

## REVIEW

## Systematic Review and Meta-analysis of Clinical Trials Examining the Benefit of Exercise Programmes Using Nordic Walking in Patients With Peripheral Artery Disease

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### WHAT THIS PAPER ADDS

Exercise programmes are recommended for the initial management of peripheral artery disease (PAD). This meta-analysis compared the effect of Nordic walking exercise or control programmes on the walking ability of PAD patients. The study demonstrated no advantage of Nordic walking programmes over control programmes, although findings from one small trial of home based Nordic walking suggested an advantage over standard home based walking. The findings suggest that current guidelines to use standard walking in PAD patients should not be changed. The lack of robust trials means that this conclusion is based on limited evidence. A large trial examining a home based Nordic walking programme may be warranted.

**Objectives:** An exercise programme is part of the initial management of peripheral artery disease (PAD). Nordic walking uses poles and a core-focused walking technique to reduce the load on the legs, which may have advantages as an exercise programme for PAD. This systematic review examined the benefit of a Nordic walking programme for treating PAD compared with other programmes.

**Methods:** A systematic approach was used to identify clinical trials comparing Nordic walking and control programmes in PAD patients. For inclusion, studies had to report maximum walking distance (MWD) measured with a treadmill test or corridor walking test both at entry and follow up. Study quality was appraised using the Cochrane collaboration tool for assessing risk of bias. An inverse variance weighted meta-analysis was performed to compare improvements in MWD.

**Results:** Five independent trials involving 294 patients were identified. In three trials, supervised Nordic walking programmes were compared with supervised standard walking. One trial compared a home based Nordic walking programme with a similar standard walking programme. One trial compared a partly supervised Nordic walking programme with best medical management. Meta-analysis of all data suggested that MWD improvements were similar for patients treated by Nordic and standard walking programmes (standardised mean difference, SMD = 1.31, 95% CI -1.28 to 3.91;  $p = .322$ ). Findings for completely supervised programmes were similar to the primary analysis (SMD = -0.79, 95% CI -2.81 to 1.24;  $p = .446$ ) while those from partially supervised or home based programmes favoured Nordic walking (SMD = 4.46, 95% CI 3.39, 5.53;  $p < .001$ ), mainly due to results from one home based trial.

**Conclusions:** This systematic review suggests no benefit of Nordic over standard walking as supervised exercise for PAD. Favourable results were reported for one home based Nordic walking programme. A larger trial is needed to assess whether this finding can be replicated or not.

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## INTRODUCTION

Recent research has highlighted the increasing burden associated with peripheral artery disease (PAD), with reports of large increases in the incidence of death and disability due to PAD throughout the world, particularly in low and middle income countries.<sup>1,2</sup> The primary disability in PAD patients is walking impairment often presenting as symptoms of intermittent claudication. This largely determines the effect of PAD on health related quality of life, and is closely correlated with the high subsequent risk of functional decline, cardiovascular events, and mortality.<sup>3–5</sup> Treatments to improve walking performance in PAD patients are therefore of primary importance in management. Current clinical guidelines recommend an exercise programme for the treatment of PAD.<sup>6,7</sup> Most exercise programmes used in PAD patients have involved a supervised programme of treadmill walking and/or other exercises performed two or three times per week at a central facility (e.g., a gym).<sup>8</sup> Such programmes are frequently not taken up by patients in practise due to the impracticability of attending a central facility regularly and the pain experienced during exercising.<sup>9,10</sup> Furthermore, such supervised exercise programmes are not available in many parts of the world most likely due to the high cost of running them.<sup>9</sup> Findings from previous studies suggest that other types of exercise programmes, including those involving upper limb exercise, can improve walking performance and functional status in PAD patients.<sup>11–13</sup> Nordic walking (sometimes known as Nordic pole walking) utilises specially designed poles and a core-focused walking technique which engages the muscles of the arms and trunk to reduce the load on the legs during walking.<sup>14–16</sup> Nordic walking has been reported to more effectively improve cardiovascular fitness than standard walking.<sup>14–16</sup> Since Nordic walking places less load on the legs this could be a more effective approach to improve walking performance in PAD patients although this could also result in reduced promotion of adaptative changes (e.g., angiogenesis) in the leg muscles.<sup>17–21</sup> The aim of this systematic review and meta-analysis was to summarise all available evidence from controlled clinical trials on the efficacy of Nordic walking, in comparison to control programmes, in improving walking performance in PAD patients.

## METHODS

### Literature search

This systematic review was performed according to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) statement.<sup>22</sup> A comprehensive literature search was performed using multiple databases (Web of Science [via ISI Web of Knowledge; 1965], Scopus [1966],

Medline [via OvidSP, 1966], PubMed, The Cochrane Library and Embase [1980]) to identify clinical trials examining the effect of Nordic walking on walking performance in PAD patients. The following search terms were applied: “Nordic walking OR Nordic pole walking OR pole walking” AND “peripheral arterial disease OR intermittent claudication OR peripheral arterial occlusive disease OR peripheral vascular disease OR limb ischaemia OR limb ischemia OR peripheral artery disease”. The search was performed in December 2017 without language restrictions by two authors (J.G. and K.M.). In addition, reference lists of primary articles and reviews were searched to increase the yield of relevant publications. Titles and abstracts were screened to identify potentially relevant studies. If the suitability of an article was uncertain, the full text was reviewed. For inclusion in this systematic review studies needed to have assessed walking performance in patients with PAD treated by an exercise programme involving Nordic walking in comparison with a control programme. Studies were excluded if data on walking performance assessed by a recognised outcome measure, specifically a treadmill or corridor walking test, was not available in PAD patients treated with Nordic walking and a control programme. The selection of studies for inclusion was performed independently by two authors (J.G. and K.M.) with differences in opinion resolved by consensus.

### Data extraction and quality assessment

Data were extracted from included studies independently by two authors (J.G. and K.M.), with inconsistencies resolved by discussion. The following data were collected: sample sizes for the intervention and controls group, study design, details of the Nordic walking programme (including methods of delivery, frequency and duration of exercise and support provided), details of the control programme, vascular risk factors of the included patient groups (including age, sex, smoking history, prevalence of hypertension, diabetes, dyslipidaemia, airways disease and coronary heart disease, and body mass index, BMI, and ankle brachial pressure index, ABPI), details of the walking performance assessment (including assessment method, time point examined and results for the intervention and control groups), and data on physical activity. Where data were not available in the publication the corresponding author was contacted for this information. Methodological quality and potential bias of included studies were assessed independently by two investigators using the Cochrane collaboration tool for assessing risk of bias.<sup>23</sup>

### Statistical analysis

A meta-analysis was performed comparing maximum walking distance (MWD) in patients treated by an exercise

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