Physiotherapist-directed rehabilitation exercises in the outpatient or home setting improve strength, gait speed and cadence after elective total hip replacement: a systematic review

Corinne L Coulter[1,2], Jennie M Scarvell[3], Teresa M Neeman[4] and Paul N Smith[5]

[1]Australian National University Medical School, [2]Physiotherapy Department, Canberra Hospital, [3]Physiotherapy, University of Canberra, [4]Statistical Consulting Unit, Australian National University, [5]Trauma and Orthopaedic Research Unit, Canberra Hospital Australia

Question: In people who have been discharged from hospital after a total hip replacement, do rehabilitation exercises directed by a physiotherapist improve strength, gait, function and quality of life? Are these exercises as effective in an unsupervised home-based setting as they are in a supervised outpatient setting? **Design**: Systematic review with meta-analysis of randomised trials. **Participants**: Adult patients after elective total hip replacement. **Intervention**: Physiotherapist-directed rehabilitation exercises after discharge from hospital following total hip replacement. **Outcome measures**: Hip and knee strength, gait parameters, functional measures, and quality of life. **Results**: Five studies comprising 234 participants were included in the review. Sufficient data for meta-analysis were only obtained for hip and knee strength, gait speed and cadence. Physiotherapy rehabilitation improved hip abductor strength by a mean of 16 Nm (95% CI 10 to 22), gait speed by 6 m/min (95% CI 1 to 11) and cadence by 20 steps/min (95% CI 8 to 32). Favourable but non-significant improvements in strength were noted for other muscle groups at the hip and knee. Function and quality of life could not be meta-analysed due to insufficient data and heterogeneity of measures, but functional measures tended to favour the physiotherapy rehabilitation group. Most outcomes were similar between outpatient and home-based exercise programs. **Conclusion**: Physiotherapy rehabilitation improves hip abductor strength, gait speed and cadence in people who have been discharged from hospital after total hip replacement. Physiotherapist-directed rehabilitation exercises appear to be similarly effective whether they are performed unsupervised at home or supervised by a physiotherapist in an outpatient setting. **[Coulter CL, Scarvell JM, Neeman TM, Smith PN (2013) Physiotherapist-directed rehabilitation exercises in the outpatient or home setting improve strength, gait speed and cadence after elective total hip replacement: a systematic review. *Journal of Physiotherapy* 59: 219–226]**

Key words: Physiotherapy, Rehabilitation, Exercise, Total hip replacement, Physical therapy

Introduction

Osteoarthritis is the most common reason for hip joint replacement surgery in Australia (Australian Orthopaedic Association 2011) and, based on current trends, is forecast to become the fourth leading cause of disability worldwide by 2020 (Woolf and Pleger 2003). Osteoarthritis causes a substantial burden with impairments not only to physical status and independence but also to quality of life. In Australia the pain and disability associated with osteoarthritis affect approximately 10% of men and 18% of women over 60 years of age (AIHW 2004).

The rate of hip replacement surgery continues to increase. In Australia, 35 996 hip replacements were performed in 2010, an increase of 3.6% compared to 2009. Since 2003, the first year of complete national data collection by the Australian Orthopaedic Association National Joint Replacement Registry, the number of hip replacements has increased by 32.4% (Australian Orthopaedic Association 2011).

Traditionally, physiotherapy has been a routine component of patient rehabilitation following hip replacement surgery. Impairments and functional limitations remain a year after surgery (Minns Lowe 2009, Trudelle-Jackson and Smith 2004), so it is valid to consider how effective post-discharge physiotherapy is in terms of restoring a patient's physical health.

Rehabilitation protocols after total hip replacement vary widely in both the specific exercises used and the timeframes for their delivery (Roos et al 2003). This may be because they are largely based on clinical experience,

What is already known on this topic: Osteoarthritis is a common cause of disability and each year more total hip replacements are performed. Impairments and functional limitations can persist after surgery. Rehabilitation protocols after total hip replacement vary widely, perhaps because previous systematic reviews have been unable to make clear recommendations about physiotherapy exercises in this setting.

What this study adds: Physiotherapist-directed rehabilitation exercises improve hip abductor strength, gait speed, and cadence in people after total hip replacement. The effects on functional measures and quality of life were less clear, but tended to favour the intervention group. Rehabilitation in the supervised outpatient setting or as a home-based program seems to provide similar benefits.

surgeon restrictions and anecdotal reports, in the absence of evidence to direct post-discharge rehabilitation.

One systematic review has examined the extent to which physiotherapy exercise is effective following discharge after total hip replacement, but this was limited to evidence published in 2004 or earlier (Minns Lowe 2009). This review concluded that 'insufficient evidence currently exists to establish the effectiveness of physiotherapy exercise following primary hip replacement for osteoarthritis'. The review considered walking speed, hip abductor strength, function, range of motion, and quality of life. However, data for only the first two of these outcomes were meta-analysed, due to variable study quality, clinical heterogeneity, limited data or a combination of these problems. The meta-analytic summaries of the data indicated promise but, as the pooled results were not statistically significant, definitive answers were unable to be derived from this review.

Therefore, we aimed to answer the following research questions:

1. In people who have been discharged from hospital after a total hip replacement, do rehabilitation exercises directed by a physiotherapist improve strength, gait, function and quality of life?
2. Are these exercises as effective in an unsupervised home-based setting as they are in a supervised outpatient setting?

Method

Identification and selection of studies

Literature searches were conducted for relevant articles published in English in five databases (MEDLINE, CINAHL, EMBASE, PEDro, and the Cochrane Library) from the earliest record to March 2012. The search terms included terms for *total hip replacement* or *arthroplasty*, terms for physiotherapy such as *rehabilitation* or *physical therapy*, and terms relating to patient discharge (eg, *post discharge*, *after discharge,* or *outpatient*) or home services (eg, *health care delivery*, *home physiotherapy*, *home rehabilitation,* and *self-care*). See Appendix 1 on the eAddenda for the full search strategy.

Box 1. Inclusion criteria.

Design
- Randomised trials
- English language

Participants
- Adults after total hip replacement

Interventions
- Post-discharge physiotherapist-directed rehabilitation exercises (outpatient or home-based)

Outcomes measured
- Muscle strength
- Gait
- Function
- Quality of life

Comparisons
- Post-discharge physiotherapist-directed rehabilitation exercises (outpatient or home-based) versus no intervention
- Physiotherapist-supervised, outpatient rehabilitation exercises versus physiotherapist-directed, unsupervised, home-based rehabilitation exercises

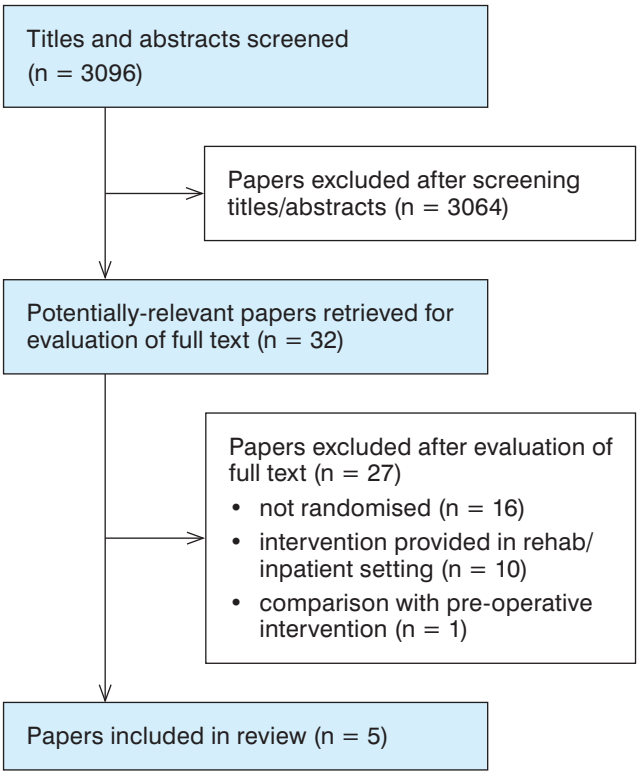

Figure 1. Flow of studies through the review.

A single reviewer screened the titles and abstracts of all the items retrieved by the searches to identify potentially relevant studies. Full text copies of relevant studies were retrieved and reviewed. The reference lists of these papers were then screened for further relevant studies. Each paper obtained in full text was examined for eligibility against the review's inclusion criteria by two reviewers (CC and JS). Disagreements were resolved by discussion. The inclusion criteria for the review are presented in Box 1.

Assessment of study characteristics

Quality: Trials meeting the inclusion criteria were assessed for methodological quality using the PEDro scale (Maher et al 2003) by two reviewers (CC and JS). Each assessor worked independently. Following assessment, any disagreements were resolved by discussion. The ten internal validity items of the PEDro scale were reported as a total score (de Morton 2009). The external validity item, which requires both the source of participants and the eligibility criteria to be reported, was also determined for each trial. The PEDro scale scores were used to characterise the trials but were not used to exclude trials from the review or the meta-analyses.

Participants and interventions: Interventions involving early rehabilitation during the hospital inpatient phase, post-acute inpatient rehabilitation, and rehabilitation in residential care (or comparison to any of these) were not considered by this review.

Table 1. PEDro scores of included trials.

Study	Random allocation	Concealed allocation	Groups similar at baseline	Participant blinding	Therapist blinding	Assessor blinding	< 15% dropouts	Intention-to-treat analysis	Between-group difference reported	Point estimate and variability reported	Total (0 to 10)
Johnsson 1988	Y	N	Y	N	N	N	N	N	Y	Y	4
Trudelle-Jackson 2004	Y	N	Y	Y	N	N	N	Y	Y	Y	6
Jan 2004	Y	N	Y	N	N	N	Y	Y	Y	Y	6
Unlu 2007	Y	Y	N	N	N	Y	Y	Y	Y	Y	7
Galea 2008	Y	N	Y	N	N	N	Y	Y	Y	Y	6

Y = yes, N = no.

Outcomes: The outcomes considered by the review were muscle strength, gait, function and quality of life. From each trial, data were extracted for these outcome measures, where available, at the beginning of the intervention and at the longest follow-up assessment point.

Data analysis

Data were extracted from each trial regarding sample size, population characteristics, details of the interventions, and the effects of interventions. Where outcome measures were reported in two or more trials and were reported by population descriptors (mean and standard deviation), meta-analyses were performed using standard software[a]. Where only one trial reported a particular measure, meta-analysis was not used but the data were reported in the text as a between-group difference with a 95% CI.

To determine the effect of intervention, experimental and control groups were compared. Where a trial employed two variations of physiotherapy intervention, the outcomes of the two intervention groups within that trial were pooled before performing this meta-analysis. Also, to determine which mode of post-discharge physiotherapy provides better patient outcomes following total hip replacement, we meta-analysed the studies in which outpatient and home-based exercise programs were compared.

Forest plots were created to display effect estimates with 95% CIs for individual trials and pooled results. In each case we tested for statistical heterogeneity. This was examined graphically on the forest plot and statistically through the calculation of the I^2 statistic. The I^2 statistic estimates the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error (chance). An I^2 value greater than 50% was considered substantial heterogeneity and random-effects meta-analysis rather that a fixed-effect model was used in these instances.

Results

Flow of studies through the review

The search returned 3096 studies. By screening titles and abstracts, 32 potentially relevant studies were identified and retrieved in full text. Of these, 27 studies failed to meet the eligibility criteria. Therefore five studies were included in the review. The flow of studies through the review is presented in Figure 1.

Characteristics of studies

Three trials compared an experimental group to a control group (Johnsson et al 1988, Jan et al 2004, Trudelle-Jackson and Smith 2004), one trial compared two experimental groups (Galea et al 2008), and one trial compared two experimental groups to a control group (Unlu et al 2007). For the comparison of experimental versus control, the outcomes of the two experimental groups in the trial by Unlu et al (2007) were pooled before including this trial in the meta-analysis. For the comparison of outpatient versus home-based exercise, the two experimental groups were compared. The quality of the trials is summarised in Table 1 and the characteristics of the participants, interventions and outcome measures are presented in Table 2.

Quality: The trials included in this review had varying internal validity with scores ranging from four to seven

Table 2. Characteristics of the five randomised trials included in the review.

Trial	Participants	Interventions	Primary outcomes	Assessments
Galea 2008	n = 23 Age (yr) = Exp 69 (SD 10), Con 67 (SD 8) Time since THR = at hospital discharge	Exp 1 = outpatient exercise program (figure of 8 walk, STS, active SLS, stairs, hip abd, heel raise, side stepping) Regimen = max 5 min per ex, 2/wk x 8 wk + prescribed home exercise program Progression = figure of 8 walk: increase laps, adding obstacles, changing surfaces, combination of the previous; STS, active SLS, steps: increase reps; hip abd, heel raise: increase reps, add weight; side stepping: increase total distance Exp 2 = same exercise program as Exp but without supervision	Gait: speed (cm/s), cadence (step/min), step length (cm) Function: TUG (sec), stairs power (Nm/s), 6MWT (m), WOMAC QOL: AQoL	Initial: Wk 0 of program Final: Wk 8 (completion) of program
Jan 2004	n = 53 Age (yr) = Exp 59 (SD 12), Con 57 (SD 13) Time since THR = > 1.5yrs post THR	Exp = home exercise program (hip F ROM bilaterally, hip abd/F/E strengthening bilaterally, 30 min walk Regimen = daily x 12 wk, hip F ROM (10 reps x 2 sets), isotonic exercise all muscle groups with weight on ankle (10 reps x 2 sets), hip abd in SLS (10 reps with 5s hold x 2 sets) Progression = not reported Con = no intervention	Strength: Hip abd, E, F (Nm) Gait: speed (m/min) Function: HHS (functional part)	Initial: Wk 0 of program Final: Wk 12 (completion) of program
Johnsson 1988	n = 30 Age (yr) = Exp 70, Con 66 Time since THR = 2 mo post-op	Exp = outpatient exercise program (supine strengthening of the abdominals, gluteals, hamstrings and quadriceps, SLS, stairs, STS, walking exercises) Regimen = 45-min sessions, 2/wk for 1 mo, then either 1/wk for 1 mo or 1 every 2 wk for 2 mo Progression = not reported Con = no intervention	Strength: Hip abd, E, F, Knee E (Nm)	Initial: 2 mo post-operative Final: 6 mo post-operative
Trudelle-Jackson 2004	n = 28 Age (yr) = Exp 59 (SD 11), Con 60 (SD 12) Time since THR = 4–12 mo post-op	Exp = home exercise program (STS, unilateral heel raises, partial knee bends, balance in SLS, marching, side and back leg raises in standing, unilateral pelvic raising and lowering in standing) Regimen = 15 reps 3-4 x wk for 8 wks Progression = 20 reps at 2 wk, 15 reps x 2 sets at 4 wk, 20 reps x 2 sets at 6 wk Con = 7 basic isometric and active ROM exercises (gluteals, quadriceps sets, hamstring sets, ankle pumps, heel slides, hip abduction in supine, hip IR and ER in supine	Strength: Hip abd, E, F, Knee E (Nm) Function: HQ12	Initial: Wk 0 of program Final: Wk 8 (completion) of program
Unlu 2007	n = 26 Age = Exp 1 45 (SD 9), Exp 2 58 (SD 7), Con 53 (SD 10) Time since THR = 12–24 mo post-op	Exp 1 = home exercise program (ROM, isometric and eccentric hip exercises bilaterally) Exp 2 = outpatient exercise program (as above) Regimen: 2 x daily, 6 wks Progression: not reported Con = no intervention	Strength: Hip abd (ft.lbs) Gait: speed (m/min), cadence (steps/min)	Initial: Wk 0 of program Final: Wk 6 (completion) of program

abd = abduction, AQoL = Assessment of Quality of Life, Con = control group, E = extension, ER = external rotation, Exp = experimental group, F = flexion, HHS = Harris Hip Score, HQ12 = 12-item hip questionnaire, IR = internal rotation, QOL = quality of life, reps = repetitions, ROM = Range of Motion, STS = sit to stand, SLS = single-leg stance, WOMAC = Western Ontario McMaster Osteoarthritis Index, 6MWT = six-minute walk test.

out of ten. All trials used true random allocation of participants and had sufficient statistical information to make their results interpretable. Only one trial (Unlu et al 2007) reported concealment of allocation and blinding of assessors. The PEDro scale criterion that relates to external validity but which does not contribute to the PEDro score was met by all trials. Four of the five trials scored six or more out of the possible ten points.

Participants: The sample size of the studies ranged from 23 to 53. The time of recruitment of participants varied from at discharge from hospital after total hip replacement to 12–24 months after the procedure.

Interventions: The included trials varied in their experimental interventions. One trial assessed a supervised outpatient program (Johnsson et al 1988), three trials assessed a home-based exercise program (Jan et al 2004, Trudelle-Jackson and Smith 2004, Unlu et al 2007) and two trials compared a home-based program to a supervised outpatient program (Galea et al 2008, Unlu et al 2007). Three papers included a true control group, who received no therapeutic intervention (Johnsson et al 1988, Jan et al 2004, Unlu et al 2007). The duration of the interventions ranged from six weeks (Unlu et al 2007) to three months (Jan et al 2004, Johnsson et al 1988).

Outcomes: All trials recorded outcomes at the end of the intervention (ie, six weeks, eight weeks or three months). Only one trial followed up beyond the intervention period (Johnsson et al 1998). Most trials measured strength of hip abductors (Jan et al 2004, Johnsson et al 1988, Trudelle-Jackson and Smith 2004, Unlu et al 2007), hip extensors (Jan et al 2004, Johnsson et al 1988, Trudelle-Jackson and Smith 2004), hip flexors (Jan et al 2004, Johnsson et al 1988, Trudelle-Jackson and Smith 2004), and knee extensors (Johnsson et al 1988, Trudelle-Jackson and Smith 2004). Gait parameters were included as outcomes in all five trials. Three trials measured gait speed (Galea et al 2008, Jan et al 2004, Unlu et al 2007) and two measured cadence (Galea et al 2008, Unlu et al 2007). Although three trials included a self-reported functional measure, the Western Ontario McMaster Universities Osteoarthritis Index (WOMAC) score (Ehrich et al 2000), the 12-Item Hip Questionnaire (Dawson et al 1996), and the Harris Hip Score (Harris 1969), no two studies used the same measure. Objective functional measures, including stair climbing or the 6MWT, varied among the trials. Only one trial used a generic quality of life measure – the Assessment of Quality of Life questionnaire (Hawthorne et al 1999). Because of these differences, function scores and quality of life measures were not meta-analysed and are reported as individual results in the text.

Effect of rehabilitation exercises

Strength: Rehabilitation exercises after discharge were effective for improving hip abductor strength, with a mean between-group difference of 16 Nm (95% CI 10 to 22) as presented in Figure 2. See also Figure 3 on eAddenda for detailed forest plot. For two of the four trials included in this meta-analysis, the intervention was home-based.

The exercises did not, however, have statistically significant effects on the strength of the hip extensors and flexors. The best estimate of the effect on hip extensor strength was close to significant – an improvement of 21 Nm (95% CI –2 to 44) as presented in Figure 4. See also Figure 5 on eAddenda for detailed forest plot. The best estimate of the effect on hip flexor strength was an improvement of 6 Nm (95% CI –2 to 13) as presented in Figure 6. See also Figure 7 on eAddenda for detailed forest plot. Two of the three trials included in these meta-analyses assessed a home-based intervention.

The exercises also did not significantly improve knee extensor strength, although the trend was again favourable with a mean between-group difference of 42 Nm (95% CI –4 to 89) as presented in Figure 8. See also Figure 9 on eAddenda for detailed forest plot. One of the two trials assessed a home-based intervention.

Gait: Rehabilitation exercises after discharge were effective for improving gait speed by 6 m/min (95% CI 1 to 11) as presented in Figure 10. See also Figure 11 on eAddenda for detailed forest plot. Rehabilitation exercises also significantly improved cadence by a mean of 20 steps/min (95% CI 8 to 32) in the one trial that measured it (Unlu et al 2007). Note that this result pools the final data from a home-based group and a supervised outpatient group, and compares them to the control group.

Function: The tools used to measure self-reported function varied between the trials. Jan et al (2004) used the Harris Hip Score, which ranges from 0 (lowest function) to 14 (highest function). Although the Harris Hip Score data in this study indicate a statistically significant benefit from the exercises, the mean between-group estimate equates to only 0.9 points (95% CI 0.2 to 1.6). The authors in this study noted that the participants with higher compliance had a greater benefit. Trudelle-Jackson and Smith (2004) used the 12-item Hip Questionnaire to measure self-reported function and reported a significant between-group difference in medians of 1.5 points ($p = 0.01$) on this scale from 12 (least difficulties) to 60 (most difficulties) favouring the experimental group.

Quality of life: None of the studies comparing rehabilitation exercise after discharge to a no-intervention control measured quality of life.

Effect of home-based versus outpatient rehabilitation exercises

Strength: Only one trial compared the effect of home-based and supervised outpatient rehabilitation exercises on muscle strength (Unlu et al 2007). Although hip abduction in both groups improved, the supervised exercise group improved by 5.4 Nm more, which the authors reported was statistically significant. However, there were very large baseline differences between the groups, which may have influenced their response to the intervention.

Gait: The data from two trials (Galea et al 2008, Unlu et al 2007) were pooled to compare the effects of home-based and supervised outpatient exercises on gait speed and cadence. Gait speed was not significantly improved by supervision of the exercises, with a mean difference of 8 m/min (95% CI –9 to 24), as presented in Figure 12. See also Figure 13 on eAddenda for detailed forest plot. Similarly, cadence was not significantly improved by supervision in the same trials (mean difference 2 steps/min, 95% CI –4 to 8), as presented in Figure 14. See also Figure 15 on eAddenda for detailed forest plot. Galea et al (2008) also measured step length, which did not significantly differ (mean difference 1 cm longer in the supervised exercise group, 95% CI –6 to 7).

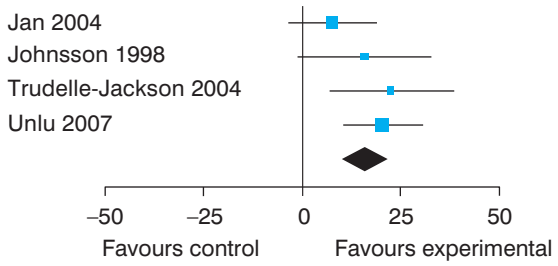

Figure 2. Mean difference (95% CI) of the effect of rehabilitation exercises on hip abductor strength (Nm) in four studies (n = 137).

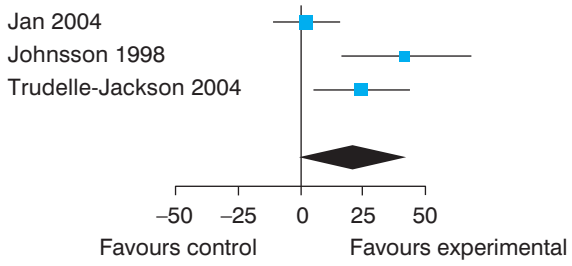

Figure 4. Mean difference (95% CI) of the effect of rehabilitation exercises on hip extensor strength (Nm) in three studies (n = 111).

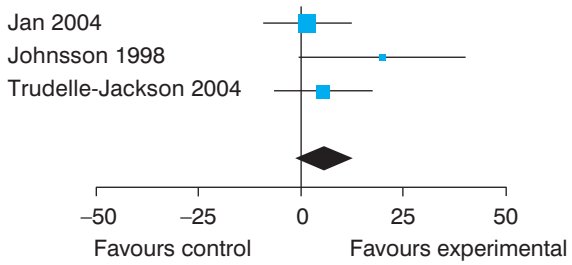

Figure 6. Mean difference (95% CI) of the effect of rehabilitation exercises on hip flexor strength (Nm) in three studies (n =111).

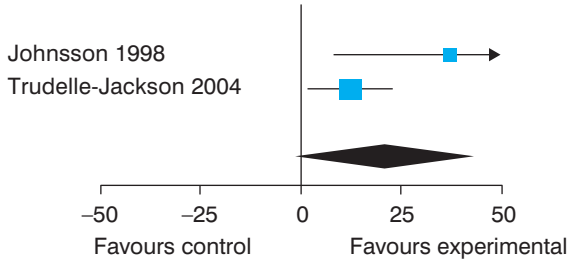

Figure 8. Mean difference (95% CI) of the effect of rehabilitation exercises on knee extensor strength (Nm) in two studies (n = 58).

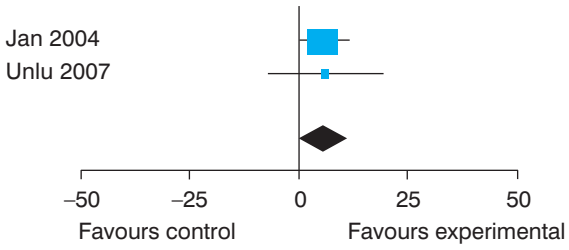

Figure 10. Mean difference (95% CI) of the effect of rehabilitation exercises on gait speed (m/min) in two studies (n = 79).

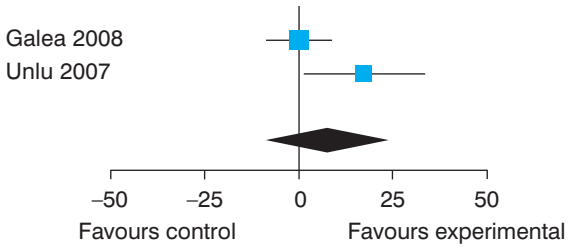

Figure 12. Mean difference (95% CI) between the effects of home-based and supervised outpatient rehabilitation exercises on gait speed (m/min) in two studies (n = 40).

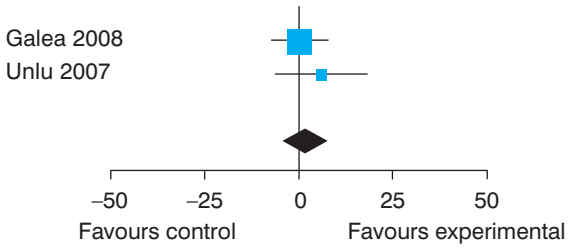

Figure 14. Mean difference (95% CI) between the effects of home-based and supervised outpatient rehabilitation exercises on cadence (steps/min) in two studies (n = 40).

Function: Only the trial by Galea et al (2008) measured function, with both self-reported and objective measures being used. The self-reported outcome was the WOMAC score, which has three domains: pain, stiffness, and function. Although each of the three domains favoured the supervised outpatient exercise group, none was statistically significant. There were three objective measures of function. The Timed Up and Go test was significantly better in the supervised exercise group, by a mean of 1.8 seconds (95% CI 0.1 to 3.5). The time to ascend four stairs did not differ significantly (mean difference 0.2 sec, 95% CI –0.2 to 0.6). Similarly, there were no significant differences in lower limb power (mean difference 26 Nm/s, 95% CI –26 to 78) or the 6-minute walk test (mean difference 31m, 95% CI –54 to 115).

Quality of life: Only the trial by Galea et al (2008) measured quality of life. They used the Assessment of Quality of Life questionnaire, which ranges from 0 (death) to 1 (full health). The two exercise groups did not differ significantly (mean between-group difference 0.05 points in favour of supervised exercise, 95% CI –0.15 to 0.25).

Discussion

This study pooled data from five eligible papers to conclude that post-discharge physiotherapy does provide better patient outcomes after total hip replacement, in terms of strength of hip abductor muscles of the operated leg, gait speed, and cadence. Outpatient supervised rehabilitation provided no better results than unsupervised home exercise programs for most outcome measures, with the exception of the Timed Up and Go test, which was faster in the physiotherapist-supervised group.

The studies included in our review found similar results to other published studies in this area. A non-randomised, controlled trial (Sashika et al 1996) showed that a six-week home program including hip range of motion exercises, isometric exercises, and eccentric strengthening increased strength of hip abductors, walking speed, and cadence. Unlu et al (2007) evaluated a six-week program including the same exercises as Sashika et al (1996), though with two comparison groups: one home based and one supervised by a physiotherapist. Both treatment groups showed an improvement in isometric hip abductor torque, gait speed, and cadence. Di Monaco et al (2009) performed a systematic review of controlled trials of physical exercise programs after total hip replacement, which also supported the usefulness of rehabilitation from late phase (> 8wks post-operative). This review included some of the studies in our review (Jan et al 2004, Trudelle-Jackson and Smith 2004, and Unlu et al 2007), and concluded that for these programs to be effective they should comprise weight bearing exercises with hip abductor eccentric strengthening.

In our systematic review, functional outcomes were measured using a wide range of tools. As a consequence meta-analysis of these data was not possible. The review by Minns Lowe (2009) was also unable to meta-analyse these data and concluded it was not possible to determine whether post-discharge physiotherapy is effective due to insufficient evidence. In the absence of meta-analysis, it is worth considering some details of the trials that demonstrated good outcomes in a range of diverse measures, such as the Timed Up and Go test and self-perceived function. Jan et al (2004) showed that a 12-week home exercise program performed for 60 min daily increased bilateral hip muscle strength, walking speed, and functional score (Harris Hip Score). These improvements were significant in a highly compliant patient group (practice ratio > 50%) and patients from a low-compliance group compared to the controls. Trudelle-Jackson and Smith (2004) showed an 8-week home exercise program, including weight bearing exercises aimed at increasing strength and balance, improved self-perceived function but the control group having isometric and range-of-motion exercises did not improve. Galea et al (2008) prescribed an 8-week program, again with a home and supervised setting, consisting of seven exercises that focused on functional tasks, daily living tasks, balance, strength, and endurance and found significant improvements within each group in quality of life, physical functioning (stair climbing, the Timed Up and Go test and 6-min walk test), and spatiotemporal measures of gait. The Timed Up and Go test was originally intended as a functional measure for elderly people (Podsiadlo and Richardson 1991). A case controlled series by Coulter et al (2009) reported progressively faster Timed Up and Go test scores at each time interval in the study comparing home and supervised physiotherapy, displaying results in comparison with community dwelling older adults (Steffen et al 2002). Because of the range of different measures used, this review could not pool the data for function and quality of life measures and the results of the individual studies were not in agreement. Therefore, despite some favourable evidence, it is not yet possible to establish definitively the effectiveness of post-discharge physiotherapy rehabilitation in terms of improving function and quality of life following elective total hip replacement.

Although this review identified some significant benefits in strength and gait speed due to physiotherapy rehabilitation, it did not demonstrate a difference in outcomes between physiotherapist-prescribed home exercises performed independently and physiotherapist-supervised programs. The positive results in both settings provide an argument for further studies into these types of rehabilitation intervention after hip replacement. Further studies discriminating between supervised and unsupervised programs would provide guidance for clinical practice and resource decisions regarding how to provide post-discharge physiotherapy. In the meantime, home-based exercise programs or supervised physiotherapy can be recommended for this patient group.

Future studies need to include a longer follow-up period to identify whether any improvements are maintained and whether longer term deficits after hip replacement can be addressed. The studies included in this review collected outcomes at the end of the intervention and none had a subsequent follow-up period, except Johnsson et al (1988) with a six-month follow up. There is some evidence that weakness persists several months following hip replacement (Jan et al 2004) and consequently a 12 or 24 month follow-up is recommended.

The search strategy used for this review was comprehensive, but was limited to reviews in the English language. The limited number of eligible, high quality studies and the small sample sizes of those studies prevent a definitive answer for all outcomes in this review. This is particularly the case for functional and quality of life outcomes, where the information was so diverse and sparse that meta-analysis could not be performed. The trials in this review spanned a period of 21 years and therefore some of the data were more difficult to extract from the reports, although where data were measured from graphs the two independent reviewers showed full agreement for all items for all papers.

In conclusion, this review showed that physiotherapy can improve strength and gait speed after total hip replacement. The low number of studies limits the evidence to establish the overall effectiveness of post-discharge physiotherapy for patients who have undergone a primary total hip replacement. More research is required to establish functional and quality of life outcomes, which may be the most important to people recovering from the procedure. More research is particularly required to compare the efficacy of home exercise programs to supervised exercise

programs, especially in regard to relative resource implications. Further well-designed trials are necessary and researchers are encouraged to continue clinical studies to evaluate the full range of effects of physiotherapy in this population. ■

Footnotes: [a]Review Manager 5.1, The Nordic Cochrane Centre, Copenhagen: The Cochrane Collaboration, 2011.

eAddenda: Appendix 1 and 2 available at jop.physiotherapy.asn.au

Ethics: The ACT Health Human Research Ethics Committee and Australian National University Human Research Ethics Committee approved this study. All participants gave written informed consent before data collection began.

Competing interests: Nil.

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Correspondence: Corinne Coulter, Physiotherapy Department, Canberra Hospital, Canberra, Australia. Email: corinne.coulter@act.gov.au

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