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Anterior knee pain (patellofemoral dysfunction)

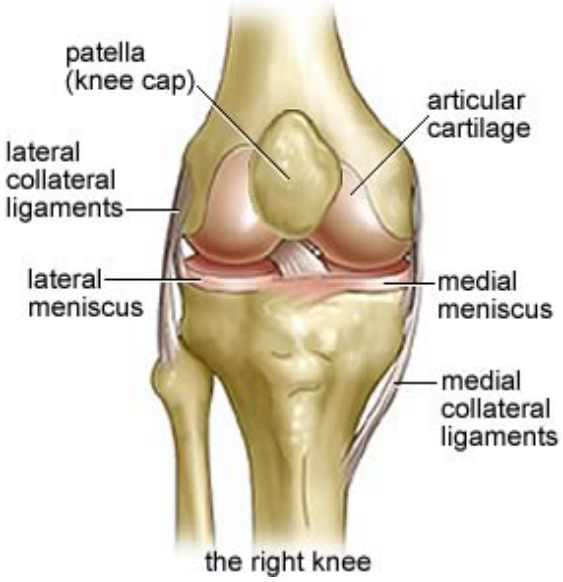
This leaflet gives advice and exercises to help you manage your knee pain. If you have any queries after reading it, please discuss with your physiotherapist or contact the physiotherapy department on 0118 322 7812 Monday to Friday 8am to 4pm.

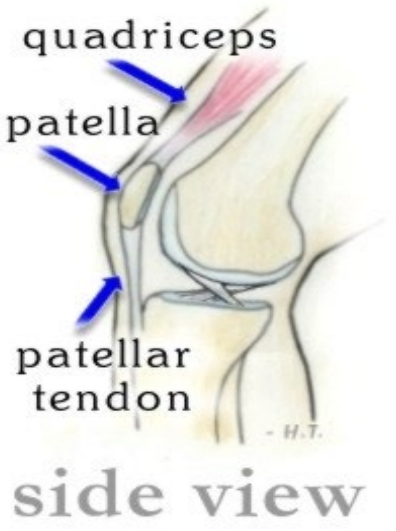
What is anterior knee pain?

Anterior knee pain is an umbrella term which encompasses a wide range of related but significantly different conditions resulting in pain at, around or behind the knee cap.

25% of the population will be affected at some time and it is the most common overuse syndrome affecting sports people – although you do not have to be sporty to be affected. It is also a leading cause of chronic knee pain in adolescents.

Basic anatomy





The knee cap (patella) is a triangular bone which sits on top of the thigh bone (femur). Both the back of the kneecap and the end of the thigh bone (femoral condyle) on which the kneecap sits are covered with cartilage (shiny surface). This cartilage helps to reduce friction, promote smooth movement and acts as a shock absorber.

The back of the kneecap is divided by a vertical ridge which corresponds with a groove in the end of the thigh bone. Although these ridges are matched to a certain extent, they are not totally matched.

The kneecap is held in place partly by its bony make up and partly by the soft tissues around the knee, especially the thigh muscles (quadriceps) that encircle the kneecap and form the patella tendon.

The role of the kneecap is to increase the lever arm of the thigh muscles to allow them to work more efficiently, to reduce friction of the patella tendon on the bones beneath and to protect the femoral condyles from direct pressure and wear and tear, e.g. when kneeling.

Why does knee pain happen?

The kneecap and thigh bone work closely together when the knee is bent and straightened. If due to any, or a combination, of the factors stated below, this fails to occur, then pain may result. When the knee bends and straightens the kneecap follows an 'S' shaped path with the kneecap gliding up and down on the femoral condyle. As the angle of knee bend (flexion) increases, the back of the kneecap is exposed to varying stresses in different areas of the kneecap. These forces may not be spread evenly over the area but may build up in certain areas of the kneecap not designed to tolerate these pressures. This is especially so when the muscles of the thigh are working incorrectly and are 'imbalanced' (out of sync with each other). This 'imbalance' can lead to further limitation of the joint between the kneecap and the thigh bone and a swollen knee may be the result, which often makes the problem worse.

Your anterior knee pain is unique to you, and factors contributing towards your anterior knee pain may be different than someone else with the same diagnosis.

Patellofemoral pain is normally a non-traumatic injury, but is often related to a sudden change in activity levels. This can be due to an increase in activity levels e.g. taking up a new sport or training more, or due to a decrease in activity resulting in deconditioning and reduced muscle strength. These changes lead to increased stress being placed upon the patellofemoral joint leading to pain.

Common symptoms

1. Pain beneath and/or around the kneecap especially on climbing up and down stairs, kneeling, lunging, squatting, hopping or jumping.
2. Clicking and grating in the knee.
3. Giving way of the knee.
4. 'Cinema goers' knee (pain after maintaining a sitting position for a period of time).
5. Swelling.
6. Tight feeling in the calves and thighs.

All the above symptoms may interfere with sports and cycling and climbing stairs may become a problem. The above symptoms may be brought on by repeated activity of a repetitive nature, e.g. running, cycling, climbing and step aerobics.

Factors influencing the condition

1. Skeletal factors, e.g.
    - size and shape of knee
    - leg length
    - bony changes in thigh (femur), and
    - lower leg (tibia) bones.

2. Joint factors, e.g.
   - tightness of the soft tissues on the outside of the knee.
3. Muscle factors, e.g.
   - poor thigh muscle control and power
   - weak hip and bottom muscles (glutes) leading to reduced control of single leg movements
   - tight hip, thigh and calf muscles
   - abnormalities in the soft tissues around the knee
   - disturbed muscular control around the knee
4. Biomechanical factors: deformities or limited movements at the spine, hips, knees, ankles and feet. Having strong muscles is key, but it's also important to have muscles that work efficiently to control your movement – above, at and below your knee. A lack of movement control can contribute towards irritation of your knee.
5. Trauma: Direct or indirect blow to the knee.
6. Overuse, e.g. cyclists and runners.
7. Unaccustomed activity: Depending on what you usually do, you will have a level of activity that your knee is happy with (a load tolerance level). Excessive loading or varied and rapid increases in load can increase sensitivity in your knee, without causing physical injury or damage.
8. Maintenance of a static position for long periods, e.g. sitting.
9. Arthritis (osteoarthritis and rheumatoid arthritis) and other inflammatory conditions.
10. Softening of the shiny surface (cartilage), e.g. chondromalacia patellae.
11. Being overweight: This can significantly increase the risk of you developing knee pain as the knee has to carry the extra weight. For every pound lost your knee feels four pounds less stress.

Self-help / management

1. Maintain joint stability/mobility – non weight-bearing exercises will help to build up the muscles around the knee so that stress is reduced around the joint and will maintain joint ranges of movement. Progress to weight bearing exercises as pain allows.
2. Do continue to exercise up to the limit of pain but DO NOT push through the pain.
3. Avoid repetitive activities until pain has subsided.
4. Avoid walking up and down hills.
5. Avoid high heels which can worsen the problem by pushing kneecaps back onto the thigh bones.
6. Avoid kneeling and squatting.
7. Avoid standing for long periods of time with the knees locked back.
8. Avoid breaststroke swimming.
9. If the knee swells – rest it and use ice to settle.
10. If overweight, try to lose weight so that less load is put through your kneecap.

Possible treatments

1. **Physiotherapy:**
   Physiotherapy will identify the dominant “contributory factors” and provide a specific, targeted rehabilitation programme. This may include:
   a) Strengthening exercises and re-education of muscle activity in the correct sequence for the core, glutes and quadriceps
   b) Stretches for tight muscles.
   c) Control of swelling.
   d) Pain relief.
   e) Taping techniques as necessary.
   f) Joint mobilization techniques to restore full range of movement at the joint.
   g) Re-introduction to sport and previous aggravating factors in a pain free state.
   h) Treatment of spine, hips, ankles and feet as necessary.
   i) Provision of temporary or referral for permanent orthotics.
   j) Referral to pain clinic if severe and/or unremitting pain.

   Successful management requires strictly following a regular exercise programme outside of your physiotherapy appointments. Alongside your exercises, this may include resting from aggravating activities and working to gradually build them back up over time.

2. **Aids:**
   Walking stick or crutches may sometimes help to aid walking when the knee is initially painful and/or swollen.

3. **Orthotics:**
   Insoles may sometimes help if foot position is a contributing factor in producing knee pain.

4. **Drugs:**
   - Painkillers
   - Anti-inflammatory drugs.

5. **Surgery:**
   Surgery is important for investigation and management of related problems and is used for this rather than for treatment of the pain itself. The type of surgery which occasionally may be undertaken includes:
   a) Arthroscopy – as an investigative means with correction of any abnormality within the knee as necessary. Also used to exclude any other cause.
   b) Elmsie-Trilliat procedure – antero/medial advancement of the tibial tuberosity (small bony bump on the lower leg just below the knee) to help decompress the patello-femoral joint.
   c) Realignment surgery of the patello-femoral joint.
   d) Patellofemoral joint partial knee replacement.

   Please ask your knee specialist about these types of surgery and what they entail. Not all of these options may be available locally.

How long will it take to get better?

- There are no quick fixes to anterior knee pain
- With rehabilitation, we would expect to see improvements over a 3- 6 month period. However, improvements can continue beyond this.
- Maintenance of your specific exercises is crucial in sustaining improvements.
- Once you are pain free, you should not stop doing your exercises but should gradually decrease the frequency that you are doing them. Should you experience a flare up of your symptoms then you should restart your exercises again as able.
- You may need to continue indefinitely to ensure that your problems do not return. Most people will get back to normal activities including sport.

How do I manage ongoing pain?

You may sometimes get an increase in your pain, with or without warning. This is normal with anterior knee pain problems. It is important to try to settle these “flare ups” as quickly as possible. During a flare up, aim to reduce your accumulative load on your knee by decreasing your exercises and daily activities. As your knee settles, gradually build back up your normal activity levels.

The use of ice or heat and painkillers may offer some temporary relief, while you are building your daily activities back up. With the correct management, flare ups can be well controlled allowing you to continue with normal activities.

Can I exercise with patellofemoral knee pain?

You may exercise with low levels of pain. It is recommended that pain is no more than 3-4/10 and that this eases within one hour of stopping exercising and is not present the following day.

It is important to have rest days and a minimum of one day off following exercises that cause pain is recommended.

Is it normal for my knees to make noises?

Knee clicking is normal. Clicking and grating in the knee is very common and normally due to normal fluid flow behind the knee cap. There is no research to date that shows that clicking is related to joint injury or degeneration.

If you do get pain with the clicking symptoms please let your physiotherapist know.

Exercises

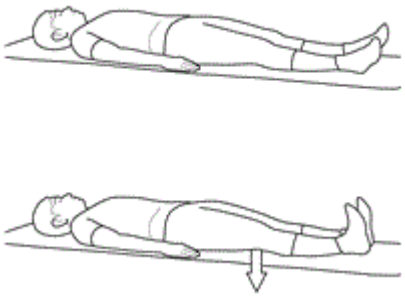
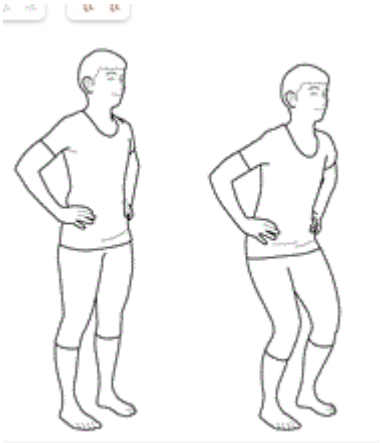
Activities which improve the quadriceps muscles without friction on the patella are the key to relieving and then preventing the recurrence of these conditions. The muscle on the inside of your thigh just above the knee is the vastus medialis muscle and it plays a very important role in holding the kneecap in the right position and protecting it. You may also require to be taught strengthening exercises to aid your “core stability” and hip strength and control as these areas work together with your knee to aid control.

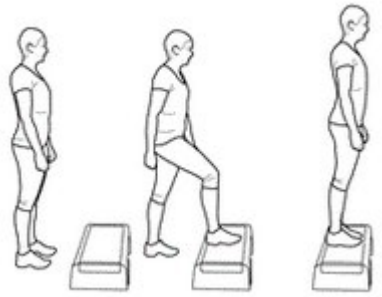
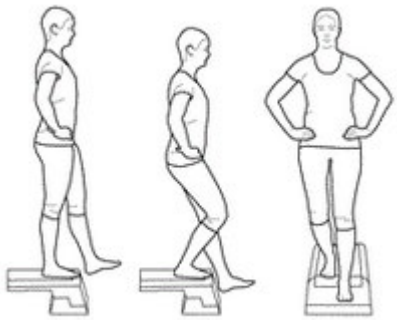
If you have tight muscles in your thigh or calves, stretches will be taught based on your needs.

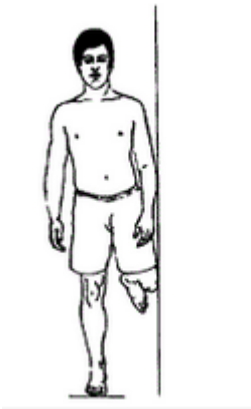
Strengthening exercises

Initially, try the exercises on the following pages little and often during the day.
Ensure you feel the muscle you are exercising working.
Gradually build up the number you can do in one go.
As you build up the number, reduce the number of times you do them in a day.
Your pain should not increase by more than 20% of your present pain levels for more than an hour after exercise. If it does, reduce the repetitions and the range you are exercising in.
Strengthening exercises should ideally be done 3-4 times per week with rest days in between.
Please only do the exercises indicated by your physiotherapist.

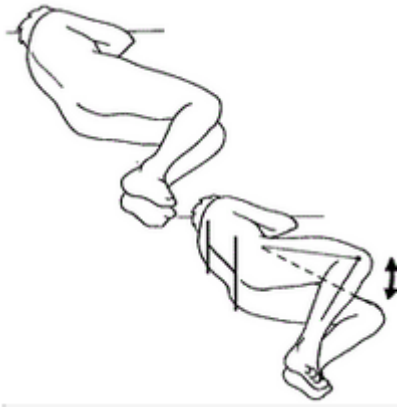
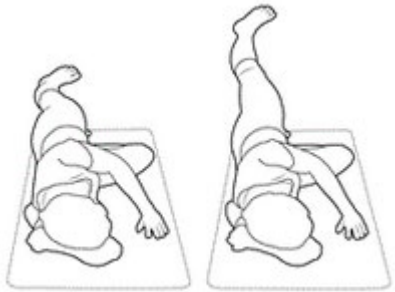
Quadriceps exercises

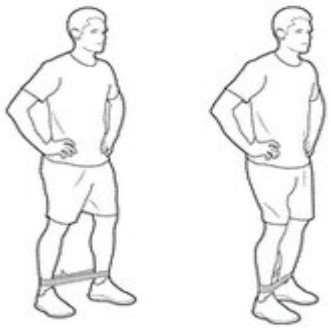
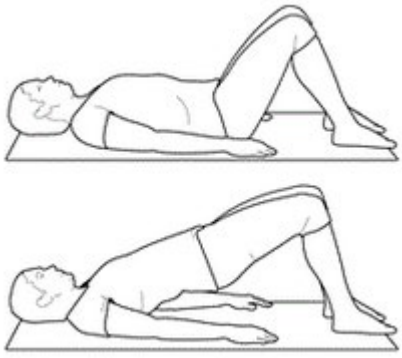
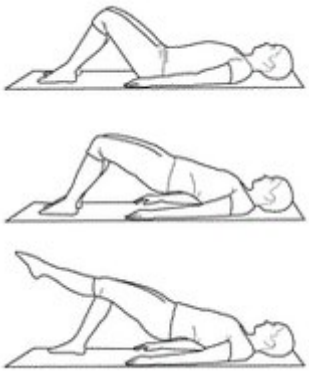
	1. Lying on your back or sitting with your back supported and your legs out straight in front of you. • Pull your feet up towards you and turn your foot out to the side slightly. • Push your knee down firmly so that your thigh muscles tighten. • Hold for 5-10 seconds. • Repeat 5-10 times.
	2. Lying on your back or sitting with your back supported and your legs out straight in front of you. • Pull your foot up towards you and turn your foot out to the side slightly. • Push your knee down firmly so that your thigh muscles tighten. • Keeping your knee straight, lift your leg up to just clear the bed. • Hold for 5-10 seconds and lower slowly. • Repeat 5-10 times. This exercise may be made harder by placing a small weight around your ankle.
	3. Place feet either side of a telephone directory or hips width apart, with feet facing forwards. • Bend knees slightly keeping knees over the big toe. • Tighten bottom and stomach muscles. • Turn knees out over second or third toes, keeping feet still. • Hold for 5-10 seconds. • Repeat 5-10 times. This exercise may be made harder by holding small weights in each hand.

	4. Stand in a lunge position with the affected leg forwards and both feet facing forwards. Try to keep your back knee straight. Transfer your weight over your front foot, in line with your great toe. • Tighten bottom and stomach muscles. • Turn knee out over second or third toes, keeping feet still. • Hold for 5-10 seconds. • Repeat 5-10 times. This exercise may be made harder by holding small weights in each hand.
	5. Stand in front of a small step or the bottom step of the stairs. • Tighten bottom and stomach muscles. • Step up with your affected leg leading, keeping your knee over second or third toes. • You may need to hold onto a rail or support initially. • This exercise can be made harder by increasing the height of the step or by doing the exercise more slowly. Additionally a small weight could be held in each hand. • Repeat 5-10 times.
	6. Stand sideways on a step with your affected leg and your other foot hanging over the edge of the step. • Slowly bend your affected knee allowing your other heel to brush the floor. • Try to keep the knee of your affected leg over your second or third toes. • This exercise can be made harder by increasing the height of the step or by doing the exercise more slowly. Additionally a small weight could be held in each hand. • Repeat 5-10 times.
	7. Stand on your affected leg on a step facing down. • Slowly lower yourself down by bending your knee to 30 degrees. • Try to keep the knee of your affected leg over your second or third toes. • This can be made more difficult by bending your knee more so that the heel of your unaffected leg touches the ground and/or by increasing the height of the step and doing the exercise more slowly.

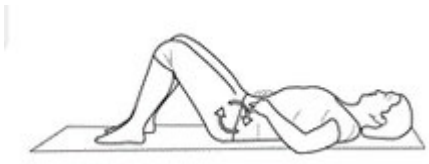
	Additionally a small weight could be held in each hand. • Repeat 5-10 times.
	8. Stand on your affected leg with your knee slightly bent and turned over your second or third toes. • Try to balance in this position. • Hold for 5-10 seconds. • Repeat 5-10 times. • To make this exercise more difficult, close one eye or both eyes.

Gluteal exercises

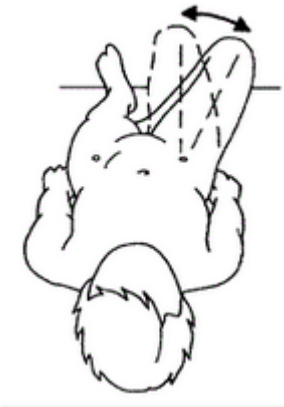
	1. Lie on your unaffected side with your knees bent. Tighten your buttocks and stomach muscles. • Lift your top knee as far as you can, without letting your pelvis rotate forward or back. • Keep your feet together and back straight during the exercise. • Hold for 5-10 seconds. Lower your leg slowly. • Repeat 5-10 times.
	2. Lying on your side with your bottom leg bent and your upper leg straight. • Roll your top hip slightly forward, use top arm to support yourself in front. • Keeping your top leg straight, lift it up towards the ceiling to hip height. Make sure the leg stays in line with your body and toes point forwards. • Hold for 5-10 seconds. Lower your leg slowly. • Repeat 5-10 times.

	3. Stand with your hand supported on a firm surface. • Keep your body upright and with your hip, knee and foot facing forwards move your operated leg out to the side. Do not let your body bend sideways. • Hold for 5-10 seconds. • Lower your leg slowly. • Repeat 5-10 times.
	4. Start by standing with a resistance band around both ankles or feet. • Keep your hips straight and your knees soft, i.e not fully straight. • Takes steps sideways against the resistance band. You should feel the tension in your buttocks. • Repeat 5-10 times in each direction. • As this exercise gets easier, repeat with knees bent to 45 degrees.
	5. Lying on your back with knees bent. • Tighten your lower stomach and bottom muscles. • Tilt your pelvis backwards and slowly lift your pelvis and back one vertebrae at a time. • Lift your bottom off the floor only as far as you can while maintaining your pelvic position (do not arch your back). • Hold for count of 5-10 seconds. • Return to starting position. • Repeat 5-10 times.
	6. Lie on your back with your knees bent. • Squeeze your buttocks and tilt your pelvis backwards. • Lift your pelvis and straighten one knee keeping your thighs in line. Bend the knee, lower the foot on the floor and return to the starting position. • NB: Keep your pelvis horizontal and your lower back in a neutral position. • Repeat 5-10 times.

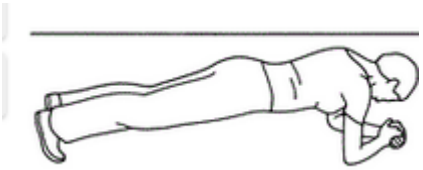
Core strengthening exercises

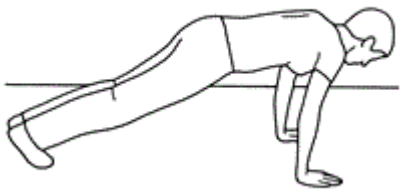


1. Lying on your back with hips and knees bent and neck and back muscles relaxed.
   - Breathing in – tighten the pelvic floor muscles.
   - Breathing out – lift the pelvic floor and activate deep abdominal muscles.
   - Repeat at least 10 times.



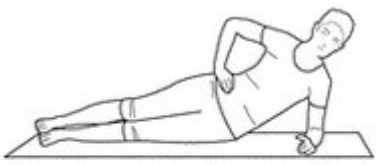
2. Lie on your back with your affected leg bent and the heel beside the straight knee. Your back should be flat and your pelvis should be level without any twist.
   - Squeeze stomach muscles to keep the back flat and slowly let the bent knee lower out to the side.
   - Do not let the pelvis twist or rotate at all.
   - Only move the leg as far as the flat back and level pelvis allow.
   - Slowly return to the start position maintaining control of the pelvis during the return.
   - Repeat 5-10 times.

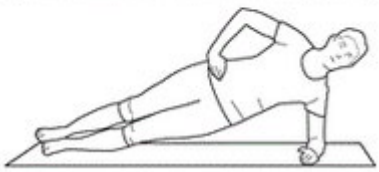




3. Lie on your front. Place your forearms under your shoulders.
   - Raise yourself up onto your forearms and toes.
   - Make your body into a straight line from shoulder to hip to heel.
   - Hold for as long as you can, staying straight.
   - Do not hold your breath.
   - Repeat 5 times.
   - N.B. You can start this exercise at an easier level by starting with your knees bent and raising onto your knees.

To make this exercise more difficult, raise yourself up onto your hands keeping your body in a straight line from shoulder to hip to heels.





4. Lie on your side, both legs straight, one on top of the other.
   - Prop yourself onto your elbow, keeping your body straight.
   - Lift your hips, making your body into a straight line from shoulder to hip to heel.
   - Hold for as long as you can, staying straight and maintaining a good position.
   - Do not hold your breath.
   - Repeat 5 times.

Once the above exercises are able to be completed with ease, you should then practice jumping, hopping, running and cycling maintaining your affected knee over your second or third toes. The use of a mirror to view what is happening at your knee may be beneficial.

Exercise pictures © Physio Tools Ltd.

Useful numbers and contacts

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Visit the Trust website at www.royalberkshire.nhs.uk

Please ask if you need this information in another language or format.

Debbie Burden (RBFT Orthopaedic Physiotherapy Specialist)
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