RESEARCH ARTICLE

# Feasibility of an Exercise-Based Rehabilitation Programme for Chronic Hip Pain

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## Abstract

**Background.** Chronic hip pain is prevalent and disabling and has considerable consequences for the individual, and health and social care. Evidence-based guidelines recommend that patients with chronic hip pain benefit from exercise, but these guidelines are predominantly based on the efficacy of knee rehabilitation programmes. Studies investigating hip rehabilitation programmes suggest that these may not be feasible, citing issues with case identification. This study evaluated the feasibility of an exercise-based rehabilitation programme in a primary care hospital.

**Methods.** Forty-eight participants with chronic hip pain were randomly allocated to receive a five-week exercise and self-management programme or to continue under the management of their general practitioner (GP). Participants were assessed at baseline, six weeks and six months. Outcome measures included Western Ontario and McMaster Universities osteoarthritis index physical function subscale, pain, objective functional performance, self-efficacy, anxiety and depression.

**Results.** This programme was feasible, well tolerated and easily implemented into a primary healthcare facility. Adherence to the programme was high (81% attendance). Immediately following rehabilitation, all outcomes measures improved (effect sizes 0.2–0.4), although these improvements diminished at six months. There were no differences between the groups (all $p > 0.05$).

**Conclusions.** An exercise-based rehabilitation programme was found to be feasible and well tolerated by people with chronic hip pain. The moderate effects in all outcomes immediately following rehabilitation suggested that it warrants further investigation. Issues with diagnosis and adaptations to the programme were identified and will be addressed in a randomized controlled trial. Copyright © 2011 John Wiley & Sons, Ltd.

## Introduction

Chronic hip pain is common and disabling, with considerable personal, healthcare and societal costs (Badley et al., 1994; March and Bachmeier, 1997;

Urwin et al., 1998). Clinical management guidelines for chronic lower limb pain emphasize conservative management – for example, self-management and exercise (Altman et al., 2000; Pendleton et al., 2000; Zhang et al., 2005). Exercise is efficacious for the

management of chronic lower limb pain (Hurley et al., 2007). Rehabilitation programmes that combine exercise and self-management reduce pain and improve function (by increasing motor function) and promote self-management and self-efficacy for disease management through patient education, cognitive restructuring, coping strategies and psychosocial interventions (designed to restructure patients' beliefs about their joint pain and condition) (Hurley et al., 2007; Mazzuca et al., 1997). They are designed to be delivered to patients with chronic musculoskeletal pain in a primary healthcare setting and are practicable, minimizing the burden on busy physiotherapy outpatient departments (Jessep et al., 2009).

However, few studies have specifically evaluated hip rehabilitation (Hernández-Molina et al., 2008; Hopman-Rock and Westhoff, 2000; McNair et al., 2009; Zhang et al., 2008) and the majority of studies on which clinical guidelines are based contain only a small proportion of patients with hip pain (Fransen et al., 2002; Halbert et al., 2001; van Baar et al., 1999). These guidelines assume that patients with hip pain respond to exercise in the same way as patients with other chronic lower limb joint pain. For example, at the knee joint, quadriceps sensorimotor dysfunction is associated with considerable functional incapacity (Hurley et al., 1997), which is improved by exercise-based rehabilitation (Bearne et al., 2002; Hurley et al., 2007; Jessep et al., 2009). However, the hip joint is anatomically different, more stable than the knee joint and is surrounded by several muscle groups, which may protect it from sensorimotor dysfunction associated with chronic pain. Therefore, the difference in the anatomical structure and risk factors for the development of pain and dysfunction between each lower limb joint (Allen et al., 2010; Lohmander et al., 2009) raises the possibility that hip pain will not respond to exercise in the same way as the knee, thus altering the effectiveness of exercise-based rehabilitation.

This preliminary study evaluated the feasibility of an exercise based rehabilitation programme aimed at decreasing chronic hip pain and disability in a primary care.

# Methods

### Study design

This study was a pragmatic, single-blind, randomized, controlled feasibility study.

### Participants

Participants with chronic hip pain of more than six months' duration were recruited from two general practitioner (GP) practices in the south of England over an 11-month period. They were identified from the GP medical records and contacted by letter, inviting them to participate in the study. To be included in the study, participants had to be 50 years of age or older with a clinical diagnosis of hip osteoarthritis (OA) (Altman et al., 1991). People were excluded from the study if they: had received physiotherapy for hip pain within the past six months; had primary pain from other joints (e.g. back, knees or ankles) which interfered with assessment; had unstable co-existing medical problems (e.g. cardiovascular, respiratory or neurological disorders); had received an intra-articular injection to the hip within six months of study commencement; were currently taking systemic steroids; were unable or unwilling to exercise or unable or unwilling to give informed consent.

The study was approved by the West Kent Research Ethics Committee (Ref No 05/Q1801/57).

Participants attended an initial assessment at the physiotherapy department of a primary healthcare hospital when anthropometric data and history of their hip pain, drug and other therapy was documented.

### Outcome measures

The primary outcome measure was the Western Ontario and McMaster Universities osteoarthritis index physical function sub-scale (WOMAC$_{(func)}$). This self-completed questionnaire required the patient to rate their difficulty in completing physical tasks on a 0 (no difficulty) to 4 (extreme difficulty) point scale (minimum score = 0, maximum score = 68) (Bellamy et al., 1988).

Secondary outcome measures included:

*The WOMAC pain subscale (WOMAC$_{(pain)}$).* This self-completed questionnaire assessed pain on a 0 (no pain) to 4 (extreme pain) point scale (minimum score = 0, maximum score = 20);

*The total WOMAC score (WOMAC$_{(total)}$).* This self-completed questionnaire assessed pain, stiffness and physical function on a 0 (no symptoms/difficulty) to 4 (extreme symptoms/difficulty) point scale (minimum score = 0, maximum score = 96);

*The arthritis self-efficacy scale.* This self-completed questionnaire assessed the degree of confidence that participants felt in their ability to influence their hip

pain, day-to-day activities and symptoms (minimum score = 10, maximum score = 100) (Barlow and Williams, 1996; Lorig et al., 1989).

*The hospital anxiety and depression scale* (HADS) (Zigmond and Snaith, 1983). This self-completed questionnaire evaluated the level of anxiety (seven questions) and depression (seven questions) on a 4-point scale (minimum score = 0, maximum score = 21).

*Objective functional performance.* This was estimated by the aggregate time to perform four common activities of daily living: i) the 50-foot walk test; ii) rise from a chair (seat height = 43 cm) and walk 50 feet; iii) ascent and iv) descent of a flight of stairs (step rise height 17 cm × ten stairs) (aggregate functional performance time [AFPT]) (Hurley et al., 1997).

All outcomes were measured at baseline, post-intervention (or after six weeks) and six months post-intervention by a clinical physiotherapist, specifically trained to complete these assessments, who was unaware of the participants' allocation.

## Randomization

Following baseline assessment, participants were individually randomized to usual care (the control group) or the rehabilitation programme. The randomization list was generated using a computer random number programme and held at a remote unit by a member of the research team unconnected with the daily running of the study.

## Intervention

### Usual care

Participants randomized to the control group continued routine management prescribed by their GPs, including referral to secondary care. Medication for co-existent conditions continued as needed.

### Rehabilitation group

In addition to usual management by their GP, those participants randomized to the rehabilitation programme received ten 75-minute group exercise and self-management sessions (up to eight participants per group, twice a week for five weeks) (Hurley et al., 2007), supervised by an experienced, qualified clinical physiotherapist (band 6) in a physiotherapy outpatient department. Each session comprised of two parts;

1. Supervised exercises: For 45 minutes, participants completed an exercise circuit consisting of; i) strengthening and stretching exercises for the hip abductors, flexors and gluteal musculature; ii) cycling on a static exercise bike; iii) therapeutic resistance bands to increase hip muscle strength and dynamic control (maintaining joint stability and motor control during movement); iv) functional and balance/coordination exercises. As the quantity and quality of these exercises improved, they were progressed and more challenging exercises were introduced. The physiotherapist prescribed exercises for each participant according to their abilities, and monitored and revised the performance of these exercises.

2. Education, coping and self-management: At the end of each exercise session, participants took part in a 30-minute 'interactive discussion' emphasizing simple coping strategies, self-care, pain control, joint protection and problem-solving to enable lifestyle changes to promote joint health and self-management. The sessions emphasized the importance of attaining and maintaining correct bodyweight and incorporating regular exercise and physical activity into the daily routine. All interactive discussions were facilitated by the physiotherapist who supervised the exercise classes. A handbook containing information that reinforced the discussion topics and exercises completed in the sessions was provided.

## Discharge policy

After ten rehabilitation sessions, the participants were discharged with specific advice and written instructions to perform a simple home exercise programme consisting of the exercises performed during their rehabilitation sessions.

## Data analysis

The effect of the intervention on all outcome measures was assessed by calculating mean change and standardized effect size and categorized as a small (0.01–0.19), medium (0.2–0.79) or large (>0.79) effect (Cohen, 1988).

All data were analysed on an intention-to-treat basis, comparing within- and between-group differences using analysis of covariance, correcting for baseline scores. Statistical significance was accepted at $p < 0.05$.

Data analysis was performed using SPSS 17.0 for Windows.

## Results

Sixty-three people with chronic hip pain were identified and sent detailed information about the study from two local GP surgeries. Forty-eight people (76%) consented to participate in the study. There were no between-group differences in participant characteristics or the duration of hip pain at baseline (all $p > 0.05$, Table 1).

Adherence to the programme was high, with an 81% mean attendance at the rehabilitation sessions. The overall study attrition rate at six months was 25%. Participants with the worst function (mean baseline WOMAC$_{(func)}$ 21.6) withdrew from rehabilitation (two participants did not complete the programme, one of whom withdrew prior to starting it and the other failed to complete it because of other commitments; one underwent surgery and two were unavailable for follow-up) and those participants with better function (mean baseline WOMAC$_{(func)}$ 12.6) withdrew from the control group (six participants were unavailable for follow-up and one moved away) (Figure 1).

Immediately following cessation of the programme, all outcome measures improved (Table 2). The WOMAC$_{(total)}$, WOMAC$_{(pain)}$ subscale and arthritis self-efficacy scale improved with a moderate effect size (0.5); function (AFPT and WOMAC$_{(func)}$ subscale) also improved with a moderate effect size (0.4) and HADS anxiety and depression scores improved with an effect size of 0.2 and 0.3, respectively. At six months, these improvements had declined but remained better than the baseline scores (effect size 0–0.5; Table 2).

The between-group difference effect sizes ranged from 0.2–0.4 at six weeks and 0–0.3 at six months. There were no between-group differences in any outcome measure at any assessment point (all $p > 0.05$, Table 3).

## Discussion

This study showed that an exercise-based rehabilitation programme was feasible, safe and well tolerated and may have clinical benefits for people with chronic hip pain. However, there were several limitations. The small sample size limits the inferences that can be drawn from this preliminary, statistically underpowered study. However, the study was not designed to investigate the clinical benefits, but to assess the interest in, and feasibility of, recruitment and retention onto the trial, all of which were good. It also gives an indication of the possible effect size that can be used to adequately power a larger study to establish clinical effectiveness.

In addition, the diagnosis of hip pain is problematic, since pain experienced at the hip may be referred from the lumbar spine, pelvic girdle or be due to soft tissue dysfunction, which may have influenced the response to a rehabilitation programme that was designed to mobilize the hip joint and strengthen the surrounding muscles. Consistent with other studies (Tak et al., 2005), the present study successfully recruited patients presenting with chronic hip pain, who, typically for such patients, had a clinical diagnosis of OA. However, clinical diagnosis is less sensitive and specific than radiographic detection and, consequently, there is a risk that our participants may have had pain referred from other structures. Unfortunately, as radiographic examination is not readily available in primary care (Juhakoski et al., 2009) the participants of the present study were a 'clinically ambiguous' but pragmatically representative patient population, and the results are generalizable to the large population of people presenting with chronic hip pain in primary care.

The development of complex healthcare interventions requires small feasibility studies to be carried out to establish their practicability and potential effectiveness to inform the design of larger studies (Medical Research Council, 2000). Following this preliminary study,

**Table 1.** Baseline participant characteristics for rehabilitation or usual care groups. Presented as mean (range) unless stated

|                              | Usual care        | Rehabilitation      | *p* Value |
|------------------------------|-------------------|---------------------|-----------|
| Number (females)             | 24 (19)           | 24 (15)             |           |
| Age (years)                  | 67 (53–78)        | 65 (52–76)          | 0.3       |
| Height (metres)              | 1.65 (1.50–1.88)  | 1.70 (1.57–1.83)    | 0.3       |
| Weight (kilograms)           | 74.1 (44–118)     | 77.5 (57–109)       | 0.7       |
| Body mass index              | 26.9 (18–39)      | 27.3 (20–40)        | 0.3       |
| Duration of hip pain (years) | 5.6 (1–40)        | 4.4 (1–12)          | 0.06      |
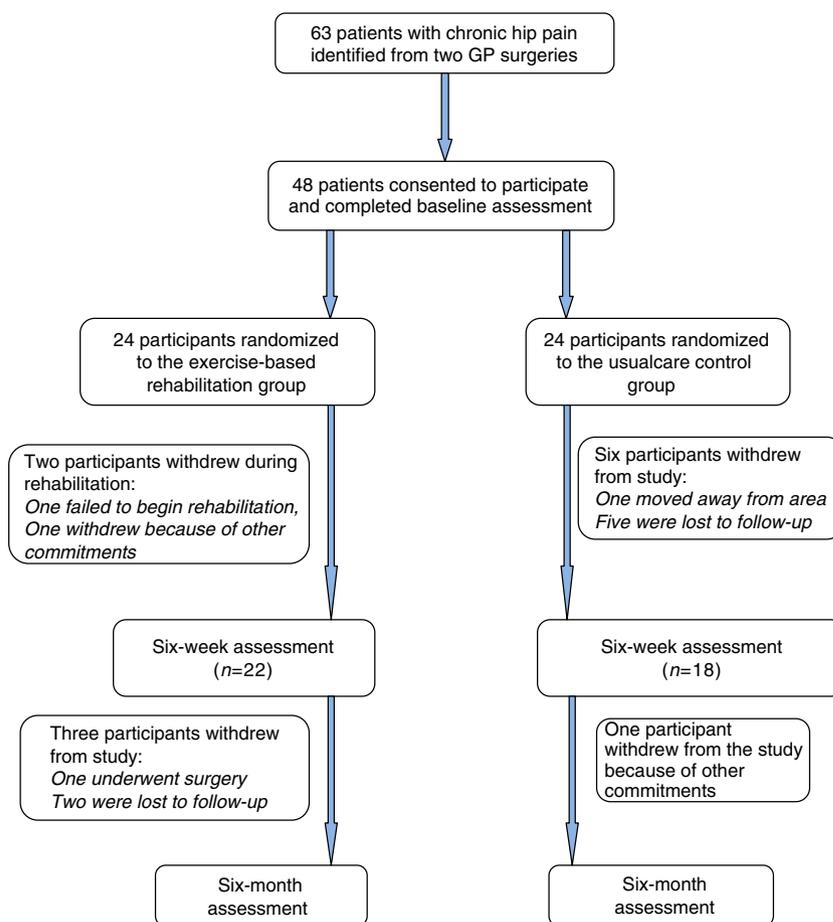
**Figure 1**. Pathway for participants entering the 'feasibility of an exercise-based rehabilitation programme for chronic hip pain' study

**Table 2.** Outcome data (mean [standard deviation]), mean change from baseline (standard deviation) and effect size (ES) following rehabilitation

| | Baseline | 6/52 | Mean change (SD) ES[#] | 6/12 | Mean change (SD) ES[#] |
|---|---|---|---|---|---|
| WOMAC$_{(func)}$* | 14.3 (9.0) | 11.1 (7.9) | 3.3 (6.3) **0.4** | 13.5 (10.1) | 0.3 (11.4) **0.1** |
| WOMAC*(pain)** | 5.0 (2.7) | 3.7 (2.0) | 1.3 (2.5) **0.5** | 4.4 (3.1) | 0.3 (4.0) **0.2** |
| WOMAC*(total)** | 22.0 (11.8) | 15.7 (10.8) | 6.6 (9.4) **0.5** | 17.0 (14.8) | 4.7 (19.0) **0.4** |
| AFPT* | 42.2 (14.6) | 36.5 (5.8) | 3.0 (6.7) **0.4** | 35.4 (3.8) | 4.0 (5.6) **0.5** |
| HADS anxiety* | 5.0 (2.6) | 4.6 (2.6) | 0.6 (2.0) **0.2** | 4.0 (3.0) | 1.3 (2.2) **0.0** |
| HADS depression* | 3.0 (2.3) | 2.4 (1.8) | 0.8 (1.7) **0.3** | 2.4 (2.2) | 2.8 (2.2) **0.3** |
| Self-efficacy | 68.2 (6.6) | 71.5 (7.2) | 3.4 (3.9) **0.5** | 69.5 (6.6) | 0.6 (6.3) **0.2** |

*Improvement indicated by lower values.

[#]Mean change compared with baseline and within-group effect size.

**Table 3.** Outcomes data (mean [standard deviation]), between-group difference (*p* value) and effect size (ES) after rehabilitation or usual care

| | Baseline | | 6 weeks | | | 6 months | | |
|---|---|---|---|---|---|---|---|---|
| | Usual care | Rehabilitation | Usual care | Rehabilitation | Difference (*p* value)<br>*ES*# | Usual care | Rehabilitation | Difference (*p* value)<br>*ES*# |
| WOMAC$_{(func)}$* | 17.3 (12.5) | 14.3 (9.0) | 13.8 (10.6) | 11.1 (7.9) | 2.7 (0.4)<br>**0.3** | 13.5 (12.1) | 13.5 (10.1) | 0.0 (1.0)<br>**0.0** |
| WOMAC(*pain*)* | 5.2 (4.22) | 5.0 (2.65) | 4.7 (3.2) | 3.7 (2.0) | 1.0 (0.2)<br>**0.3** | 3.8 (3.4) | 4.4 (3.1) | 0.7 (0.6)<br>**0.2** |
| WOMAC(*total*)* | 25.1 (17.4) | 22.0 (11.8) | 20.9 (14.3) | 15.7 (10.8) | 5.2 (0.2)<br>**0.4** | 19.4 (16.3) | 17.0 (14.8) | 2.4 (0.6)<br>**0.1** |
| AFPT* | 41.0 (16.3) | 42.2 (14.6) | 38.8 (8.9) | 36.5 (5.8) | 2.2 (0.3)<br>**0.3** | 37.7 (7.9) | 35.4 (3.8) | 2.4 (0.3)<br>**0.3** |
| HADS anxiety* | 4.1 (2.6) | 5.0 (2.6) | 4.1 (3.0) | 4.6 (2.6) | 0.5 (0.6)<br>**0.2** | 4.5 (3.0) | 4.0 (3.0) | 0.5 (0.6)<br>**0.2** |
| HADS depression* | 2.88 (2.8) | 3.04 (2.3) | 2.9 (2.1) | 2.4 (1.8) | 0.5 (0.5)<br>**0.2** | 2.5 (1.2) | 2.4 (2.2) | 0.1 (0.9)<br>**0.1** |
| Self-efficacy | 68.1 (8.1) | 68.17 (6.6) | 69.9 (6.9) | 71.5 (7.2) | 1.6 (0.5)<br>**0.2** | 69.9 (8.4) | 69.5 (6.6) | 0.5 (0.8)<br>**0.0** |

All data are presented as mean (standard deviation) unless stated.
*Improvement indicated by lower values.
#Between-group difference effect sizes.

adaptations to the programme have been identified. More sensitive and specific clinical diagnosis of people with hip pain will be required but, until this is developed, studies may include people with radiographic evidence of hip degeneration only, although this would limit the results to people with anatomically advanced hip disease and be less applicable to the large number of people without radiographic changes.

The anatomical nature of the hip joint means that hip pain and dysfunction may adversely affect many structures which need mobilizing and strengthening exercise to be effective. Developments to the exercise programme used in the present study will address possible lumbar, pelvic girdle and soft tissue dysfunction, which may enhance efficacy.

In the present study, 75% of eligible people identified initially agreed to participate, which was greater than that in other trials of exercise programmes (Bearne et al., 2002; Hurley et al., 2007) and high subsequent attendance and a low withdrawal rate suggests that the programme fulfilled an unmet need in people with chronic hip pain. Informal feedback from participants showed that the programme's premise, content and delivery was understood, popular and well tolerated, similarly to the programme for chronic knee pain from which this programme was adapted (Hurley et al., 2007).

The study attrition rate was 25%, in line with other exercise studies (Bearne et al., 2002) but, as participants with the worst function withdrew from the rehabilitation group and those with better function withdrew from the control group, this preferential withdrawal may have diluted and therefore underestimated the treatment effect.

The moderate benefit in all short-term outcomes found in this study was similar to that in people who completed the Enabling Self-management and Coping with Arthritic knee Pain through Exercise (ESCAPE)–knee pain programme (Hurley et al., 2007) and other programmes for chronic musculoskeletal conditions (Hopman-Rock and Westhoff, 2000) but declined over time. These benefits might be sustained by adding 'booster' sessions (Jessep et al., 2009).

However, as chronic hip pain is very prevalent and disabling, an exercise-based rehabilitation programme which produces moderate improvements warrants further investigation in better designed trials, to see if these benefits are real, and can be improved and sustained. As the personal suffering, health and social care expenditure on chronic joint pain will increase as

more people live longer (Hootman and Helmick, 2006), programmes such as ESCAPE–pain which are relatively brief, safe, effective and affordable for people with chronic knee pain and can be delivered to large numbers of people should be developed (Jessep et al., 2009). This feasibility study has shown that adapting the programme for hip pain is possible and has potential, but needs more rigorous design, including an assessment of cost-effectiveness and qualitative evaluation of the programmes acceptability to participants.

## Conclusion

Identifying an acceptable and feasible intervention which can be conducted in primary care facilities would represent a considerable development in the clinical management of people with chronic hip pain. The present preliminary study suggests that the rehabilitation programme described here is feasible and tolerable, and the adaptations identified will inform the design of a large randomized, controlled trial, with a nested qualitative study, evaluating the efficacy, acceptability and cost-effectiveness of this rehabilitation programme.

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