



RACER

Robotic Arthroplasty:
A Clinical and cost Effectiveness
Randomised controlled trial



Physiotherapy Manual

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INTRODUCTION AND BACKGROUND TO THE RACER TRIAL

The RACER Trial is an NIHR-funded trial which aims to determine whether robotic total knee replacement (TKR) is clinically and cost-effective when compared to TKR using conventional instruments.

We will determine this based on pain in the first three days after surgery, from what people tell us in a questionnaire one year after surgery, and on the balance between the cost of the device and any benefit it might have.

Three-hundred and thirty two people will take part across a number of NHS trusts across the UK. Everyone taking part will have a CT scan which will be used to develop a computer plan for the operation, which has a small radiation dose. They will then be assigned at random to either have surgery performed using standard instruments or using a robot. The participants will not find out whether they had the robot or not until the end of the study. People will have two additional small cuts to the skin which are needed for the robot to monitor the position of the leg. Everyone in the study will have the extra skin cuts so they cannot tell which treatment they received.

Participants undergoing either of these two operations follow the same post-operative rehabilitation process as per standard care. All participants are assessed before discharge as to whether they require post-operative physiotherapy referral. All patients will be provided with a series of exercises within a discharge booklet, and self-direct their rehabilitation. If the ward physiotherapy team feel that an out-patient physiotherapy referral would be beneficial, for whatever reason, then participants will be referred to their usual rehabilitation service, as per standard care.

We will ask participants about how much pain they have on each day after the operation, for three days. We will record blood loss and the number of painkillers they use, and the time they are in hospital. At 6 weeks how their general health is. At three, six and twelve months after the operation, we will ask participants about how their knee feels, how satisfied they are, how their general health is, and whether they have had any problems after the surgery. We will also ask these questions two, five and ten years after the operation. We will perform a CT scan of the knee and an x-ray of the whole leg after three months to measure the position that the knee replacement was put in, there is a very small dose of radiation from this.

We will use this information to decide whether robotic knee replacement or standard knee replacement give the best results for people undergoing knee replacements. We will also compare the costs and work out whether robots provide good value for the NHS, or whether we should stop using them.

HOW TO USE THE RACER PHYSIOTHERAPY MANUAL

The purpose of this manual is to provide support and guidance on what the research team anticipate would be routine rehabilitation for these patients. The exercises listed in this manual mirror those outlined within the patient discharge booklet. You may feel that your patient may require additional physiotherapy exercises or treatment. This is permitted in the RACER trial design and, therefore, do not withhold any physiotherapy interventions that you feel are clinically warranted.

There are no limitations on where your patients are seen (one-to-one or group), who sees them (assistant, technical instructors, or qualified member of the team), or if any other interventions (manual therapy, hydrotherapy, orthotics, onward referral) are made. This manual merely acts to guide your interventions.

We will not collect any information from you on what interventions you use or the frequency with which you see your patients and there is no additional paperwork which we require from you. Included in this guide (and the patient discharge booklet) is a home exercise diary. You may find this helpful for your patients to aid their engagement and compliance with home exercises so please feel free to use this.

We have also included a Physiotherapy Treatment Log at the end of this Manual. This can be useful to help monitor what physiotherapy treatments are offered and delivered in the sessions. This is an optional document which you may choose to use if you feel it is useful in monitoring your interventions.

If you have any questions regarding any aspect of the trial, please feel free to contact the research team on 02476 968629 or at RACER@warwick.ac.uk

OUT-PATIENT EXERCISES

The following exercises are outlined in the participant discharge booklet which each participant has received and are, therefore, imagined to be the cornerstone of recovery. Please feel free to use as many of these exercises as you feel clinically indicated. Equally if you feel that additional interventions are warranted, this is also permitted.

The patient home exercise diary is included at the end of this manual, it is not mandatory and will not be collected for the study, but please feel free to use this for your patients as an additional option to aid their compliance and understanding of the home exercise programme.

Using the Borg Scale of Perceived Exertion of Moderate activities, participants should be aiming to register 11 to 14 on the Borg scale ('fairly light' to 'somewhat hard'), progressing to 'strenuous activities' registered 15 or higher ('hard' to 'very, very hard') depending on their capabilities. It is beneficial to monitor this throughout each session to ensure that participants are exercising to the sufficient level i.e. neither over- or under-exercising both in frequency and level of effort.

Exercises have been divided into STARTER and PROGRESSOR EXERCISES. Participants should commence on the STARTER exercises. Once you and they feel that they are managing these easily, please progress them to the PROGRESSOR EXERCISES.

We recommend that participants exercise for as long as they feel beneficial at home, 2 to 4 times a day if possible. Therefore, whilst the diary goes to 6-weeks, please feel free to encourage your participants to get into good habits of exercising their knee, not only throughout the initial 3 months post-operatively, but also long-term.

The following exercises are outlined as:

1. Bed-based Exercises
2. Chair-based Exercises
3. Standing Exercises
4. Walking
5. Physical Activity Recommendations

1 BED-BASED EXERCISES

1A - STARTER EXERCISE: THIGH SQUEEZES

Lying down or slightly reclined with a rolled-up blanket under your knee so that it rests in a bent position, lift your foot off the bed whilst keeping your thigh on the blanket; straighten your knee as fully as possible. Hold for 5 seconds Repeat 10 times.



1B - STARTER EXERCISE: STRAIGHT LEG RAISE

Lie down or slightly reclined. Lock your knee straight. Lift your whole leg 10cm/4 inches off the bed. Aim to keep your leg straight. Hold for 5 seconds. Repeat 10 times.



1C - PROGRESSOR EXERCISE: STRAIGHT LEG RAISE (WITH WEIGHTS OR EXERCISE BANDS)

To make the exercise more challenging, this can be done against the exercise band * or with a 1 kg weight around your ankle.



- A 2 meter green exercise band will be given to participants with the Rehabilitation Booklet.

1D - STARTER EXERCISE: CALF STRETCHES

Lying down or slightly reclined with a rolled-up blanket under your ankle so that the back of your knee is off the bed; straighten your knee as fully as possible. Hold for 5 seconds Repeat 10 times.



1E - PROGRESSOR EXERCISE: CALF STRETCHES (WITH SHEET OR TOWEL)

To increase the stretch on the calf, wrap a rolled up sheet or large towel around your foot, holding the two ends in your hands. Pull the two ends so your foot is pulled towards your head. Hold the stretch for 5 seconds. Repeat 10 times.



2 CHAIR-BASED EXERCISES

2A - STARTER EXERCISE: KNEE BENDING IN SITTING

Sit on a chair with your feet on the floor. Bend your knee as much as possible. Use your other leg to push your knee back a little further (see photograph below). Repeat 10 times.



2B - PROGRESSOR EXERCISE: (WITH RESISTANCE BANDS)

To make the exercise more challenging, an exercise band can be securely attached in front of you, for example to the leg of a table, and around the ankle of the leg you are training. Bend your knee against the resistance by sliding the foot backwards on the floor. In a controlled manner, return to the starting position. Repeat 10 times.



2C - STARTER EXERCISE: SEATED LUNGE (FLEXION)

Sitting, bend your operated leg back as far as you can. Keep your foot flat on the floor and do not allow it to move forwards. Slide your bottom forwards on the chair. Repeat 10 times.



2D - STARTER EXERCISE: KNEE STRAIGHTENING IN SITTING

Sit up straight on a sturdy chair, so that your feet are supported on the floor. Bend your ankle and straighten your knee using your front thigh muscles. In a controlled manner, return to the starting position. Repeat 10 times.



2E - PROGRESSOR EXERCISE: KNEE STRAIGHTENING IN SITTING (WITH RESISTANCE BANDS)

To make the exercise more challenging, this can be done against the exercise band or with a 1 kg weight around your ankle. Repeat 10 times.



3 STANDING EXERCISES

3A - STARTER EXERCISE: MINI-SQUATS

In standing, hold onto a stable surface. Slowly bend your knees. Keep your heels on the floor. Slowly return to standing by straightening your knees. Repeat 10 times.



3B - STARTER EXERCISE: BALANCE EXERCISE

Standing at a kitchen work surface or study chair. Stand on your un-operated leg only, hovering your hands over the support. See how long you can balance on one leg. Aim for 30 seconds. Try the same thing with your operated leg.



3C - PROGRESSOR EXERCISE: BALANCE EXERCISE (EYES CLOSED TAPPING THE SUPPORT)

To make this harder, try with your eyes closed or try to tap the support in front of you to tap out a count of 10.



3D - PROGRESSOR EXERCISE: 3B AND 3C WHILE BALANCING ON PILLOW/CUSHION

To progress this further, see if you can do these balancing activities standing on a cushion or pillow. Just make sure that the surfaces aren't slippery under the pillow, so you stay safe.



4 WALKING

We recommend that patients walk as a key part of their recovery. Please support patients to consider how they can incorporate walking into their routine daily lives. Following the principles of pacing and graded activity to progress from their baseline capabilities to achieve their goals in walking. Encouragement to increase both walking distance and walking speed should be made. Progression on walking aids would be considered where appropriate.



5 PHYSICAL ACTIVITY RECOMMENDATIONS

Please have open discussions with your patients regarding their goals for physical activity and progression on meaningful activities. Explore issues regarding return to work, return to household activities, engaging in community and social activities and physical pursuits which the individuals may wish to return to but have been limited by their previous knee pain. Goal setting and prioritising activities should be encouraged.

APPENDICE 1: RACER TRIAL: EXAMPLE PATIENT EXERCISE DIARY

This diary is meant to help participants track the amount of rehabilitation exercise people do in their own home.

Participants should be asked to **tick** the exercises, if any, they managed to performed each day once they go home after their operation.

Racer Exercise Diary																					
Exercises – START DATE: ___/___/___	Week 1							Week 2							Week 3						
Number of days in the week from 1st day you leave hospital:	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
1A - Thigh Squeezes																					
1B - Straight leg raise																					
1C - Straight leg raise (with bands or 1 Kg weight)																					
1D - Calf Stretches																					
1E – Calf Stretches (with sheet or towel)																					
2A - Knee bending in sitting																					
2B – Knee bending in sitting (with resistance bands)																					
2C - Seated lunge (flexion)																					
2D - Knee straightening in sitting																					
2E - Knee straightening in sitting (with resistance bands)																					
3A - Mini Squats																					
3B - Balance exercises (one leg stance)																					
3C - Balance exercises (one leg stance, progressing to tapping support surface 10 times)																					
4 - Walking exercises (weight-transference, carrying objects, slalom, different speeds)																					
5 - Other physical activities recommended																					

Racer Exercise Diary																					
Exercises – START DATE: ___/___/___	Week 4							Week 5							Week 6						
Number of days in the week from 1st day you leave hospital:	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
1A - Thigh Squeezes																					
1B - Straight leg raise																					
1C - Straight leg raise (with bands or 1 Kg weight)																					
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4 - Walking exercises (weight-transference, carrying objects, slalom, different speeds)																					
5 - Other physical activities recommended																					

APPENDICE 2: PHYSIOTHERAPY TREATMENT LOG OF EXERCISE CLASS CONTENT

This Physiotherapy log can be used to monitor what patients did in the physiotherapy treatment received following their RACER surgery.

It is meant to be a helpful tool and its completion is not mandatory.

Session	1	2	3	4	5	6
Date of Session:						
1A - Thigh Squeezes						
1B - Straight leg raise						
1C - Straight leg raise (with bands or 1 Kg weight)						
1D - Calf Stretches						
1E – Calf Stretches (with sheet or towel)						
2A - Knee bending in sitting						
2B – Knee bending in sitting (with resistance bands)						
2C - Seated lunge (flexion)						
2D - Knee straightening in sitting						
2E - Knee straightening in sitting (with resistance bands)						
3A - Mini Squats						
3B - Balance exercises (one leg stance)						
3C - Balance exercises (one leg stance, progressing to tapping support surface 10 times)						
3D - Balance exercises (one leg stance, progressing to tapping support surface or safely balancing on pillow/cushion)						
4 - Walking exercises (weight-transference, carrying objects, slalom, different speeds)						
5 - Other physical activities recommended						