

Osteoarthritis and Cartilage



Trajectories of adherence to home-based exercise programs among people with knee osteoarthritis

P.J.A. Nicolson †*, R.S. Hinman †, J. Kasza ‡, K.L. Bennell †

† Centre for Health, Exercise and Sports Medicine, Department of Physiotherapy, School of Health Sciences, The University of Melbourne, Victoria, Australia
‡ Department of Epidemiology and Preventive Medicine, Monash University, Melbourne, Victoria, Australia

ARTICLE INFO

Article history:

Received 9 June 2017

Accepted 9 January 2018

Keywords:

Osteoarthritis

Knee

Exercise

Adherence

Latent class growth analysis

Trajectories

SUMMARY

Objective: To investigate the presence of different trajectories of self-reported adherence to home exercise programs among people with knee osteoarthritis (OA), and to compare baseline characteristics across identified groups.

Design: Pooled analysis of data from three randomised controlled trials involving exercise interventions for people aged ≥ 50 years with clinical knee OA ($n = 341$). Exercise adherence was self-reported on an 11-point numerical rating scale (NRS; 0 = not at all–10 = completely as instructed). Latent class growth analysis was used to identify distinct trajectories of adherence, at intervals from 12 to 78 weeks from baseline. Baseline characteristics of these groups were compared using chi-squared tests, one-way analysis of variance (ANOVA) and Kruskal Wallis tests where appropriate.

Results: Three distinct adherence trajectories were identified: a “Rapidly declining adherence” group ($n = 157$, 47.4%) whose adherence was 7.7 ± 1.6 (/10) at 12 weeks, declined to 4.2 ± 2.2 by 22 weeks and remained low thereafter; a “Gradually declining adherence” group ($n = 153$, 45.1%) whose adherence declined from 8.5 ± 1.5 to 7.8 ± 1.5 over the same period, and continued to decline slowly, and a “Low adherence” group ($n = 21$, 6.3%) whose adherence was 2.2 ± 1.4 at 12 weeks and remained low. At baseline the “Rapidly declining adherence” group reported significantly lower Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) pain (mean difference (95% Confidence Interval (CI)) -0.8 (-1.4 , -0.2)) and better WOMAC function compared to the “Gradually declining adherence” group (-3.1 (-5.2 , -1.1)).

Conclusion: Three trajectories of self-reported adherence to home exercises were found among people with knee OA. Findings highlight the need for close monitoring of adherence from initiation of a home exercise program in order to identify and intervene when low or rapidly declining adherence is identified.

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Introduction

Knee osteoarthritis (OA) is an increasingly common and disabling problem in older adults worldwide¹. Exercise is considered the cornerstone of non-surgical management of knee OA and is recommended in all current clinical guidelines^{2–5}. These recommendations are based upon high quality evidence demonstrating the effectiveness of exercise for improving function and

decreasing pain⁶. Due to the chronic nature of knee OA, and given financial constraints, home-based exercise programs are commonly used. The most recent Cochrane review of exercise for knee OA found that home-based programs provided moderate beneficial treatment effects that did not differ significantly from those reported with supervised individual and class-based exercise programs⁶. Optimizing outcomes of home exercise programs is thus essential in the successful long-term management of knee OA.

Although exercise provides immediate and short-term clinically worthwhile benefits for people with knee OA, these benefits have been found to decline over time and disappear in the long-term^{6–8}. Adherence to exercise programs as prescribed has been associated with greater improvements in both physical performance and self-reported pain and function among people with hip and knee

* Address correspondence and reprint requests to: P. Nicolson, Centre for Health Exercise and Sports Medicine, Department of Physiotherapy, University of Melbourne, Parkville, Victoria, 3010, Australia. Tel: 61-3-8344-4135.

E-mail addresses: pnicolson@unimelb.edu.au (P.J.A. Nicolson), ranash@unimelb.edu.au (R.S. Hinman), jessica.kasza@monash.edu.au (J. Kasza), k.bennell@unimelb.edu.au (K.L. Bennell).

OA^{8–12}. Furthermore, an international expert multidisciplinary panel suggested that long-term adherence to an exercise program is the key predictor of the long-term success of that program¹³. However, a number of clinical trials examining exercise interventions for people with knee OA have reported that adherence to home-based exercise programs varied significantly between participants, was poor overall, and declined over time^{8,9,14–18}. Given that adherence to exercise among people with knee OA is influenced by a vast array of factors^{19,20}, it is unsurprising that exercise adherence varies across individuals. To date, studies have not examined the presence of common trajectories of adherence across cohorts of people with knee OA undertaking home exercise programs.

Identifying distinct exercise adherence trajectories among people with knee OA allows a better understanding of how adherence to exercise typically changes over time, and may facilitate identification of individuals most at risk of declining exercise adherence, who may benefit from interventions specifically designed to boost exercise adherence at particular time points. The aim of this study was to investigate the presence of groups showing different trajectories of self-reported adherence to home exercise programs among people with knee OA, and to compare baseline characteristics across identified groups.

Methods

Study overview

We performed a pooled analysis of data previously collected in three randomized controlled trials (RCTs) investigating exercise interventions for painful knee OA^{14–16}. Detailed protocols and results of the studies have been previously published^{14–16,21–23}. Data were excluded from any study arms that did not include exercise.

Participants

Participants ($n = 341$) in the three RCTs were recruited from the community via advertisements in print, radio and digital media, in metropolitan Melbourne and across Australia. Similar recruitment strategies were used in all included studies. Approval was obtained from The University of Melbourne's Human Research Ethics Committee for each study, and all participants provided written informed consent.

Common inclusion criteria for all studies were: (1) aged ≥ 50 years; (2) fulfilling the criteria of knee OA according to the American College of Rheumatology²⁴; knee pain on most days of the past month; (3) knee pain ≥ 3 months duration; and (4) overall average knee pain in the last week ≥ 4 on an 11 point numeric rating scale (NRS).

Exclusion criteria for all studies were 1) previous knee arthroplasty or on waiting list; 2) other knee surgery or corticosteroid injection into the knee in the past 6 months; 3) physiotherapy for the knee in the past 6 months; 4) systemic arthritic conditions; 5) any other condition that affected the lower limbs and/or limited the ability to exercise safely (such as polio, neuropathy, peripheral nerve disease, stroke or Parkinson's disease); or 6) not fluent in written and spoken English.

Exercise interventions

Table I outlines the content and duration of the trial intervention arms from which data was pooled. All participants in the included exercise intervention arms of the studies were prescribed 4–6 lower limb strengthening exercises by a physiotherapist from the same pre-defined list of exercises, to be completed unsupervised at home three times per week.

Measures

Adherence to home exercise program

Participants in all studies self-rated their adherence to the prescribed home exercise program over the previous 3 months (12 weeks) using an 11-point NRS (0 = not at all, 10 = completely as instructed). Such scales have been found to have acceptable reliability (intra-class correlation coefficient = 0.77) in assessing exercise adherence among other musculoskeletal populations²⁵. Exercise adherence measurement time points are outlined in Table I.

Demographic characteristics

Demographic information was collected at baseline, including age, sex, height and weight. Body mass index (BMI) was calculated.

Outcome measures

Baseline scores of the following outcome measures were used in analyses.

Pain and physical function

Pain and physical function were measured on the respective subscales of the WOMAC (Likert version 3.1)²⁶, which is a disease-specific self-reported questionnaire. The pain subscale has five items, each answered on a five point Likert scale (0 = no pain, 4 = extreme pain) giving a total score out of 20 (maximum pain). The physical function subscale has 17 items, each answered on a five point Likert scale (0 = no dysfunction, 4 = extreme dysfunction) giving a total score out of 68 (maximum dysfunction).

Health-related quality of life

The Assessment of Quality of Life instrument version 2 (AQoL II) was used to measure health-related quality of life²⁷. The AQoL II consists of 20 questions covering six dimensions of health-related quality of life including independent living, social relationships, coping, pain and psychological wellbeing. Scores range from -0.04 (worst possible health-related quality of life) to 1.00 (full health-related quality of life).

Self-efficacy

Self-efficacy was evaluated using the Arthritis Self-Efficacy Scale. This scale assesses confidence for managing pain (five questions); physical function (nine questions) and other arthritis symptoms (six questions). Each question is rated on a 10-point NRS (1 = very uncertain, 10 = very certain) with total weighted scores ranging from 3 (lowest level of self-efficacy) to 30 (highest level).

Statistical analysis

All analyses were conducted in R (R foundation, Vienna, Austria). To identify groups of participants with distinct trajectories of home exercise adherence, we used latent class growth analysis. Conventional growth modelling assumes that a single trajectory can adequately describe the adherence pattern of the entire sample, however the latent class method allows for different adherence trajectories: i.e., for participants' adherence to vary around different means over time²⁸. Models were fitted to the longitudinal adherence data using the *lcm* package²⁹ in R. The optimal model was identified by fitting a single-group model to the data and then successively increasing the number of groups until model

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