ORIGINAL ARTICLE

Land-Based Versus Pool-Based Exercise for People Awaiting Joint Replacement Surgery of the Hip or Knee: Results of a Randomized Controlled Trial

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ABSTRACT. Gill SD, McBurney H, Schulz DL. Land-based versus pool-based exercise for people awaiting joint replacement surgery of the hip or knee: results of a randomized controlled trial. Arch Phys Med Rehabil 2009;90:388-94.

Objective: To compare the preoperative effects of multidimensional land-based and pool-based exercise programs for people awaiting joint replacement surgery of the hip or knee.

Design: Randomized, single-blind, before-after trial.

Setting: Physiotherapy gymnasium and hydrotherapy pool.

Participants: Patients awaiting elective hip or knee joint replacement surgery.

Interventions: Land-based (n=40) or pool-based exercise program (n=42). Each 6-week program included an education session, twice-weekly exercise classes, and an occupational therapy home assessment.

Main Outcome Measures: Participants were assessed immediately before and after the 6-week intervention, then 8 weeks later. Primary outcomes were pain and self-reported function (Western Ontario and McMaster Universities Osteoarthritis Index) and patient global assessment. Secondary outcomes were performance-based measures (timed walk and chair stand) and psychosocial status (Medical Outcomes Study 36-Item Short-Form Health Survey mental component score). Pain was also measured before and after each exercise class on a 7-point verbal rating scale.

Results: Although both interventions were effective in reducing pain and improving function, there were no postintervention differences between the groups for the primary and secondary outcomes. However, the pool-based group had less pain immediately after the exercise classes.

Conclusions: While our multidimensional exercise-based interventions appeared to be effective in reducing disability in those awaiting joint replacement surgery of the hip or knee, there were no large differences in the postintervention effects of the interventions. However, pool-based exercise appeared to have a more favorable effect on pain immediately after the exercise classes.

Key Words: Arthroplasty; Exercise; Occupational therapy; Rehabilitation.

AN INCREASING NUMBER of hip and knee replacements are performed each year throughout the world.[1,2] It is estimated that current numbers could double by the year 2016.[3] This increase has been attributed to the aging population, prosthetic advancements, and an increased number of younger people receiving the operation.[1,2] Lengthy waits for hip or knee joint replacement surgery have been reported in several countries.[4]

People awaiting joint replacement surgery of the hip or knee experience high levels of pain and reduced physical performance,[2] which can have a profound impact on quality of life.[5] Long waits for surgery prolong this experience and could increase disability.

Although it is generally accepted that exercise can reduce pain and improve function in those with lower-limb arthritis,[6] few studies have demonstrated this benefit in those awaiting hip or knee joint replacement surgery. However, methodologic limitations and small sample sizes affected the conclusiveness of many of these trials. A systematic review of randomized trials in those with earlier stage hip or knee OA has demonstrated improvements in pain and physical function after exercise-based interventions.[7] The optimal content of the exercise interventions remains uncertain.[7] Few studies have compared the effects of land-based and pool-based exercise, and few differences in their effects have been found.[8-10]

This study aimed to determine whether 2 different exercise-based interventions, together with education and a home environment assessment, might improve the preoperative status of those awaiting joint replacement surgery of the hip or knee. Additionally, it aimed to determine whether land-based exercise or pool-based exercise was more effective in reducing disability, and whether 1 form of exercise was better tolerated than another.

List of Abbreviations

ANCOVA	analysis of covariance
ANOVA	analysis of variance
BMI	body mass index
ES	effect size
GAC	global assessment of change
MCS	mental component score
OA	osteoarthritis
SF-36	Medical Outcomes Study 36-Item Short-Form Health Survey
WOMAC	Western Ontario and McMaster Universities Osteoarthritis Index

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METHODS

Study Population

Volunteers were recruited from the surgical waiting list of a tertiary health care provider in regional Victoria, Australia. Patients were eligible if they were on the waiting list for joint replacement surgery of the hip or knee. Subjects were excluded if only tibial osteotomy was to be performed, if they were currently completing a physiotherapy program, if surgery was scheduled before completion of the 6-week supervised program, if they were not medically fit to complete an exercise program as assessed by their local doctor, or if they had inadequate communication skills in English. Subjects were not excluded if they had previously had physiotherapy, including physiotherapy for their affected joints. They were not excluded if they completed a self-directed exercise program or a group exercise program under the direction of a lay instructor. Participants were recruited over a 10-month period.

Ethics approval for this study was obtained from the relevant clinical facility and university. Informed consent was obtained from all participants.

Randomization and Allocation

Subjects were recruited into the investigation by the primary author and allocated to a group by a research assistant. Allocations were sealed in envelopes, each bearing the subject's name. After completion of the baseline assessments, each subject was then given the envelope. Eligible subjects were randomly assigned to either a land-based or pool-based intervention, stratified according to whether the hip or knee was to be replaced, using a random numbers table.

Interventions

Exercise classes were completed in groups of 4 to 6 participants under the instruction of a physiotherapist. Classes for both the land-based and pool-based exercise programs were conducted twice a week for 6 weeks, with each session lasting 1 hour.

Exercises were completed at a moderate intensity between 12 and 14 on the Borg Rating of Perceived Exertion Scale.[11]

The initial class for both groups was a 60-minute education session that included the pathogenesis of advanced OA and disability and the principles of healthy exercise.

The land-based exercise sessions were held in a physiotherapy gymnasium, and the pool-based exercises were conducted in a hydrotherapy center. The exercises were designed to be simple and easily reproduced (appendix 1). A $6 fee was charged for each exercise session.

All participants were asked to complete 30 minutes of exercise at home, 3 times a week, including walking, riding a stationary bike, or performing exercises similar to those completed in the supervised classes. After the 6-week intervention, participants were encouraged to continue to exercise at home until the follow-up assessment. Throughout the investigation, participants kept a log book of compliance.

All participants received a home visit and environmental assessment from an occupational therapist, similar to that described by others.[12]

Outcome Assessment

In accordance with the Outcome Measures for Arthritis Clinical Trials recommendations,[13] the primary outcome measures for this investigation were pain and physical function, as assessed by the WOMAC,[14] and patient GAC. For the GAC, we designed a 7-point verbal rating scale similar to that used by Middel et al.[15] The secondary outcomes measures included the 50-Foot Timed Walk[16] and 30-second Chair Stand Test[17] as performance-based measures, and the SF-36 MCS[18] as a measure of psychosocial well being. To determine how well each exercise class was tolerated, we assessed pain immediately before and after the class, as well as pain the next day, using our own 7-point verbal rating scale, ranging from no pain to severe pain.

Blind assessment occurred immediately before and after the 6-week intervention, and 8 weeks afterward. All assessors were trained and assessed for competence by the primary author.

Statistical Analysis

For the primary and secondary outcomes, within-group and between-group comparisons were assessed using a 3×2 repeated-measures ANOVA. To control for any baseline differences, between-group differences found by ANOVA were explored with ANCOVA, and ESs were calculated accordingly.[19] Paired *t* tests were used to explore significant within-group main effects. Because GAC data were ordinal, between-group differences were assessed using the Mann-Whitney *U* test.

To facilitate analysis, pain scores immediately before and after each exercise class were converted to a 1 (no pain) to 7 (severe) scale. Scores were then averaged over the 6-week program.

Based on previous studies,[8-10] large differences between the groups were not expected. To have an 80% chance of detecting a medium-sized effect (P=.05, 2-sided), 64 subjects were required in each group.[20]

RESULTS

Participants

Figure 1 describes the flow of participants through each stage of the investigation. Of the 86 participants assessed at baseline, 4 subjects (2 from each group) refused the exercise group to which they were allocated and were removed from the study.

The baseline characteristics of the sample are presented in table 1. The average age ± SD of the sample was 70.3±9.8y (range, 30–89y). Most participants were older adults, with just 3 participants under the age of 50 years. On average, the sample was obese (BMI ≥30).[21] Only 8 participants were in their healthy BMI range (19.0–24.9).[21] One third of participants engaged in regular exercise prior to commencing the intervention. Most participants (n=76, 92.6%) indicated that pain was the main reason for surgery. Inspection of baseline scores indicates that participants in both groups were similar for most baseline characteristics.

Intervention

Exercise classes were well attended, with an average of 10.5 and 9.8 of the 12 classes attended by the land-based and pool-based groups, respectively. Reasons for nonattendance were usually other commitments or feeling unwell. Compliance was also high with the home exercise program, with participants of the land-based and pool-based groups reporting a mean of 3.8 and 3.7 sessions of exercise at home each week. After the 6-week intervention, participants reported 2.8 and 2.9 sessions of exercise a week in the land-based and pool-based groups, respectively. Each home exercise session averaged 30 to 45 minutes in duration.

Apart from transient musculoskeletal soreness, no adverse events occurred as a result of the intervention.

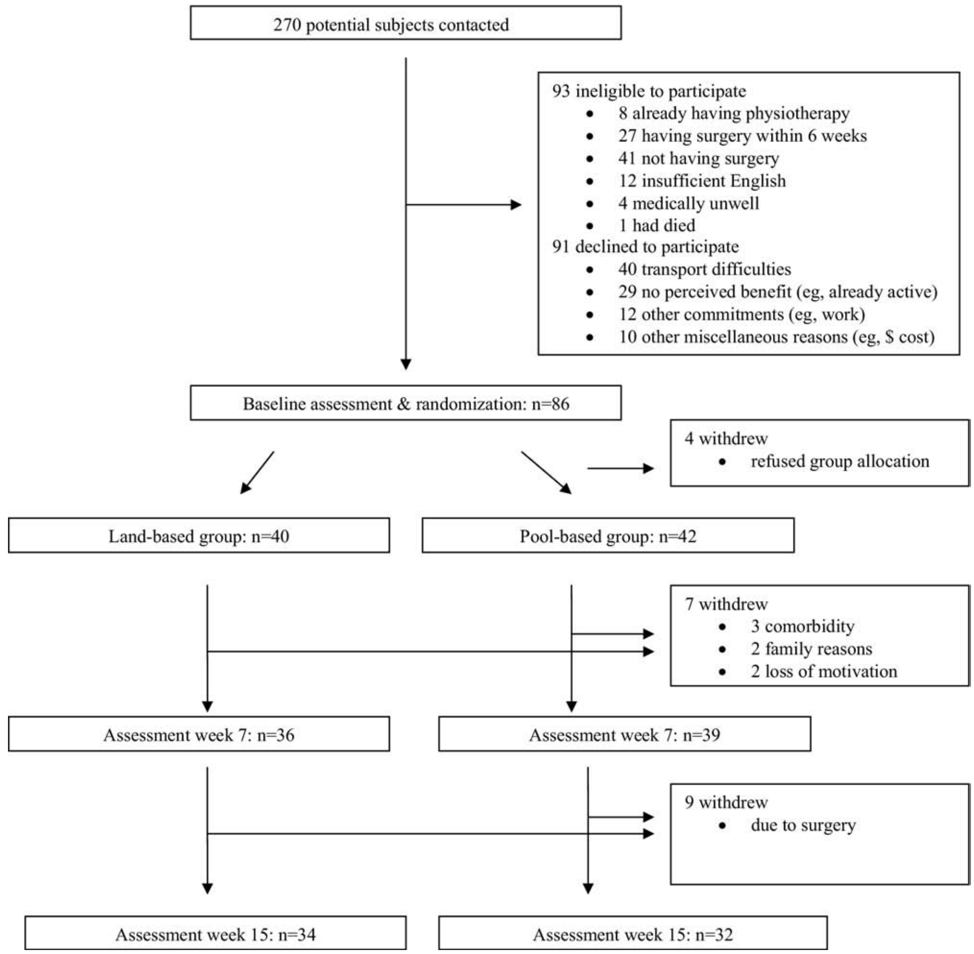

Fig 1. Participant recruitment and participation.

Primary Outcome Measures

There were no significant differences for the main effect of group for both WOMAC Pain (F=.257; *P*=.614) and WOMAC Function (F=.112; *P*=.739; table 2). There was a significant main effect for time for both measures (*P*=.000). Post hoc paired *t* tests for WOMAC Pain found that both the land and pool groups demonstrated a significant improvement between baseline and week 7 assessments (land, *P*=.000; pool, *P*=.011), but only the land-based group showed a significant improvement between baseline and week 15 assessments (land, *P*=.015; pool, *P*=.431). For WOMAC Function, both groups showed a significant improvement between baseline and week 7 assessments (land, *P*=.000; pool, *P*=.016) and for the baseline to week 15 assessments (land, *P*=.012; pool, *P*=.045).

According to the GAC, 85% (n=64) of the 75 subjects assessed at week 7 reported an overall improvement as a result of the intervention. Seventy-one percent of participants reported improving either moderately or a lot. The distribution of responses was very similar between the 2 groups ($z=-.130$; *P*=.896).

Secondary Outcome Measures

There were no significant between-group differences for the 50-Foot Timed Walk, 30-second Chair Stand Test, or SF-36 MCS (see table 2). However, consistent with the primary outcome measures, there were significant main effects for time for the 50-Foot Timed Walk and 30-second Chair Stand Test. Post hoc analysis with paired *t* tests revealed significant improvements between the baseline and week 7 assessments for both groups and both tests ($P<.05$, all comparisons), but only the 30-second Chair Stand Test demonstrated a significant improvement between baseline and week 15 assessments ($P<.05$, both groups).

A significant interaction effect was found for pain scores immediately before and after the exercise classes (F=8.595; *P*=.005). Post hoc ANCOVA revealed significant differences between the groups, with the pool-based group reporting less pain both immediately after the exercise class and the next day (table 3). The ES was small.[19] Statistically significant within-group comparisons revealed that the pool-based group showed a reduction in pain when pre-exercise class pain scores were compared with postexercise class pain scores (*P*=.000). In contrast, the land-based group demonstrated an increase in pain when pre-exercise class pain scores were compared with next day pain scores (*P*=.001).

DISCUSSION

Synopsis of Results

Our results failed to demonstrate significant postintervention differences between the land-based and pool-based interventions. However, the pool-based group appeared to have less pain than the land-based group both immediately after the exercise session and the next day. After the intervention, sub-

Table 1: Baseline Characteristics

Characteristics	Land-Based Group n=40	Pool-Based Group n=42
Age (y)	71.6±8.9	69.2±10.5
Female	23 (57.5)	28 (66.7)
Surgery type		
TKR	15 (37.5)	20 (47.6)
TKR bilateral	8 (20.0)	4 (9.5)
THR	17 (42.5)	18 (42.9)
THR bilateral	0	0
Previous joint replacement	8 (20.0)	6 (14.3)
BMI (kg/m²)	31.0±5.3	31.1±5.9
Joint pathology		
OA	39 (97.5)	41 (97.6)
RA	1 (2.5)	1 (2.4)
Current exercise program*	15 (37.5)	12 (28.6)
WOMAC Pain (0–20)	11.5±3.1	11.4±3.1
WOMAC Function (0–68)	36.8±13.2	37.8±9.9
SF-36 MCS (mean=50)	52.2±10.9	48.1±11.6
30-second Chair Stand Test (number of stands)	6.3±3.4	6.1±3.1
50-Foot Timed Walk (s)	14.9±4.9	16.8±9.3

NOTE: Values are means ± SDs, and the numbers in the parentheses indicate proportions for the ordinal/categorical data.
Abbreviations: RA, rheumatoid arthritis; THR, total hip replacement; TKR, total knee replacement.
*Current exercise program: planned activity on a set basis (daily, weekly) incorporating 1 or more specific exercises to improve physical condition.

jects reported moderate to large global improvements that concurred with significant within-group improvements in pain and function.

Baseline Characteristics

The baseline characteristics of our sample are consistent with other reports of moderate to severe pain[2] and poor physical function[22] in those awaiting joint replacement surgery of the hip or knee. Although surgery is usually successful at improving these factors,[2,22] long waiting times reinforce the need to provide effective interventions to reduce the burden of pain and disability in this expanding population.

Most participants were outside their healthy weight range, being either overweight (39%) or obese (51%). Numerous others have reported similar findings.[23] Considerable evidence has linked obesity with an increased risk of developing OA[23] and requiring joint replacement surgery.[24] A smaller body of evidence showed that obesity is a risk factor for pain[25] and disability.[26] Messier et al[27] reported that a combination of diet and exercise produced greater improvements in function than either treatment in isolation. Although the educational component of our intervention noted the importance of a healthy diet and body weight, because an intensive weight loss program was included, the improvements demonstrated by participants might have been enhanced.

Table 2: Between-Group Comparisons: Land-Based Versus Pool-Based Groups

Groups	Baseline	Week 7	Week 15	*P*
WOMAC Pain				
Land (n=34)	11.6±3.0	9.2±3.7	10.0±2.3	.614
Pool (n=32)	11±3.7	10.1±2.9	10.3±3.4	
WOMAC Function				
Land (n=34)	36.9±12.9	29.2±12.7	32.2±12.4	.739
Pool (n=32)	36.0±10.3	32.3±10.4	32.6±10.7	
50-Foot Timed Walk				
Land (n=34)	14.4±4.9	13.1±3.5	14.5±5.1	.173
Pool (n=31*)	15.8±6.3	13.6±4.6	15.0±4.6	
30-second Chair Stand Test				
Land (n=34)	6.8±3.6	9.7±4.3	8.8±4.7	.179
Pool (n=31*)	6.5±3.4	7.8±4.0	7.3±4.1	
SF-36 MCS				
Land (n=34)	52.1±9.6	55.7±9.3	51.9±12.1	.205
Pool (n=32)	49.5±10.8	50.6±11.2	51.2±10.5	

NOTE. Values are means ± SDs unless otherwise indicated.
*One subject was unable to attend the week 15 assessment session. This subject completed only the questionnaires (by post).

Table 3: Change in Pain Intensity Before and After Each Exercise Class: Between-Group Comparisons

Mean* ± SE Land (n=34)	Mean* ± SE Pool (n=30)	Difference Between Means† (95% CI)	*P*	ES‡ (95% CI)
Pain immediately after the exercise session: land vs pool				
3.08±.08	2.78±.09	.30 (.05–.54)	.019	.33 (.06–.60)
Pain the day after the exercise session: land vs pool				
3.49±1.0	3.11±1.1	.38 (.09–.67)	.011	.37 (.09–.69)

Abbreviations: CI, confidence interval; SE, standard error.
*Adjusted mean score from ANCOVA.
†Differences between the means are calculated as land score minus pool score.
‡Positive ES indicates difference in favor of the pool-based group.

Between-Group Comparisons

To our knowledge, this is the first study to compare directly the effects of land-based exercise and pool-based exercise in subjects awaiting joint replacement surgery of the hip or knee. Of the small number of studies that have compared the effects of land-based and pool-based exercises, few differences have been found.[8-10] Notably, Foley et al[10] investigated the effectiveness of a 6-week land-based or pool-based exercise program for measures of pain and physical function in 105 community-residing adults with hip or knee OA, 44% of whom were on the waiting list for surgery. Of the 6 measures used, including the WOMAC, only right quadriceps strength indicated a difference between the groups ($P=.03$). More recently, Silva et al[28] compared the effects of land-based and pool-based exercise in 64 subjects with knee OA. Although both groups demonstrated improvements over the course of the 18-week intervention, only 1 measure, pain before and after the 50-Foot Timed Walk, demonstrated a difference between the groups. Others measures, including the WOMAC and visual analog scale for pain, indicated no differences between the groups. Research by others has also failed to find large differences between the effects of land-based and pool-based exercise,[8,9] suggesting that exercise rather than environment could be the common causative agent in producing the effects. However, these studies had small sample sizes such that medium or smaller differences might have gone undetected.

Consistent with clinic practice,[5] our interventions included a home exercise program. The home exercise program was designed to be simple and easily reproduced and to augment the effects of the supervised exercise classes. However, because most participants completed a land-based home exercise program, any between-group differences that occurred because of the land-based and pool-based exercise classes could have been moderated. By not including a home exercise program, we might have been more likely to detect a significant between-group effect; however, in doing so, the beneficial effects of the intervention might have been reduced.

Our results provide empirical support for suggestions that pool-based exercises might improve pain and be better tolerated than land-based exercise.[29] Inspection of pain scores for the land-based group over the duration of the 6-week program indicated that increases in pain were most noticeable in the first 2 or 3 sessions. Because there was no such trend for the pool-based group, it appears that land-based exercise has a more marked period of adjustment to the demands of exercise. By recognizing this, both the patient and clinician can prepare by ensuring that exercises commence at the appropriate intensity by considering the participants' preprogram activity levels, and by using appropriate postexercise pain management techniques.

Although the types of exercises differed, the exercise environment was the most notable difference between the 2 groups. This might explain why the pool-based group appeared to have less pain after the exercise classes. Buoyancy, hydrostatic pressure, and thermotherapy might combine to produce beneficial effects on pain after pool-based exercise. Thermotherapy is a widely recognized treatment modality in OA[30] and is recommended in clinical practice guidelines[31]; however, there is little empirical evidence to support its common use.[30] Further research is required to understand the mechanisms of how both pool-based and land-based exercise might affect short-term changes in pain.

Most studies in this population have found limited improvements after preoperative exercise interventions. Although methodologic constraints and small sample sizes might have contributed to this, most interventions have been unidimensional, such that exercise was the only component of the intervention. In recognition of the multidimensional nature of pain and disability in chronic disease,[32] our intervention included group classes (as opposed to individual treatments), an education session, and a home assessment. By including these components, psychologic, behavioral, social, and environmental factors might have been influenced, which could be a key reason why our interventions consistently demonstrated improvements. In other populations with chronic pain such as low back pain, there has been a conceptual shift away from unifactorial to multifactorial treatment models.[33] When the results of this investigation are compared with others in this population, it appears that this conceptual shift might also be required.

Week 15 Follow-Up Assessment

Week 15 follow-up data indicated that subjects maintained a significant improvement from the baseline assessment on many of the measures. Ongoing participation in a home exercise program might have contributed to this effect. Teaching patients to manage their health independently, in this instance through exercise, is an essential component in helping those with chronic health conditions. However, not all measures indicated a sustained improvement. This relative deterioration could indicate that attending a professionally supervised group program is a vital ingredient to the success of our intervention. This environment encourages compliance, correct technique, and progression with the exercise program, and allows motivational psychosocial interactions between the therapist and participants.

Postoperative Outcomes

Numerous studies have found that preoperative status predicts postoperative outcomes.[1,34] Although few studies have shown that preoperative exercise programs improve postoperative outcomes,[35] most of these studies also failed to demonstrate improved preoperative outcomes. Designing programs that successfully change the preoperative status of patients appears to be a reasonable prerequisite for improving postoperative status. Already, reductions in postoperative inpatient length of stay have been demonstrated for participants in preoperative programs.[36,37] Fiscal savings from reduced length of stay could outweigh the costs of providing preoperative programs.

Table 4: Resistance Exercises for Land-Based Exercise Program

Land-Based Resistance Exercises	Starting Technique*	Progressions	Regressions
Heel raises	Rise onto both toes simultaneously. Hold a support for balance.	1. Decrease upper-limb support 2. Single leg heel raises 3. Increase repetitions	1. Increase upper-limb support 2. Decrease amplitude 3. Decrease repetitions
Chair stands	Sit near edge of chair. Stand without use of arms. Fully sit between repetitions.	1. Do not fully sit between repetitions 2. Increase repetitions	1. Allow upper-limb use 2. Add cushion to raise height of chair 3. Decrease repetitions
Bridges	Lie on back. Bend hips/knees to comfortable level, raise buttocks fully, arms resting on plinth by side.	1. Place arms across chest 2. Straighten 1 leg along plinth (repeat exercise for both legs, 2 × 10) 3. Lift 1 leg off plinth and hold in air (repeat exercise for both legs, 2 × 10) 4. Increase repetitions	1. Decrease amplitude of lift 2. Decrease repetitions
Step up/down	Place one foot on 10-cm step. Step second leg onto step, then step it back down again.	1. Do not allow stepping leg to touch step or ground with each repetition 2. Increase height of step to 15cm, then 20cm, then 30cm	1. Increase upper-limb use on rail 2. Decrease height of step to 5cm

*Exercises commenced at 2 × 10 repetitions, emphasizing controlled isotonic movements.

Table 5: Pool-Based Exercise Program

Pool Exercises	Variations	Progressions	Regressions
Walking (20–30min)	Forward Backward Sideways Lunge walking Heel walking Toe walking	Walk faster Deeper water† Deeper lunges	Walk slower Shallower water Shallower lunges
Lower-limb ROM exercises in standing*(10min)	Hip/knee flexion Hip abduction/adduction Hip extension Knee flexion	Faster movement Bigger floatation device Less upper-limb support	Slower movement Smaller floatation device More upper-limb support
Squats (2 sets of 10 repetitions)		Shallower water Deeper squat Single leg squat	Deeper water Shallower squat
Lower-limb ROM exercises in supine (10min)	Hip abduction/adduction Hip extension Cycling	Faster movement	Slower movement

Abbreviation: ROM, range of motion.
*A noodle or cuff float was placed below the foot or attached to the moving leg of each participant. Subjects who required assistance for balance held onto kick boards placed flat on top of the water. Subjects who were still unable to maintain their balance held onto a rail at pool side.
†Walking in deeper water increased the volume of water needing to be displaced to move forward; hence, walking in deeper water was seen as a progression.

Study Limitations

This study failed to reach its sample size targets because recruitment was lower than expected during the funded period. Consequently, our study had sufficient power to detect only large differences, and small to medium differences could have gone undetected.[20] Of the 177 subjects eligible for participation in this investigation, 91 (51%) declined. The most common reason was transport difficulties (n=40, 44%), particularly the time and distance to get to the location of the intervention. Rooks et al[37] recruited just 12% (n=108) of eligible patients and reported that transport difficulties were the primary obstacle to attendance. In our study, the second most common reason was no perceived benefit (n=29, 32%). These patients reported that they were already active but notably, none were currently completing a structured exercise program. Clinicians should be aware of these barriers to recruitment and conduct interventions at locations convenient to patients, possibly at multiple centers. Having local doctors and orthopedic surgeons encourage patients to attend because of the demonstrable benefits may further enhance recruitment.

All exercise classes were supervised by the same therapist. Because many of the benefits realized by our interventions could have been facilitated through the psychosocial interactions between the therapist and participants, our results might not generalize to different therapists with differing skills, interests, and motivations. Because we did not include a no intervention group, some of the improvements found within each group could be attributable to Hawthorne effects.[38]

Changes in medication during the course of the intervention could have influenced both pain and function scores at reassessment independent of the intervention. Although manipulating medication usage was beyond the scope of this intervention, participant self-report at the week 7 assessment indicated little change from baseline in the type or timing of medication use.

CONCLUSIONS

Our interventions were based on common clinical practice; hence, they should be easily reproduced in clinical settings. Because no large postintervention differences were found between the groups, either form of therapy appears justifiable. However, given that the facilities required for a land-based exercise program are more readily available and considerably cheaper than the pool-based alternative, there is good reason to prescribe the land-based program. However, pool-based participants reported less pain immediately after each exercise session and the next day, and because pain is the primary concern of people with arthritis, interventions that more successfully address pain are attractive to patients.

This investigation provides empirical evidence that interventions including exercise, education, and environmental modification reduced pain and improved function in those awaiting joint replacement surgery of the hip or knee. Although there appeared to be no large postintervention differences between land-based and pool-based interventions, pool-based exercise resulted in less pain immediately after the exercise class. Interventions designed around a multidimensional model of health are recommended.

Acknowledgments. We thank Carly Middlin, OT, who designed and supervised the home assessments.

APPENDIX 1: FORMAT OF EXERCISE CLASSES

Land-based program: 5 to 10 minutes of forward, sideways, and backward walking; 20 minutes pedaling a stationary exercise bike; resistance exercises (table 4); calf, hamstrings, and quadriceps stretches (2 sets of 30 seconds).

Pool-based program: walking and active range of movement exercises (table 5); calf, hamstring, and quadriceps stretches (2 sets of 30 seconds).

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