

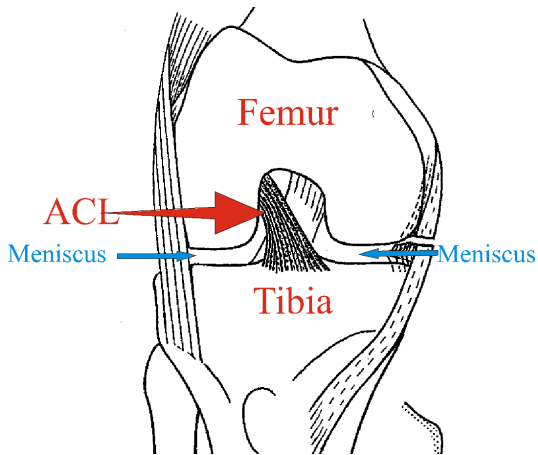


Anterior Cruciate Ligament Surgery

What does the ACL do?

Knee Anatomy

Anterior View (Front)



Lateral View (Side)

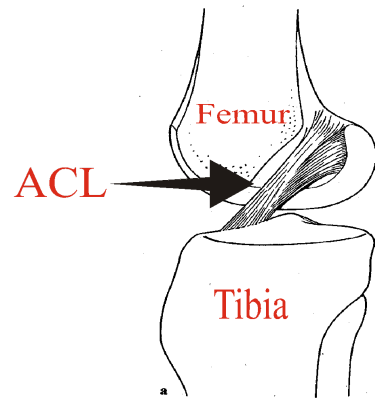


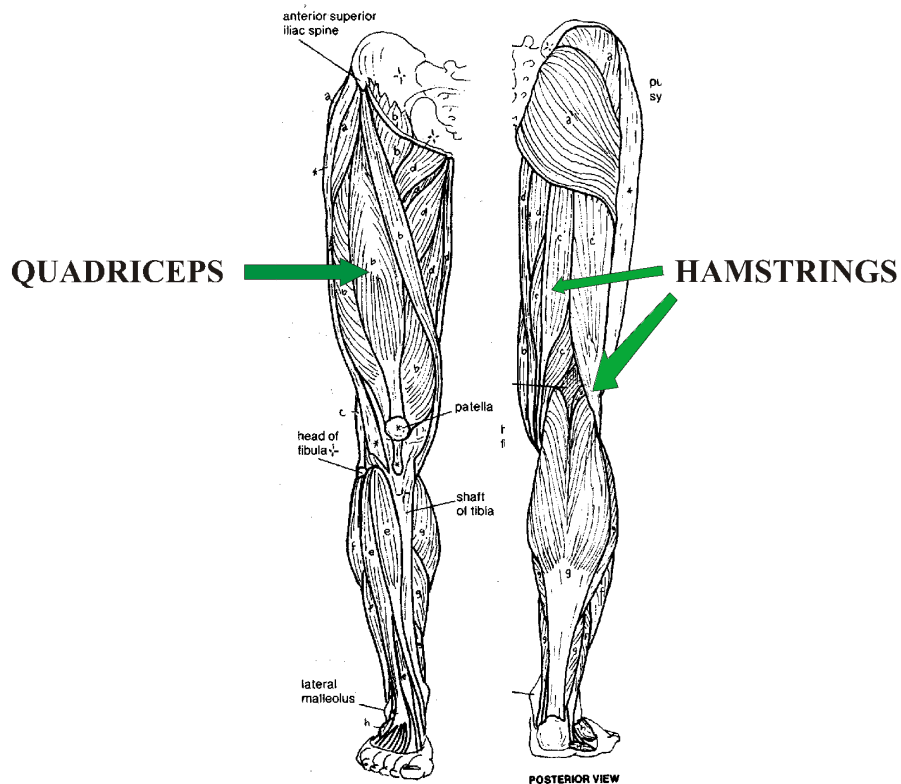
Fig. 237 a-c. The areas of ins

Lower Limb Muscles

There are two main groups of muscles that control and support your knee -

Quadriceps – muscles that straighten your knee

Hamstrings – muscles that bend your knee and they take over the balance reactions in your knee (this is proprioception).



The knee has 4 main ligaments that stabilise the knee.

These are the 2 side or collateral ligaments namely the inner or **medial collateral ligament** and the outer or **lateral collateral ligament**.

In the middle of the knee are the 2 cruciate or crossing ligaments. These take their names from their attachments on the tibia. The back or **Posterior Cruciate Ligament** is attached to the front of the femur and attaches to the back of the tibia or shin bone. Hence its name, the posterior or back cruciate ligament. It prevents the tibia from moving too far back on the shin bone.

The **Anterior Cruciate Ligament (ACL)** attaches to the back of the thigh bone and the shin bone at the front. It prevents excessive forward movement of the shin on the thigh bone and also controls the knee during twisting or rotational movements.

How is the ACL injured?

The most common way in which the ligament is torn is during sport. In the UK the 2 most common sports are football and netball.

Often the individual is twisting at speed. Patients usually report that they tried to change direction and the knee gave way often with a popping noise. The knee suddenly swells and usually the individual is unable to play on. This results in severe pain.

It is usually dramatic enough such that patients present to their local A & E department where they are assessed. 99% of the time there will be nothing to see on x-rays. Sadly patients are usually reassured that they have simply sprained their knee and told to report to their GP if things don't settle.

The knee then usually settles down such that within a few weeks the patient can walk relatively normally but the knee doesn't feel quite right. By 6-12 weeks the knee is beginning to feel stronger and often an attempt is made to get back to sport. The knee invariably gives way and is unstable. Straight line running is usually possible but the knee feels unstable if the patient tries to change direction. Twisting and turning is usually not possible or difficult.

What are the consequences of having a torn ACL?

Damage at the time of the injury

At the time of the initial injury it is very common for other structures to be damaged as the knee gives way. The most commonly injured structures are the **menisci** or meniscal cartilages. These structures are the shock absorbers that sit between the end of the thigh bone and the top of the shin bone. 70% of patients who tear their ACL will damage one or both of these structures.

At the time of the injury the joint surfaces are bashed together and this results in "bruising" to the joint surfaces and the underlying bone. The joint surface may be significantly damaged at the time of the injury resulting in a chondral (joint surface cartilage) or osteochondral (joint surface and underlying bone) lesion.

When the ACL tears other ligaments may also be damaged. The most common area to damage is the "postero-lateral corner." This is an area that includes the outer or lateral ligament and the capsule on the outer side of the knee.

Damage that occurs after the initial injury or secondary damage

Once the ACL has been torn the knee is at risk of further episodes of instability and giving way. Each time the knee gives way the important structures inside the knee, namely the joint surface cartilage and shock absorbing menisci, may sustain further damage. The initial giving way results in severe pain. The subsequent smaller episodes of instability are less painful and usually cause minimal symptoms.

If an individual remains active with an unstable knee following an ACL rupture then it is possible to severely damage the knee quite rapidly over a short period of time.

It is for this reason that this injury is now treated aggressively with surgical reconstruction at the earliest opportunity.

When is the best time to get my ACL fixed?

The ideal timing is when the knee has settled down and there is minimal swelling with good movement. On average it takes 4-6 weeks from the time of the injury for the knee to settle.

How is the operation done?

What kind of anaesthetic is used for the surgery?

In the vast majority of cases you will have a general anaesthetic. Occasionally a nerve blocks and/or an epidural may be used by the anaesthetist in the operating theatre and will result in your leg feeling numb and weak when you wake up.

What is used to make the new ACL

There are 2 ways of obtaining tissue for the new ligament. The most common way is to take tissue from either the injured or normal knee. This is called autograft. The most common tissue used to make the new ligament is either to use the hamstring tendons (the most commonly used graft) or the central portion of the patella tendon which is called a BTB graft or bone-tendon-bone graft.

Sometimes it is appropriate to use donor tissue. This is called an allograft.

Your surgeon will explain the pros and cons of the different grafts and help you choose what is most appropriate for you.

How is the graft introduced into the knee?

The most common way for the graft to be introduced into the knee is by making a tunnel starting below the knee in the shin bone. The tunnel is made using a special device called a jig that aims the drill to the correct location in the knee. A socket is then made in the thigh bone and the graft is pulled up the tunnel in the shin bone, across the knee joint and up into the socket in the thigh bone.

The TransLateral Technique

Prof Wilson has pioneered a new way of carrying out this procedure. We have called this the TransLateral technique. The normal ACL has quite a large attachment area or foot print on the side of the thigh bone. The TransLateral technique allows the surgeon to reliably identify the anatomy and place the new ligament in a more precise and anatomic location. This has led to the development of a series of new instruments to make anatomic ACL surgery more reliable and reproducible for surgeons.

All Inside ACL surgery

The most common way of carrying out the procedure has been described above.. Traditionally both hamstring tendons are taken to create the graft. The 2 long tendons are folded to create a “ 4 strand graft”. For the all inside only one tendon needs to be taken for the graft. Rather than make a complete tunnel in the tibia and a socket in the femur, the all inside technique involves making a socket in the tibia and the femur. The all inside technique therefore requires 50% less tissue for the graft and less bone to be removed than with a standard ACL reconstruction.

How is the new ACL fixed?

Once the graft has been pulled into position it is fixed with either screws or buttons, which hold / suspend the new ACL in the tunnels or sockets.

Other surgery carried out at the time of the ACL reconstruction

If there is any joint surface damage or meniscal cartilage tears present at the time of the reconstruction this will be dealt with at the same time as your ACL is reconstructed.

BEFORE YOUR OPERATION

It may be appropriate for you to attend for **physiotherapy** before your operation:

- To strengthen the hamstrings
- To strengthen the quadriceps
- To improve proprioception (balance reactions)
- To achieve full range of movement
- To minimise swelling

THE PHYSICAL CONDITION OF YOUR KNEE AT THE TIME OF SURGERY IS CRITICAL TO YOUR RECOVERY.

PRE-ASSESSMENT

Approximately 2-4 weeks before your operation date, you will be asked to attend the pre-assessment Clinic. At this clinic, routine testing and other pre-operative tests including urine, blood and x-rays may be carried out. You may be in Clinic for 3 to 4 hours.

This appointment will also provide you with the opportunity to speak to your consultant and/or registrar.

The reconstructive surgery and post-operative care will be explained so that you will be fully aware of what is expected of you during your recovery.

RISKS OF SURGERY

These will be explained to you in more detail at the Pre-Assessment Clinic.

Anaesthetic complications

These relate to the heart, lung and circulatory system and are unusual in people under 60 years old. The chance of having any serious complications related to the anaesthetic are a lot less than 1%.

Blood clots

Deep Vein Thrombosis (DVT) or pulmonary embolus (PE) are extremely rare following an ACL reconstruction and the overall risk is less than 0.5%. To reduce your risk you will be asked to wear special AV compression boots until you are discharged. You will also be encouraged to get up and begin walking soon after surgery. Early mobilisation has been shown to reduce the risk of a blood clot following this type of surgery. High-risk patients may be given anticoagulant drugs for a few weeks after surgery to prevent blood clots.

Infection

The risk of a serious infection is less than 0.5%. You will be given antibiotics at the time of the operation to minimise this risk.

Haematoma (bleeding into the tissues)

This is again a rare complication. If there is any bleeding this may slow recovery but rarely affects outcome.

Numbness

It is common to have some small areas of numbness on your leg following the surgery. This usually settles within a few months of the surgery. Any long-term numbness is minimal and well tolerated.

Stiffness

Some patients struggle to regain full movement following an ACL reconstruction. This usually settles over the first few weeks with appropriate rehabilitation. Occasionally it may be necessary to carry out an MUA or manipulation under anaesthetic to regain movement and unstiffen the knee. Bend / flexion is rarely an issue. However we work hard to ensure that you regain full extension / knee straightening in the first few weeks as if it is not achieved in this time it can become a long term issue.

Failure and re-rupture

This occurs in approximately 2-5% of patients. In up to 10% of patients there is a poor biological response and the graft fails to incorporate and mature resulting in a lax knee. Adherence to the rehabilitation programme will minimise this risk.

SURGERY CHECKLIST

You will need to bring an over-night bag into hospital that includes **shorts** and a sturdy pair of **trainers or shoes**.

ON ADMISSION

On admission to the ward nursing staff will ensure you are familiar with equipment that will be used during your stay. This includes:

- **Cryo-cuff** - a wrap-around compressive cold pack
- **AV Boots** - inflatable boots to help your circulation

Your physiotherapy assessment will include familiarising you with the correct use of **elbow crutches** and checking range of movement of your knee.

The surgeon and anaesthetist will see you prior to surgery as appropriate.

DAY OF SURGERY

Following the surgery you will have a bandage on your knee. You will also have a **Physiolab** (www.physiolab.com) around the knee and **you will have AV boots** on your feet.

Nursing and other staff will make regular observations of your temperature and pulse, and will monitor your exercises, medication intake and pain control. You may receive anti-inflammatory drugs and pain relief as appropriate.

Your **dressings** will be changed prior to discharge. We would suggest renting a physiolab cryotherapy device prior to surgery for 1 month and have this waiting for you at home on the day of surgery. Your **AV boots** will remain in place unless you are walking around.

When will I be discharged from hospital?

You will be discharged on the day of surgery.

Goals necessary before discharge include:

- Be **walking safely** with crutches and have practised going up and down stairs with a physiotherapist
- Understand the **home instructions** for the next week

IF YOU HAVE NOT ACHIEVED THESE GOALS, YOUR DISCHARGE MAY BE DELAYED.

On **discharge** the Nursing staff will give you:

- Medication as appropriate
- A letter for your GP
- A sick certificate if required
- Written instructions regarding removal of stitches, further appointments etc.
- You will be discharged with tubigrip on your leg. You should keep this during the daytime until advised by your physiotherapist.

AFTER DISCHARGE – THE FIRST WEEK

At home, you should remain. **Lying down with your leg elevated** and get up to walk only for essential purposes. It is very important to stay off your feet and keep your operated leg elevated as swelling occurs easily and quickly and can result in a delay in your recovery. Continue to maintain extension appropriate to your graft while working to increase flexion and decrease swelling by using the home ice regime.

DO:

- Rest with the leg above horizontal
- Keep wounds dry
- Keep walking to a minimum
- Use an ice pack (a large pack of frozen peas in a damp tea towel) for 15 minutes 4 times a day
- Exercise regularly
- Attend the physiotherapy appointments

Please feel free to call the ward if you have any problems or questions.

Signs of potential problems include:

- Sustained increased temperature. It is normal to have a slight temperature following surgery and it is usually higher in the evening with a return to normal by morning.
- Increased knee pain that is unrelieved with medication
- Increased knee or calf swelling
- Stomach upset after taking medication
- Increased drainage or dressing problems

If you experience any of these problems

- **call the hospital on +44 20 7034 3316**
- or The OS team on 020 3397 7779
- **or your GP immediately.**

GENERAL ADVICE

It is advisable to take **painkillers** prior to exercising.

You will be encouraged to do regular **home exercises**. If you already attend a gym most of the machines will be beneficial to your recovery but it is important to avoid knee extension exercises for at least 4 months. Your physiotherapist will advise you when you can return.

To avoid **knee swelling**

- Keep walking to minimum in the first two weeks.
- Take anti-inflammatory drugs as prescribed.
- Use ice regularly, as instructed.
- Continue exercises, as advised by your Physiotherapist.

You will use your **crutches** until you can walk without a limp, usually 3 – 4 weeks.

Driving

Driving can be undertaken when comfortable and safe. Depending on which leg and car type (automatic/manual) this may be between 3 and 6 weeks.

Return to work

For office / sedentary type work most patients will need 6 weeks off. For manual type work the time off is 8-12 weeks.

Return to sport

- Swimming can be undertaken after 6 weeks (but avoid breast stroke)
- Running and other impact activities can be started only when recommended by the physiotherapy department, usually no earlier than four months post-op, and only after regular check-ups.
- You must not play any contact sports for 9 months. Some sports can be started earlier. You will be able to discuss this with your Consultant at the 6 month review.

Post-Operative Rehabilitation

All necessary care will be provided until a Physiotherapist visits to commence your **exercise programme** and start you walking. This will happen during the first day.

When you walk you may put as much weight on your leg as you can tolerate. Putting weight on your leg will not affect the reconstruction, **but being upright may cause swelling**, therefore standing still should be kept to a minimum. **Walking too much** will cause your knee to swell and this will slow your recovery. It is therefore important you follow the 'strict' **exercise instructions** to avoid delaying your rehabilitation.

You should only walk for essential toilet purposes.

The aims of your rehabilitation will be to:

- Reduce swelling
- Achieve full range of movement
- Increase strength
- Improve proprioception (your balance reactions)
- Walk without elbow crutches
- Return to full function
- Return to sport (as desired)

COMPLIANCE WITH THESE INSTRUCTIONS AND HOME EXERCISE IS VITAL TO ACHIEVE A RETURN TO FULL FUNCTION.

Your first visit to the Physiotherapy Department will be one week after discharge. The **swelling** in your knee will be checked and your **range of movement** measured.

You will be followed up in the ACL class where you will receive appropriate rehabilitation.

WEEK 1 EXERCISES

ACL Reconstruction – Week 1 postoperative							
Name : _____ Date : _____							
If you have any questions regarding this program then consult your physiotherapist							
ACL Knee		All Exercises must be completed 5 times a day					
Flexion Exercises	Date						
Heel Slide x 10							
Flexion Hang							
Extension Exercises Patellar tendon only	Date						
Heel Prop 10min							
Towel Stretch x10							
Leg Control Exercises	Date						
Quads tightening x 10							

- Correct Walking: Heel to toe, roll off toe.
- Correct Stance: When standing, shift weight to involved knee and lock out leg; when sitting, heel prop.
- Swelling Control: Cryocuff (if available) and ice pack before exercises **KEEP LEG ELEVATED; DO NOT SIT WITH LEG DEPENDENT; WALK ONLY FOR ESSENTIAL TOILET PURPOSES.**

WEEK 1 - EXERCISES FOR YOUR KNEE

5 times a day

Patellar Tendon Graft

Heel Prop 10 minutes

Rest with heels supported



Towel Stretch x10

Lift heel with towel, tighten thigh muscle, release towel and maintain heel lift. Hold 5 sec.



Heel Slides x 10



Flexion Hang



Quads tightening



WEEK 1 - EXERCISES FOR YOUR KNEE

5 times a day

Hamstring graft

**Extension to neutral –
Quads Tightening**

Heel Slides

Flexion Hang



WEEK 2 - EXERCISES FOR YOUR KNEE

ACL Reconstruction – Week 2 Postoperative							
Name : _____ Date : _____							
If you have any questions regarding this program then consult your physiotherapist							
ACL Knee		All Exercises must be completed 4 times a day					
	Date						
Heel Slide x 10							
Quads Tightening x10							
Calf Raises							
Calf Stretch							
For Patella Tendon Only -							
Heel Prop 5min							
Towel Stretch x 10							
Prone Hang if necessary							
Additional Exercises -							
Mini squat x 10							
Hamstring curl – lying face down, bend knee							

You will stay on **crutches for 2 weeks** and discharge from crutches will be based on assessment by your physiotherapist.

WEEK 2 EXERCISES
Patellar Tendon Grafts

Heel Props



Towel Stretches



Prone Hangs



Heel Slides



Quarter Squat



Quads Tightening



WEEK 2 – EXERCISES
Hamstring grafts

Extension to neutral

Heel Slides



Quads Tightening



Quarter Squat



Calf Raises

Calf Stretch

Hamstring curl – lying face down, bend knee

Your next visit to the Physiotherapy Department will be one week later. At this visit your **swelling** and **range of movement** will again be checked.
 You will be given the following exercises for **Week 3**.

WEEK 3 - EXERCISES

ACL Reconstruction – Week 3 Postoperative							
Name : _____ Date : _____							
If you have any questions regarding this program then consult your physiotherapist							
ACL Knee		All Exercises must be completed 3 to 4 times a day					
	Date						
Heel Slide x 10							
Quads Tightening x10							
Calf Raises (on step?)							
Calf Stretch							
For Patella Tendon Only -							
Heel Prop 5min							
Towel Stretch x 10							
Prone Hang if necessary							
Mini squat x 10							
Hamstring curl – lying face down, bend knee							
Flexion Lunge on Stair							
Hamstring Stretch							
Knee Extension With Band to 45°							
Knee Flexion With Yellow Band							

WEEK 3 EXERCISES
Patellar Tendon Grafts
Towel Stretches

Heel Props



Prone Hangs



Heel Slides



Quarter Squat



Knee Extension with Band



WEEK 3 – EXERCISES
Hamstring Graft

Heel Slides



Knee Extension With Band



Quarter Squats



Quads Tightening



- Calf Raises
- Calf Stretch
- Hamstring curl – lying face down, bend knee

Your next visit to the Physiotherapy Department will be one week later. At this visit your **swelling** and **range of movement** will again be checked.

You will be given the following exercises for **Week 4**.

WEEK 4 - EXERCISES

ACL Reconstruction – Week 4 Postoperative							
Name : _____		Date : _____					
If you have any questions regarding this program then consult your physiotherapist							
ACL Knee		All Exercises must be completed 3 to 4 times a day					
	Date						
Heel Slide x 10							
Quads Tightening x10							
Calf Raises (on step?)							
Calf Stretch							
For Patella Tendon Only -							
Heel Prop 5min							
Towel Stretch x 10							
Prone Hang if necessary							
Mini squat x 10							
Hamstring curl – lying face down, bend knee							
Flexion Lunge on Stair							
Hamstring Stretch							
Knee Extension With Band to 45°							
Knee Flexion With Yellow Band							
Side Step							
Bike							

WEEK 4 – LEG CONTROL EXERCISES

Quarter Squats 45



Side Steps



Knee Extension with Band To



Continue with heel slides and quads tightening

Calf Raises

Calf Stretch

Hamstring curl – lying face down, bend knee

Your next visit to the Physiotherapy Department will be one week later. At this visit your swelling and range of movement will again be checked. You should have almost full range of movement by this time. You will be given the following exercises. **ACL Circuit 1**

ACL 1. 4 – 7 WEEKS

		4	5	6	7
1.	BIKE Low resistance				
2.	PT – TOWEL STRETCHES PT – HEEL PROP				
3.	HS – TIGHTEN QUADS				
4.	HEEL SLIDE				
5.	HEEL/TOE WALK				
6.	HIGH KNEE WALK				
7.	HAMSTRING CURL - ADD ANKLE WEIGHT ADD RESISTANCE BAND				
8.	BRIDGING – 2 LEG 1 LEG				
9.	KNEELING				
10	GLUTE WORK - CLAM - SIDE LYING LEG LIFT				
11.	UP AND DOWN ON TOES 2 LEG 1 LEG				
12.	BAND – SITTING EXTEND KNEE TO 45°				
13.	BALANCE ON WOBBLE BOARD + SQUAT?				
14.	MINI SQUATS, OR WALL SLIDES WITH BALL				
15.	STRETCHES – CALF, HAMSTRINGS, QUADS?				

ACL1.DOC

ACL 2. – 8 – 11 WEEKS

8

9

10

11

1.	BIKE				
2.	HAMSTRING CURL ADD ANKLE WEIGHT ADD RESISTANCE BAND				
3.	LEG PRESS				
4.	LUNGES				
5.	UP AND DOWN ON TOES On edge of step 1 leg				
6.	BRIDGING Double leg Single leg Wobble cushion/gym ball				
7.	STEP EXERCISES ON White block Stairs Bench				
8.	SIDE STEPS ON White block Stairs Bench				
9.	STEP-OVERS ON White block Stairs Bench				
10.	SUMO SQUAT				
11.	WALL SLIDES				
12.	SINGLE LEG DIP				
13.	WOBBLE BOARD 2→1 leg With squat				
14.	QUICK FLICKS				
15.	STRETCHES				

ACL 3 – 12 Weeks +

At the 12-week mark you will be assessed for your suitability to progress to the Advanced Level of exercises by your physiotherapist. At this stage we are assessing for a good level of isolated strength over a full range of movement (ROM) and control of static based movement such as a squat in the operated leg.

The Advanced Level aims to progress you towards returning to your regular training through improving your control during movement, and if you are aiming to return to running based activities advice will be given at this point as to when this will be appropriate for you. We do not recommend running before 4-5 months until you have been properly assessed and given the appropriate running drills to work through. If your consultant has given you the go-ahead to start running again we would still recommend a running mechanics assessment to avoid causing damage to the graft.

You will now be under the supervision of the Physiotherapy Team's Fitness Instructor who will guide you, discuss your aims and make recommendations towards your goals and also assist with your Home Exercise Program (HEP) which will aim to return you to your regular training or sporting activities as soon as possible.

The following pages are just an example of the exercises that you could be performing and are by no means comprehensive, but will aid you towards making a full recovery. If, prior to your injury, you were performing at an above average sporting level, progression may be quicker.

PLEASE SELECT APPROPRIATE EXERCISES

FLEXIBILITY	EXERCISE	HOME	CLASS	M1	M2	M3	M4
MOVEMENT							
	HIGH KNEES ONTO TOES						
	KNEE HUG ONTO TOES						
	RUSSIAN WALK						
	HAMSTRING WALK						
	INCHWORM						
	STORK WALK						
	QUAD WALK						
RUNNING MECHANICS							
	KNEE SKIPS						
	HIGH KNEES						
	FAST FEET						
	WALL DRILL						
	PRE-TURN						
	DEAD LEG RUN - HURDLES						
	BOX LEG DRIVE						
	CARIOCA						
FLEXIBILITY							
	HAMSTRING TOWEL						
	KNEELING HAMSTRING						
	PIRIFORMIS/GLUTE						
	QUADS						
	CALF						
	HURDLER STRETCH						
	HIP FLEXORS						

BALANCE								
	WOBBLE BOARD							
	WOBBLE BOARD THROW/CATCH							
	BOSU							
	BOSU - SL							
Single Leg	SL DIP - FRONT							
	SL DIP - BACK							
	SL DIP – MVT FRONT to BACK							
	RUNNING MOVEMENT							
	BALANCE with O/H PRESS							
	TRAMPETTE							

NOTES:

ACL 3 – STRENGTH (FUNCTIONAL)

PLEASE SELECT APPROPRIATE EXERCISES

STRENGTH	EXERCISES	HOME	CLASS	M1	M2	M3	M4
BODYPART							
HAMSTRINGS							
	HAMSTRING BRIDGE						
	SB CURLS						
	SL ROMANIAN DEADLIFT – DL & SL						
	KB SWINGS						
	TOWEL PULLS (TUG’O’WAR)						
TOTAL LEG							
	SB SQUAT						
	MB/PB SQUAT						
	LUNGES						
	MB LUNGES with UB MVT						
	LUNGE MVT PATTERNS						
	SB SQUAT THRUSTS						
	SB SQUAT THRUSTS + PRESS-UP						
	SB PIKE						
1-Leg Pattern	RUNNING MOVEMENT WITH DB’s						
	BOX STEP-UP with O/H PRESS						
	ALT LEG SQUAT THRUSTS						
	ALT LEG SQUAT THRUSTS on SB						

ACL 3 – SPORT SPECIFIC MOVEMENT

PLEASE SELECT APPROPRIATE EXERCISES

	EXERCISES	HOME	CLASS	M1	M2	M3	M4
LADDER DRILLS							
	SINGLE LEG RUN						
	TWO FEET RUN						
	SPOTTY DOG						
	CROSSOVER						
	IN-OUT SHUFFLE						
	SIDE RIGHT-IN/SIDE LEFT-IN						
RUNNING							
½ - ¾ & FULL Speed	STRAIGHT LINES						
	FWD/BACKWARD						
	FWD/BACK TO STOP						
	V-DRILL						
	STRAIGHT LINES & TURN						
	LATERAL CONE MOVEMENT						
	LATERAL CONE WITH ROTATION						
PLYOMETRICS							
JUMPING	Note: NOT more than 6-8REPS per exercise						
	JUMP FORWARD TO HOLD						
	BUNNY JUMPS/LADDER						
	HURDLE JUMPS						
	JUMP ONTO PLATFORM						
	JUMP DROPS FROM PLATFORM						
	JUMP COMBINATIONS						
HOPPING	Note: NOT more than 5 contacts per foot per exercise						
Single Leg Progression	FORWARD to HOLD/ BACK to HOLD						
	LATERAL to HOLD						
	SL PROGRESSIONS on LADDER						
	90° TURNS on LADDER						
	CONE PATTERN						
	SPEEDSKATERS						