reduction in patients with back pain.

The purpose of this report is to review the evidence regarding the clinical effectiveness of aerobic exercise for chronic non-cancer back pain compared with pharmacological interventions.

## Research Question

What is the clinical effectiveness of aerobic exercise for chronic non-cancer back pain?

## Key Findings

No evidence was identified regarding the clinical effectiveness of aerobic exercise alone compared with pharmacological interventions, for the management of chronic non-cancer back pain.

## Methods

### Literature Search Methods

A limited literature search was conducted by an information specialist on key resources including MEDLINE, the Cochrane Library, the University of York Centre for Reviews and Dissemination (CRD) databases, the websites of Canadian and major international health technology agencies, as well as a focused Internet search. The search strategy was comprised of both controlled vocabulary, such as the National Library of Medicine's MeSH (Medical Subject Headings), and keywords. The main search concepts were aerobic exercise and back pain. No filters were applied to limit the retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2014 and September 18, 2019.

### Selection Criteria and Methods

One reviewer screened citations and selected studies. In the first level of screening, titles and abstracts were reviewed and potentially relevant articles were retrieved and assessed for inclusion. The final selection of full-text articles was based on the inclusion criteria presented in Table 1.

**Table 1: Selection Criteria**

<b>Population</b>	Individuals with chronic back pain from any cause (other than cancer), who are not pregnant
<b>Intervention</b>	Aerobic exercise (i.e., walking, running, swimming, cardiovascular exercise) alone, excluding yoga, Pilates, tai chi, physiotherapy, or sling training
<b>Comparator</b>	Pharmacological interventions (e.g., analgesics; including usual care if usual care is continuation of pharmacological interventions alone)
<b>Outcomes</b>	Clinical effectiveness (e.g., pain reduction, functional performance, quality of life, disability level, global impression of recovery, adverse events)
<b>Study Designs</b>	Health technology assessments, systematic reviews/meta-analyses, and randomized controlled trials

### Exclusion Criteria

Articles were excluded if they did not meet the selection criteria outlined in Table 1, they were duplicate publications, or were published prior to 2014. Studies in which aerobic exercise was embedded within another intervention were excluded.

## Summary of Evidence

### Quantity of Research Available

A total of 364 citations were identified in the literature search. Following screening of titles and abstracts, 344 citations were excluded and 20 potentially relevant reports from the electronic search were retrieved for full-text review. No potentially relevant publications were retrieved from the grey literature search for full text review. Of these 20 potentially relevant articles, all publications were excluded for various reasons. Appendix 1 presents the PRISMA<sup>8</sup> flowchart of the study selection.

### Summary of Study Characteristics

No health technology assessments, systematic reviews, meta-analyses or randomized controlled trials that met the inclusion criteria were identified, hence a summary could not be presented.

### Summary of Critical Appraisal

No relevant studies were identified hence a summary could not be presented.

### Summary of Findings

No relevant studies were identified hence a summary could not be presented.

### Limitations

No health technology assessments, systematic reviews, meta-analyses or randomized controlled trials that met the inclusion criteria were identified, hence no findings could be presented.

## Conclusions and Implications for Decision or Policy Making

No health technology assessments, systematic reviews, meta-analyses or randomized controlled trials were identified regarding the clinical effectiveness of aerobic exercise alone compared with pharmacological interventions, for the management of chronic non-cancer back pain.

In some studies that were evaluated for potential inclusion in this review, the intervention was aerobic exercise in addition to other types of exercises, or aerobic exercise was compared with other non-pharmacological modalities, or the comparison was between before and after aerobic exercise. Hence these reports did not satisfy the inclusion criteria for this current report and were therefore not critically appraised or included in the summary of findings. However, as these reports may provide some useful insights, they are discussed here. A systematic review by Wewege et al.<sup>9</sup> comparing progressive aerobic exercise with progressive resistance exercise concluded that both were equally effective in reducing chronic low back pain, however they mentioned that high quality RCTs were needed to better assess treatment efficacy. A second systematic review by Gordon et al.<sup>10</sup> comparing aerobic exercise or aerobic exercise in addition to other treatments with other exercise programs, mentioned that exercise intervention programs including either aerobic fitness, muscular strength, or flexibility appear to be beneficial for non-specific chronic low back pain (NSCLBP). However, the authors mentioned that the most appropriate intervention for an individual with NSCLBP remains unclear as NSCLBP is multifactorial in nature and all cases are not identical. A third systematic review by Lawford et al.<sup>11</sup> reported

that low quality evidence suggests that walking is as effective as other non-pharmacological interventions in improving disability, function, and quality of life in adults with chronic low back pain. A fourth systematic review by Meng et al.<sup>5</sup> comparing findings before and after aerobic exercise, concluded that aerobic exercise may reduce pain and improve physical and psychologic functioning in individuals with chronic low back pain, however they mentioned that because of limitations such as small sample size and results with wide standard deviations, additional well conducted studies were needed for definitive conclusions.

Additionally, one systematic review prepared by Skelly et al.<sup>1</sup> for the Agency of Healthcare Research and Quality (AHRQ), and one overview of Cochrane reviews by Geneen et al.<sup>2</sup> had broad objectives and investigated a variety of treatment options for a variety of chronic pain conditions. The findings of these two reports,<sup>1,2</sup> though not specifically on comparison of aerobic exercise with pharmacological treatment for chronic back pain, may offer some useful insights. The AHRQ systematic review<sup>1</sup> investigated noninvasive, nonpharmacological treatments for several types of chronic pain. It reported that, based on low quality evidence, for chronic low back pain there was suggestion of improvement in function in the short term with exercise compared with usual care, attention control or placebo; however, the between group differences in function were not statistically significant for intermediate-term function or long-term function. It also reported that, for chronic back pain, there was suggestion of improvement in pain with exercise compared with usual care, attention control or placebo; strength of evidence being moderate for short-term effect, and low for both intermediate-term and long-term effects. Of note, the authors did not identify any study, that compared exercise with pharmacological therapy for chronic low back pain. The overview<sup>2</sup> of Cochrane reviews on physical activity and exercise for chronic pain mentioned that regardless of etiology, the impact of chronic pain is generally similar across many conditions. The focus of this overview was on the comparison of exercise with no-exercise interventions (such as sham exercise, education, wait-list control, or no treatment). The authors concluded that there was suggestion of some reductions in pain severity and improvements in physical function, with exercise and physical activity, though these effects were mostly small to moderate and were inconsistent across studies. They mentioned that further research with larger sample size, including participants with a wide spectrum of pain severity, and longer intervention and follow-up periods, is needed.

Future well conducted research, investigating the effect of aerobic exercise in comparison with pharmacological treatment for chronic back pain, would provide useful information on the comparative effects of these treatment modalities and reduce uncertainty.

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## Appendix 1: Selection of Included Studies

