

JUMPER'S KNEE PROTOCOL

TRAINING PROGRAM



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DISCLAIMER

The information contained in “JUMPER’S KNEE PROTOCOL” is not meant to replace any specific advice you may have been given by a doctor, athletic trainer, or therapist. The information is not intended as a substitute for professional medical input or action.

All exercise involves some inherent risk. If you are unfamiliar with any exercise and unsure of the proper technique, seek supervised guidance from a qualified coach.

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The Protocol

Fixing Jumper's Knee

In the science section of Jumper's Knee Protocol, two methods of patellar tendon rehab were laid out: 1) a 4-stage process and 2) heavy isometrics. Which one should you use? Both.

By combining the principles of each method, you are addressing the tendon but also 1) the brain, 2) the muscle, and 3) the kinetic chain.

1) Brain

The brain puts pain in your patellar tendon to protect it. This is a good thing because pain forces you to stop loading your compromised tendon. If you had no pain and continued to load, you would risk rupture. But it's also a bad thing if you want to get back to playing sport normally.



The first step in restoring normal brain function is **stage 1 isometrics**.

This type of loading helps to safely put load back through the tendon while balancing out the problems of inhibition and activation coming from the brain.

You can get a synergistic effect if you use auditory (metronome), visual (eye movement), and sensory (putting your hands on the quadriceps muscles to feel them contract). These all help to accelerate the process of restoring normal brain function.



2) Muscle

The quadriceps and the calves are two areas that will show loss of size, strength, and function with patellar tendinopathy. The entire limb is also important, but the knee extensors show the biggest loss in function. **Stage 2 lifting** becomes about strengthening your atrophied muscles.



3) Kinetic Chain

Pain changes how the body moves. Jumps become more of a hip hinge, lands become stiffer at the knees, and the whole leg can tend to be more extended during accelerations, decelerations, and changes of direction. Brain and muscle improvements in stage 1 and 2 will help to restore normal kinetic chain function but **stage 3 store-and-release** is when you put everything back together and push your elastic function.



The 4-Stage Process

Rehab is about climbing the ladder. As pain and function improve in isometrics, move up to lifting. As pain and function improve in lifting, move up to store-and-release. As pain and function improve in store-and-release, move up to sport. The benchmarks for progression are listed at the end of each phase.

Managing Pain

Patellar tendon rehab is difficult because there is no specific plan or exercise that will work for all people. But patellar tendon rehab is also easy because the tendon tells you if it's happy or not with pain responses. You just need to know *when* to listen:

During training. Increased tendon pain during training, as long as it's not excruciating, is *okay*. It's a normal part of rehab. An allowable pain number that's consistent across the research is a 3/10 pain. Keep in mind that this is a rough estimate. Some people do better on the low end (1/10), and some do better on the high end (5/10). How do you know where you fit? The *next day pain response*.

Next Day Pain. Increased tendon pain 24-hours later or the following morning is *not okay*. This is a sign that the tendon's capacity has been exceeded.

Next day pain is *always* the guiding light. This will tell you whether your tendon is tolerating rehab well or if you need to scale back. To determine next day pain, you have two options:

1) Pain-Provocation Test

This is the single-leg decline squat done to 90° of knee flexion or maximum angle allowed by pain.

You do 1 repetition every single day at the same time and you keep note of your pain level.

If your pain has returned to baseline from the previous day, this means the previous day's loading has been tolerated. You can progress as planned.

If the pain is worse, load tolerance has been exceeded. This is when it may be necessary to scale back by moving up a stage (e.g., Stage 2 Lifting back to Stage 1 Isometrics), decreasing the intensity (e.g., jumps at 50% instead of 100%), or decreasing the volume (e.g., 5 sets to 3 sets) until pain settles.



2) Next Morning Pain

The pain provocation test can be reliable if done at the same time everyday under the same conditions. Sometimes, this can be difficult to pull off. For this reason, next morning pain can be a more accurate measure of how your tendon is doing.

Getting out of bed and walking around for a bit can be enough to gauge how the tendon is doing from the previous day's loading. Increased stiffness and pain compared to the previous morning is a sign that your tendon's capacity has been exceeded and training needs to be scaled back.



STAGE 1

Isometrics

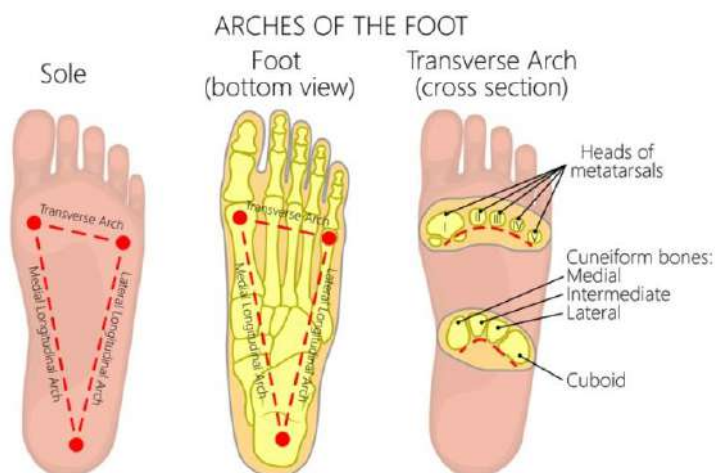
Do this workout every day. If possible, do twice per day, spaced at least 6 hours later.

	Exercise	Sets	Reps	Tempo	Rest
1	QUADRICEPS ISOMETRIC	5	30-45 sec. ea.	ISO	2 min.
2	FOAM ROLLER BRIDGE	3	30 sec.	ISO	2 min.
3	ISO LUNGE/SPLIT SQUAT	ACCUMULATE 3 MIN. PER SIDE		ISO	as needed
4	SINGLE-LEG STAND	ACCUMULATE 3 MIN. PER SIDE		ISO	as needed



Foot Pressures:

If you have patellar tendinopathy, you probably “toe grip” the ground. This is not a good thing. When performing isometric exercises, you need to avoid this. For most movements where the foot is on the ground, you should keep your weight on the tripod: Heel, first metatarsal head, and fifth metatarsal head. This will add strength to the foot arches, prevent toe gripping, and help to normalize skeletal positions up the kinetic chain.



1) **QUADRICEPS ISOMETRIC**

Choose one of the following exercises. You should feel a big hit on the quadriceps musculature and not too much discomfort on the knee itself. Do 5 sets of 30-45 second holds with a weight or depth that puts you at near-failure upon completion of the time:

- **Single-leg Leg Extension.** Use a 60-degree knee angle for patellar tendinopathy, 90-degrees for quadriceps tendinopathy, and 90-degrees for patellar tendinopathy at the tibial tuberosity (area of Osgood-Schlatter). Two options: Hang your leg off a bench and hold weight in the foot or get on a leg extension machine.
- **Single-leg Leg Press.** Same angles as above. Lower down to the position and hold.
- **Spanish Squat.** Anywhere from 60-90 degrees (or whatever you can tolerate) while maintaining an upright torso.
- **Single-leg Wall Sit.** Same as Spanish Squat.



Other options: **Single-leg Sissy Squat** (if well-tolerated) and **Reverse Nordic** (can be useful for quadriceps tendinopathy because of deep knee flexion).

2) **FOAM ROLLER BRIDGE**

This is a 3-part progression. Stay on the first and fifth metatarsal heads, not the toes. The glutes should come off the ground a bit but not too high to where you feel it in your low back. Initially, you will feel a big hit to the calves and hamstrings. As tolerance improves, these holds should become easy. Once you can do an exercise with ease for the 30 seconds with 3 sets, move on to the next one in the following session:

- **Double-leg Bridge.** Two feet on the foam roller. Do a calf raise so the heels come away from the floor. Hold.
- **Single-leg Bridge.** Same position but now take one leg off the foam roller and raise it into the air. Do a calf raise so the heel comes away from the floor. Hold.
- **Single-leg Bridge w/ calf raises.** Same position as the single-leg bridge but now, do slow and controlled calf raises (plantarflexion and dorsiflexion) for the length of the set.



3) **ISO LUNGE/SPLIT SQUAT**

You have three options. Choose only one in a workout. Accumulate 3 min. on each side. Attempt to get the time in one set. If technique starts to falter, stop that set and rest. If you can't get the 3 min. all at once, take a break, do the other side, and keep going until you accumulate the time on each side. Start from standing and "pull" yourself down into position for all of these isometrics:

- **ISO Lunge.** Long stride, front knee at around 90-degrees, chest up, weight through the tripod of the foot, try to lengthen out the back leg's hip, hold.
- **ISO Split Squat.** Shorter stride where the back knee is just under the hip, front knee at around 60- to 90-degrees, chest up, back glute squeezed, weight through the tripod of the foot, hold. This will be a bit more difficult than the ISO Lunge and you should feel a big hit on the back leg's rectus femoris muscle.
- **ISO Rear Foot Elevated Split Squat.** Back foot up on a bench behind you, front knee at around 60- to 90-degrees, chest up, weight through the tripod of the foot, hold. This will be more difficult than the ISO Split Squat because most of the weight will be on the front foot.



4) **SINGLE-LEG STAND**

Only one option.

- **Single-leg Stand.** Stand on the tripod of your foot, bring the opposite leg up, hold. You will probably get some instability at the foot as it quivers. This is okay, just try to always come back to standing on the tripod of the foot. Once 3-minutes straight becomes too easy, you can hold weight in the hands and/or bring the raised leg higher in the air.



Troubleshooting Stage 1 Isometrics:

Stage 1 Isometric training is meant to be done as a standalone. You need to completely remove everything else so you can build yourself back up. There are some exceptions listed below.

If there is something you can do that **barely** loads the patellar tendon at all (e.g., getting *standing* shots up for a basketball player, *light* straight-line dribbling for a soccer player, *easy* skipping for a track and field jumper), then go ahead. If you get increased pain responses from any activity added, you need to remove it. You are free to do whatever upper body training you want.

If you think you have a *very bad* tendon and it hasn't been loaded this extreme in a while, you should go a bit lighter on the **quadriceps isometrics** to start off and increase difficulty over time.

If you can't do the full workout twice per day, here are some options:

- One full session and one session with just the quadriceps isometric.
- One full session and one session with just exercise 3 & 4 (bodyweight isometrics).
- One session with just the quadricep isometric and everything else done in a different session.

Warmup for these sessions should look like this:

- 30-45 second Quadriceps isometric hold with a light weight (e.g., Leg Extension) or easier position (e.g., Spanish Squat).
- 30-45 second Quadriceps isometric hold with a medium weight (e.g., Leg Extension) or slightly more difficult position (e.g., Spanish Squat).
- Begin the session. Those two warmup sets do not count towards the 5 sets.

You can mix up the exercises between sessions or you can keep them the same. It's personal preference. There are pros and cons to either choice. See what works best for you.

If you are getting a lot of Vastus Lateralis (outside quad muscle) tightness, you should work to decrease the tone of that area. Do these two exercises either before or after the isometric session:

- **Foam Roll Vastus Lateralis.** Go up and down the outside quad in a controlled fashion, stopping in spots where there is tightness. 2 minutes per side.
- **Couch stretch.** Back knee up against the wall, push the hip forward so it stretches the quads. Start with the hands on the floor. If possible, sit straight up. Hold 2 minutes per side.



Twist in the Knee. If you feel that the leg gets locked easily, you could have a “twist in the knee”. The isometric sessions themselves will help to clear this up but you can use a more focused approach to restore what’s missing. Run through this sequence of simple fixes before an isometric session to unlock the knee by working upstream and downstream:

- 1) **Calcaneal Eversion.** 20 reps each side. Grab the heel bone and forcefully push it outwards, away from midline.
- 2) **Tibial Internal Rotation.** 20 reps each side. Get in a lunge position with your hands around the upper calf and tibial tuberosity. As you push your hip forward, try to internally rotate the tibia. As you come back, let go of the pull. Repeat for reps.
- 3) **Wall Single-leg Bridge.** 30 seconds each side. Keep the foot’s tripod on the wall, elevating the heel on a foam roller. Come up slightly with the hips and keep a little bend in the knee. Bring the opposite knee up, bring your opposite elbow to that knee, hold, and take deep breaths.
- 4) **90/90 Hip Lift.** 1 minute. Heels on a bench, something between the knees to engage the adductors, posteriorly tilt the pelvis using your upper hamstrings. Hold the position and breathe.
- 5) **90/90 hip switches.** 20 reps each side. Try to stay as upright as possible. When range of motion allows, try not using the hands for support.
- 6) **Arm bar.** 20 reps each side. Grab a 25-50 pound weight. Arm straight up, rotate to your side by bringing your knee up. Keep the opposite leg straight. Rock back and repeat.
- 7) **Bench Adductor.** 20 reps each side. Bodyweight. Knee or foot on a bench. Side plank position. Bring the hips up off the ground by engaging the adductors (groin), then let the hips go back down.
- 8) **Full Squat.** 2 minutes. Grab on to something for balance. Squat down as deep as you can. Keep the heels down but let the knees travel forward. Try inhaling and exhaling into the back of your ribcage.
- 9) **DB Side Bend.** 20 reps each side. Grab a weight that’s heavy but not so heavy that you can’t move your spine fully. Bend to the side and stand up. Repeat for reps.
- 10) **Hanging Knee Raise.** 20 reps. Hanging from a bar. Bring the knees up so your thighs come above 90 degrees and your pelvis posteriorly rotates. Straighten out and repeat.

Done together, these 10 movements will help to restore normal range of motion in your lower body while integrating musculature so you can “untwist the knee”. After running through this sequence, you should feel much better in the patellar tendon even though you didn’t load it.

[Video demonstration here](#)

Motor Cortex. A large part of Stage 1 Isometrics is balancing out inhibition and activation from the brain. This can be accelerated by using these tools during your **quadriceps isometric** exercises:

- Listen to a metronome at 60 beats per minute.
- Do eye movements with each beat (up and down, side to side).
- Put your hand on your quad to feel it activating.

[Video demonstration here](#)



WHEN TO PROGRESS



BENCHMARKS TO ENTER STAGE 2 LIFTING:

- **Next day pain is regularly at a 3/10 or less, using either:**
 - How you feel in the morning
 - Pain-provocation test
- **Improvements in Quadriceps, Calves, and Entire Leg function:**
 - Your **QUADRICEPS ISOMETRIC** numbers have noticeably improved
 - You can manage doing the **FOAM ROLLER BRIDGE** on a single leg with calf raises
 - Your **ISO LUNGE/SPLIT SQUAT** and **SINGLE-LEG STAND** times are noticeably improved (e.g., you are at or near being able to hold for 3-minutes straight).
- **Strength and endurance of the legs are similar side-to-side.**



You will still use this same isometric workout for the subsequent stages. For the **quadriceps isometric**, continue to get stronger. For the **foam roller bridge** (once you hit the last progression), alternate each progression between workouts (e.g., isometric day 1 – 3 sets double leg, isometric day 2 – 3 sets single-leg, isometric day 3, 3 sets single-leg w/ calf raises, repeat sequence). For the **iso lunge/split squat** and **single-leg stand**, you should get to the point where 3-minutes is the norm and you'll just keep doing that for each workout.

STAGE 2

Lifting

This is a 4-day sequence. Continue repeating it after finishing or rest for a day then repeat.

Day 1 (squat and split squat)

	Exercise	Sets	Reps			Tempo	Rest
			Week 1	Week 2	Week 3		
1	ACHILLES HOPPING PROGRESSION						as needed
2	KNEE-DOMINANT SQUAT	5	5	4	3	3 ECC 3 CON	3 min.
3	SPLIT SQUAT	5	5 ea.	4 ea.	3 ea.	3 ECC 3 CON	3 min.
4	LATERAL LUNGE	3	10 ea.	10 ea.	10 ea.	controlled	as needed

Day 2 (isometrics)

	Exercise	Sets	Reps	Tempo	Rest
1	QUADRICEPS ISOMETRIC	5	30-45 sec. ea.	ISO	2 min.
2	FOAM ROLLER BRIDGE	3	30 sec.	ISO	2 min.
3	ISO LUNGE/SPLIT SQUAT	ACCUMULATE 3 MIN. PER SIDE		ISO	as needed
4	SINGLE-LEG STAND	ACCUMULATE 3 MIN. PER SIDE		ISO	as needed

Day 3 (hip hinge and step up)

	Exercise	Sets	Reps			Tempo	Rest
			Week 1	Week 2	Week 3		
1	ACHILLES HOPPING PROGRESSION						as needed
2	HIP HINGE	5	5	4	3	3 ECC 3 CON	3 min.
3	STEP UP	5	5 ea.	4 ea.	3 ea.	3 ECC 3 CON	3 min.
4	LATERAL SLED DRAG	5	20 yd. ea.	20 yd. ea.	20 yd. ea.	controlled	as needed

Day 4 (isometrics + calves/hips)

	Exercise	Sets	Reps	Tempo	Rest
1	QUADRICEPS ISOMETRIC	5	30-45 sec. ea.	ISO	2 min.
2	SOLEUS	3	20 ea.	controlled	2 min.
3	GASTROCNEMIUS	3	10 ea.	controlled	2 min.
4	BENCH ADDUCTOR/ABDUCTOR	4	25 ea.	controlled	as needed

DAY 1 (SQUAT AND SPLIT SQUAT):

1) ACHILLES HOPPING PROGRESSION

This is a 7-part progression. Do only one exercise per session. In your very first workout, start with the first exercise. You can progress to the next exercise in the following session if you can do the exercise for the sets and reps with good ankle stiffness (e.g., your heel doesn't drop, you get off the ground quickly, and you're not bending excessively at the knee). You should rest at least 1 minute between sets or until fully recovered:

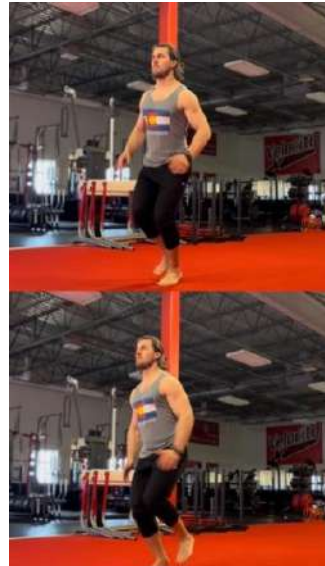
- 1) **Band-Assisted Double-leg Pogos.** Do 4 sets of 25 reps.
- 2) **Double-leg Pogos.** Do 4 sets of 20 reps.
- 3) **Alternate-leg Pogos.** Do 4 sets of 10 reps each leg.
- 4) **Single-leg Pogos.** Do 4 sets of 10 reps each leg.
- 5) **Low Hurdle Hopping.** Do 4 sets over 10 low hurdles.
- 6) **Medium Hurdle Hopping.** Do 4 sets over 10 medium hurdles.
- 7) **Double-leg tuck jumps.** Do 4 sets of 5 reps.
- 8) **Single-leg tuck jumps.** Do 4 sets of 3 reps per leg.



1) Band-Assisted Double-leg Pogos



2) Double-leg Pogos



3) Alternate-leg Pogos



4) Single-leg Pogos



5) Low Hurdle Hopping



6) Medium Hurdle Hopping



7) Double-leg Tuck Jumps

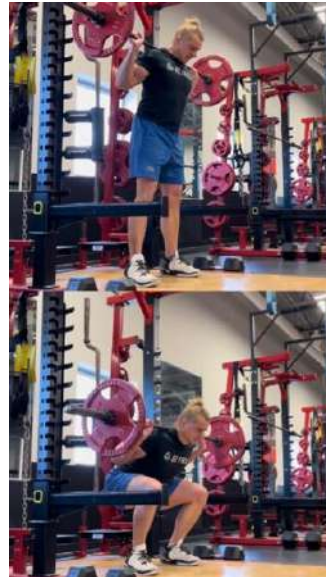


8) Single-leg Tuck Jumps

2) KNEE-DOMINANT SQUAT

Pick a squat variation that you tolerate well and can progressively add load to over time. If you find that you really compensate to load the hips more than the knees, you can elevate the heels. Think of dropping your pelvis straight down and bringing it straight up. This will load the knees, which is what you want out of a squat. Control down 3 seconds and come up for 3 seconds. Do a couple warmup sets until the weight is heavy enough. You should have only 2-3 reps left in the tank when the set is done. Week 1 is 5 reps. Week 2 is 4 reps. Week 3 is 3 reps. 3 minutes rest between sets.

- **Goblet Squat.**
- **Front Squat.**
- **Back Squat.**
- **Zercher Squat.**



3) **SPLIT SQUAT**

Pick a split squat variation that you tolerate well and can progressively add load to over time. The front knee should always bend to around 90 degrees. The knee can remain over the ankle when the patellar tendon is really sore, but if it's not, you can push the knee a bit over the toes. As with the squat, think of dropping your hips straight down and bringing them straight up. Control down 3 seconds and come up for 3 seconds. Do a couple warmup sets until the weight is heavy enough. You should have only 2-3 reps left in the tank when the set is done. Week 1 is 5 reps each side. Week 2 is 4 reps each side. Week 3 is 3 reps each side. 3 minutes rest between sets.

- **Front Foot Elevated Split Squat.**
- **Split Squat.**
- **Rear Foot Elevated Split Squat.**



4) LATERAL LUNGE

Hold only one weight in the inside hand. Step to the side, sit back, bend the knee, keep the chest up. Try to keep the sternum over the knee and the knee over the ankle. Push back through the foot, coming back to center and repeating again. This is not an exercise to load heavy, it's to get internal rotation of the hip and pronation of the foot. 3 sets of 10 reps each. Don't worry about progressively overloading, just try to keep the movement smooth with the sternum-knee-foot relationship. If you take too big of a step, it will be difficult to keep those areas lined up. In that case, take a small step until your range of motion opens up. You should feel the adductors (groin) working with each rep. Rest as needed between sets.



DAY 2 (ISOMETRICS):

Same as the isometric day covered in Stage 1.

DAY 3 (HIP HINGE AND STEP UP):

1) **ACHILLES HOPPING PROGRESSION**

Same progression as covered in day 1. Move through the progression as pain and function allow.

2) **HIP HINGE**

Pick a hip hinge variation that you tolerate well and can progressively add load to over time. Keep a slight knee bend the entire set and hinge back with the hips. You should feel a good stretch in the glutes and hamstrings on the way down. Same tempo, sets, reps, rest, as day 1 squats and split squats.

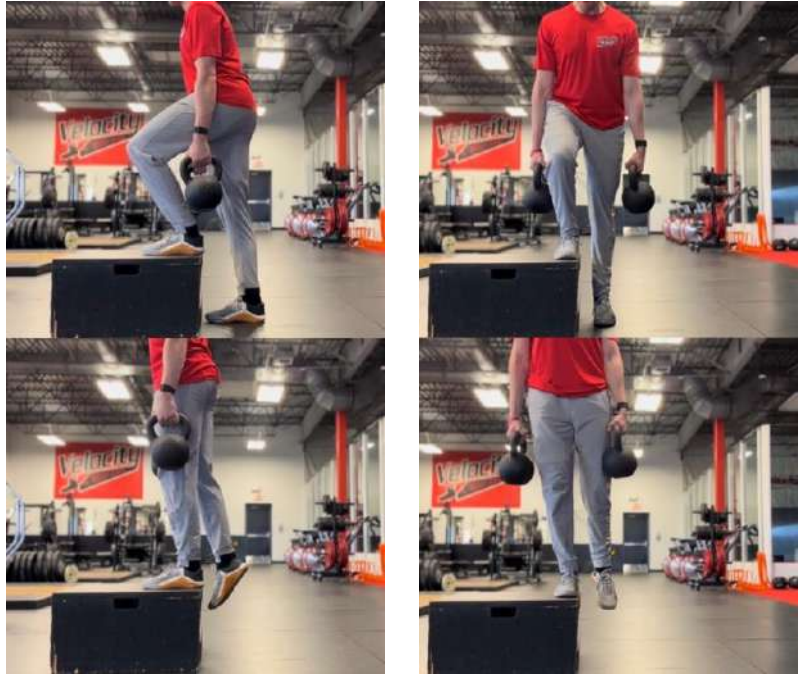
- **Barbell RDL.**
- **DB/KB RDL.**
- **Trap Bar Deadlift.**



3) STEP UP

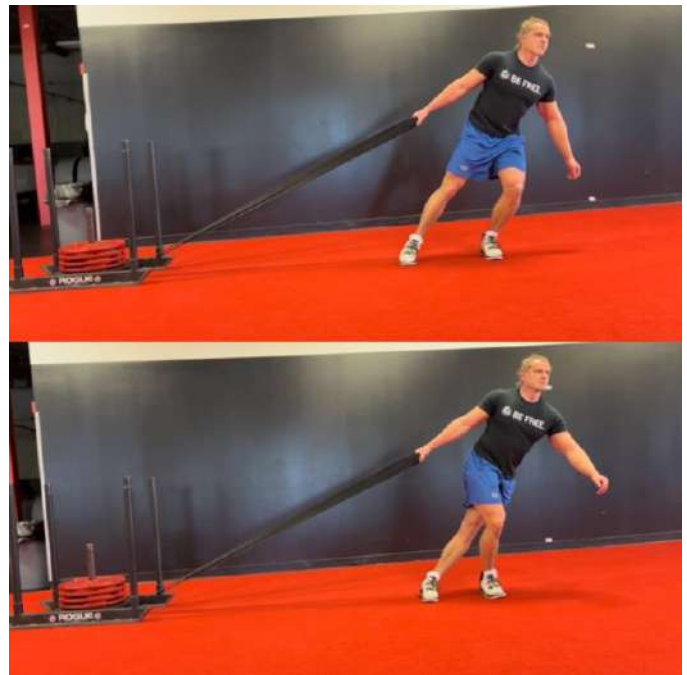
Pick a step up variation that you tolerate well and can progressively add load to over time. Try to keep the starting knee bend around 60-degrees. Stand up and lower without letting the knee snap back or extend excessively. Keep the knee soft through the set. Same tempo, sets, reps, rest, as day 1 squats and split squats.

- **Front Step Up.**
- **Side Step Up.**



4) LATERAL SLED DRAG

Similar to the lateral lunge in day 1, this exercise will get some hip internal rotation and pronation of the foot. Go a distance of about 20 yards each side. It shouldn't be so heavy that you feel it difficult to internally rotate the hip and get a good pronation push with the foot. Take smaller steps if needed and make them larger as your range opens up. Rest as needed between sets.



DAY 4 (ISOMETRICS + CALVES/HIPS):

1) **QUADRICEPS ISOMETRIC**

Same as covered before.

2) **SOLEUS**

Do a bent knee calf raise on a machine or with a weight held on the knee. One leg at a time. 3 sets of 20 each side. Just control the reps so the soleus muscle experiences fatigue towards the end of the set. Rest 2 minutes between sets.



3) **GASTROCNEMIUS**

Do a straight knee calf raise on a machine or with weight. Hold onto something for balance. One leg at a time. 3 sets of 10 each side. Controlled tempo, making sure the gastroc gets fatigued. Rest 2 minutes between sets.



4) **BENCH ADDUCTOR/ABDUCTOR**

One knee on the bench, 25 reps each adductor raise. Switch to both legs up on the bench, 25 reps each abductor raise. 4 sets. Rest as needed between sets.



Troubleshooting Stage 2 Lifting:

In Stage 1, zero to minimal patellar tendon stress activities were allowed. Now that you're in Stage 2, you can push the intensity a bit more to keep working on sport skills:

- Standing basketball shots can now become *shots on the move*.
- Light straight line soccer dribbling can now become *dribbling around cones*.
- Easy skipping for a jumper can now become *a bit more intense*.

If pain increases from these, regress. You can do whatever upper body training you want.

For the strength exercises, it is a 3-week sequence of sets/reps. If you complete the 3-weeks and you still need more time in Stage 2 Lifting because pain is still high and/or you're still weak, start over at week one. Keep repeating this until you hit the criteria for progression listed at the bottom of this page.

Warmup for Isometric days follow the same recommendation as listed in Stage 1 Isometrics. Since Lifting days start with the Achilles Hopping Progression, you should warmup a bit more to prepare for that. This is also a good chance to get more low-level store-and-release work out of your lower body. Do this:

- Jog 100 yards
- Backwards jog 100 yards
- Shuffle 100 yards each
- Carioca 100 yards each
- Skip 100 yards

Or, if you have training partners, play spikeball until warm. This will get unconscious, low-level spring activity from the Patellar and Achilles tendons.

Outside of the Achilles Hopping Progression (which needs to be done in order as pain and function allow), you can alternate strength exercises between sessions if you prefer. Squats, split squats, hip hinges, step ups can all be interchanged or kept the exact same. There are pros and cons to either choice. See what works for you, just make sure you're consistently getting stronger over the weeks.

Tempo:

The suggested tempo to strengthen muscle and to continue tendon stress relaxation is the 3-seconds eccentric and 3-seconds concentric. You should always begin your lifting phase with this slow tempo. If you are tolerating this well and gaining strength, you have two options:

- Continue with the **Health Tempo** (3 seconds down, 3 seconds up). Use this if you have a *very bad* tendon and need to be extremely cautious with loading.
- Switch into a more **Performance Tempo** (controlled down, explosive up). Use this if you are making good progress in your rehab and are looking to push things a bit harder. Keeping the reps and sets the same, you will be able to use a heavier weight with this tempo since the set won't last as long.

WHEN TO PROGRESS



BENCHMARKS TO ENTER STAGE 3 STORE-AND-RELEASE:

- **Next day pain is regularly at a 3/10 or less, using either:**
 - How you feel in the morning
 - Pain-provocation test
- **Improvements in Quadriceps, Calves, and Entire Leg function:**
 - Your **KNEE-DOMINANT SQUAT** and **HIP HINGE** numbers have noticeably improved (research recommends at least 1.5 times bodyweight for an estimated squat max).
 - Your **SPLIT SQUAT** and **STEP UP** have also improved and are consistent side-to-side.
 - You can perform the **LATERAL LUNGE** and **LATERAL SLED DRAG** without much restriction in range of motion (e.g., hips internally rotate, and feet pronate well).
- **Elite-level Hopping ability:**
 - You have completed the **ACHILLES HOPPING PROGRESSION** and can perform single-leg tuck jumps with good ankle stiffness and confidence.



You will still use this same lifting workout for the subsequent stages. For the **knee-dominant squat** and **hip hinge**, continue to get stronger. Same for the **split squat**, **step up**, **soleus**, and **gastroc**. For the **lateral lunge** and **lateral sled drag**, continue to make improvements in hip internal rotation and foot pronation. For the **achilles hopping progression** (once you hit the last progression), start it over at the first exercise and run through it again in the same sequence.

STAGE 3

Store-And-Release

This is a 6-day sequence. Continue repeating it after finishing or rest for a day then repeat.

Day 1 (store-and-release)

	Exercise	Sets	Reps	Tempo	Rest
1	LANDING PROGRESSION				as needed
2	JUMPING PROGRESSION				as needed
3	ACCELERATION/DECELERATION				as needed
4	CHANGE OF DIRECTION				as needed

Day 2 (isometrics)

	Exercise	Sets	Reps	Tempo	Rest
1	QUADRICEPS ISOMETRIC	5	30-45 sec. ea.	ISO	2 min.
2	FOAM ROLLER BRIDGE	3	30 sec.	ISO	2 min.
3	ISO LUNGE/SPLIT SQUAT	ACCUMULATE 3 MIN. PER SIDE		ISO	as needed
4	SINGLE-LEG STAND	ACCUMULATE 3 MIN. PER SIDE		ISO	as needed

Day 3 (squat and split squat)

	Exercise	Sets	Reps			Tempo	Rest
			Week 1	Week 2	Week 3		
1	ACHILLES HOPPING PROGRESSION						as needed
2	KNEE-DOMINANT SQUAT	5	5	4	3	3 ECC 3 CON	3 min.
3	SPLIT SQUAT	5	5 ea.	4 ea.	3 ea.	3 ECC 3 CON	3 min.
4	LATERAL LUNGE	3	10 ea.	10 ea.	10 ea.	controlled	as needed

Day 4 (store-and-release)

	Exercise	Sets	Reps	Tempo	Rest
1	LANDING PROGRESSION				as needed
2	JUMPING PROGRESSION				as needed
3	ACCELERATION/DECELERATION				as needed
4	CHANGE OF DIRECTION				as needed

Day 5 (isometrics + calves)

	Exercise	Sets	Reps	Tempo	Rest
1	QUADRICEPS ISOMETRIC	5	30-45 sec. ea.	ISO	2 min.
2	SOLEUS	3	20 ea.	controlled	2 min.
3	GASTROCNEMIUS	3	10 ea.	controlled	2 min.
4	BENCH ADDUCTOR/ABDUCTOR	4	25 ea.	controlled	as needed

Day 6 (hip hinge and step up)

	Exercise	Sets	Reps			Tempo	Rest
			Week 1	Week 2	Week 3		
1	ACHILLES HOPPING PROGRESSION						as needed
2	HIP HINGE	5	5	4	3	3 ECC 3 CON	3 min.
3	STEP UP	5	5 ea.	4 ea.	3 ea.	3 ECC 3 CON	3 min.
4	LATERAL SLED DRAG	5	20 yd. ea.	20 yd. ea.	20 yd. ea.	controlled	as needed

DAY 1 (STORE-AND-RELEASE):

What follows is a general recommendation for going about the Store-And-Release Day. Stage 1 Isometrics and Stage 2 Lifting are similar across the board for all athletes. Stage 3 Store-And-Release is much more individual.

The patterns affected by patellar tendinopathy are landing, jumping, acceleration/deceleration, and change of direction. Some athletes need more of some and less of others. For example:

- A high jumper's program will include a lot of jumping and acceleration
- A soccer player's program will include a lot of acceleration, deceleration, and change of direction
- A basketball player's program will include a lot of everything
- An American football punter's program will include kicking variations
- A tennis player's program will include a lot of change of direction and deceleration
- A Powerlifter will not need to do this phase because they only lift

This Store-And-Release program will address mostly everything an athlete will need. But if you feel you need more specific preparation to get back to sport, tweak the exercises and progressions to meet your demands.

What follows are 12 workouts. If you complete workout #1 with what you feel is good technique (Function) and it doesn't hurt more the following day (Pain), then you can progress to workout #2 in the following Store-And-Release session. If you do not perform the workout with good function and/or you get increased pain the following day, stay at that given workout for another session until you can do it with good function and no pain increase.

The progressions are explained first, and the twelve individual workouts are explained later.

Store-And-Release progressions are done in a gradual manner to improve patellar tendon function without causing flare ups. Each category progresses from **low** (e.g., 50% efforts) to **high** (e.g., 90-100% efforts) **intensity** and from **high** (e.g., 80 jumps, 600 yards) to **low** (e.g., 20 jumps, 150 yards) **volume**. Outside of this, there are other things done to slowly increase patellar tendon stress (noted in parenthesis), they are listed here:

1) LANDING PROGRESSION

- **Bilateral Land** (very low)
- **Split Land** (low)
- **Staggered Land** (medium)
- **Unilateral Land** (high)



2) JUMPING PROGRESSION

- **Band-Assisted Jump** (very low)
- **Seated Jump** (low)
- **Standing Jump** (medium)
- **Approach Jump** (high)



3) ACCELERATION/DECELERATION

- **Tempo Intervals** (very low)
- **Flying Sprints** (low)
- **Accel/Decel 70%** (medium)
- **Accel/Decel 90-100%** (high)



4) CHANGE OF DIRECTION (COD)

- **45-degrees** (low)
- **90-degrees** (medium)
- **180-degrees small area** (medium)
- **180-degrees big area** (high)



WORKOUT 1

LANDING

Bilateral Trap Bar/DB Land. 3 sets 5 reps.
Stand tall, drop down to a position of around 60- to 90-degrees of knee flexion and hold for 2-seconds. Stand back up and repeat. You should get even bending through the ankles, knees, and hips.



JUMPING

Band-Assisted Jump (50% jump). 4 sets 20 reps.
Grab onto bands or something that will unload your bodyweight to a degree. Squat down to about 60- to 90-degrees of knee flexion and do a 50% effort jump. Jump continuously for 20 reps.



ACCEL/DECEL

Tempo Intervals (70% speed). 6 sets 60 yards.
Set up four cones spaced 20 yards apart. Start at the first and slowly accelerate to 70% speed, you should be at that speed by the time you hit the second cone. Hold that speed until the third cone and then slowly decelerate to a stop by the fourth cone.



COD

45-Degree Zig Zag (70% speed). 5 sets ea. way 3 cuts.
Set up 5 cones spaced 5 yards apart at a 45-degree angle. Run through the pattern going 70% speed. Make sure you can cut confidently off both sides. Do equal sets going both directions.



WORKOUT 2

LANDING

Bilateral Trap Bar/DB Land. 3 sets 5 reps.
Try to increase the load in this session.



JUMPING

Seated Box Jump (50% jump). 4 sets 10 reps.

Pick a 12- to 18-inch box to sit on with another box in front that is slightly higher. From a seated position, explode up onto the box. Land in 60- to 90-degrees of knee flexion. Step down, reset, and repeat.



ACCEL/DECEL

Tempo Intervals (70% speed). 8 sets 60 yards.

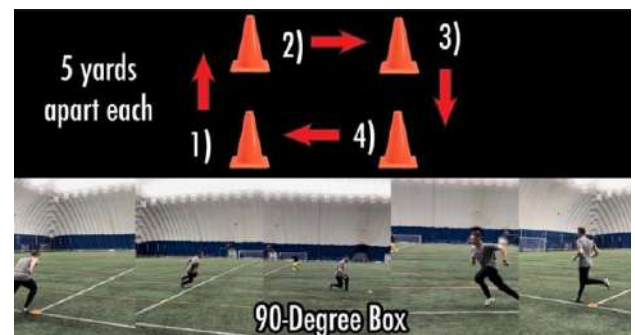
Same as previous workout with 8 sets instead of 6.



COD

90-Degree Box (70% speed). 5 sets ea. way 3 cuts.

Set up four cones spaced 5 yards apart in a box. Run through the pattern going 70% speed. Make sure you can cut confidently off both sides. Do equal sets going both directions.



WORKOUT 3

LANDING

Bilateral Trap Bar/DB Land. 3 sets 5 reps.
Try to increase the load in this session.



JUMPING

Standing Box Jump (50% jump). 4 sets 10 reps.
Pick a box you can comfortably jump onto while landing in 60- to 90-degrees of knee flexion. From a standing position, explode up onto the box. Step down, reset, and repeat.



ACCEL/DECEL

Tempo Intervals (70% speed). 10 sets 60 yards.
Same as previous workout with 10 sets instead of 8.



COD

180-Degree 5-10-5 (70% speed). 5 sets ea. way 2 cuts.

Set up three cones spaced 5 yards apart in a box. Start at the middle cone, run towards an outside cone, cut, run through the middle cone and to the other outside cone, cut, and run back through the middle cone. Go at 70%. For the next set, start by going the other direction. Then repeat. Make sure you can cut confidently off both sides.



WORKOUT 4

LANDING

DB Split Land. 3 sets 5 ea.

Grab two dumbbells. From a standing position, quickly drop down and land in a split stance. Hold for 2-seconds. Stand back up and repeat on the other side.



JUMPING

Continuous Squat Jump (50% jump). 4 sets 10 reps.

From a standing position, jump up at 50% effort, land in around 60- to 90-degrees of knee flexion with good bend at the knee/ankle/hip, jump up again and repeat for 10 reps.



ACCEL/DECEL

Flying Sprints (90-100% speed). 3 sets 20 accel, 10 hold, 30 decel.

Set up four cones. The first two, spaced 20 yards apart. The third spaced 10 yards from the second and the fourth spaced 30 yards from the third. You will use the first 20 yards to build up to a 90-100% sprint, hold it for 10 yards, then decelerate for the next 30 yards to the last cone.



COD

180-Degree 10-20-10 (70% speed). 5 sets ea. way 2 cuts.

The same as last session's 5-10-5, but the cones are now spaced 10 yards apart instead of 5.



WORKOUT 5

LANDING

DB Split Land. 3 sets 5 ea.
Try to increase the load this session.



JUMPING

Approach Box Jump (50% jump). 4 sets 5 ea.

Pick a box you can comfortably jump onto while landing in around 60- to 90-degrees of knee flexion. From a standing position, take one step forward, plant, and explode up onto the box. Step down, go back to the start position, and switch the approach style to push off the opposite leg, plant, then jump. Repeat for 5 reps each side.



ACCEL/DECEL

Flying Sprints (90-100% speed). 4 sets 20 accel, 10 hold, 30 decel.

Same as previous workout with 4 sets instead of 3.



COD

45-Degree Zig Zag (90% speed). 4 sets ea. way 3 cuts.

Same as workout 1.
Intensity has changed to 90% instead of 70% and sets are 1 less each way.



WORKOUT 6

LANDING

DB Split Land. 3 sets 5 ea.
Try to increase the load this session.



JUMPING

Continuous Approach Jump (50% jump). 4 sets 5 ea.

Get in an area with open space. Just like the approach box jumps last session, take the same step forward, plant, jump, land, then repeat. You will be moving forward down a path. Do all reps with one plant, turn around, and do the other plant going back. If you are a single-leg jumper, you can do this variation as a single-leg jump instead of double-leg.



ACCEL/DECEL

Flying Sprints (90-100% speed). 5 sets 20 accel, 10 hold, 30 decel.

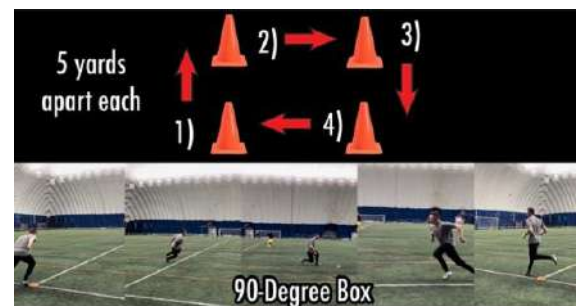
Same as previous workout with 5 sets instead of 4.



COD

90-Degree Box (90% speed). 4 sets ea. way 3 cuts.

Same as workout 2. Intensity has changed to 90% instead of 70% and sets are 1 less each way.



WORKOUT 7

LANDING

Staggered Depth Drop. 3 sets 5 ea.
Find something to drop off. Land in a staggered position with most of the weight on the front leg, at 60- to 90-degrees of knee flexion. Hold for 2-seconds, repeat for 5 reps on each side.



JUMPING

Band-Assisted Jump (100% jump). 4 sets 10 reps.
Same as workout 1 but now at 100%. Continuous.



ACCEL/DECEL

Accel/Decel (70% speed). 6 sets 10 accel, 5 decel.

Set up three cones. The first two spaced 10 yards apart and the third spaced 5 yards from the second. Start at the first cone, accelerate as quickly as possible to 70% speed. Once you hit the second cone, start decelerating so you can come to a stop by the third cone. You can vary start and stop positions with each rep.



COD

180-Degree 5-10-5 (90% speed). 4 sets ea. way 2 cuts.

Same as workout 3. Intensity has changed to 90% instead of 70% and sets are 1 less each way.



WORKOUT 8

LANDING

Staggered Depth Drop. 3 sets 5 ea.
Try to increase the height of the fall.



JUMPING

Seated Box Jump (100% jump). 4 sets 5 reps.
Same as workout 2 but now at 100% so you can raise the height of the box you're jumping on to.



ACCEL/DECEL

Accel/Decel (70% speed). 8 sets 10 accel, 5 decel.
Same as last workout but now sets are 8 instead of 6.



COD

180-Degree 10-20-10 (90% speed). 4 sets ea. way 2 cuts.
Same as workout 4. Intensity has changed to 90% instead of 70% and sets are 1 less each way.



WORKOUT 9

LANDING

Staggered Depth Drop. 3 sets 5 ea.
Try to increase the height of the fall.



JUMPING

Standing Box Jump (100% Jump). 4 sets 5 reps.

Same as workout 3 but now intensity is 100% so you can raise the height of the box you're jumping on to.



ACCEL/DECEL

Accel/Decel (70% speed). 10 sets 10 accel, 5 decel.

Same as last workout but now sets are 10 instead of 8.



COD

45-Degree Zig Zag (100% speed). 3 sets ea. way 3 cuts.

Same as workout 5.

Intensity has changed to 100% instead of 90% and sets are 1 less each way.



WORKOUT 10

LANDING

Bilateral Jump to Unilateral Land. 3 sets 5 ea.

Stand there, jump up off two legs, and land on one leg, holding for 2-seconds. Make sure there is an even bend at the ankle, knee, and hip. Start with low jumps until comfortable. 5 reps each side.



JUMPING

Continuous Squat Jump (100% jump). 4 sets 5 reps.

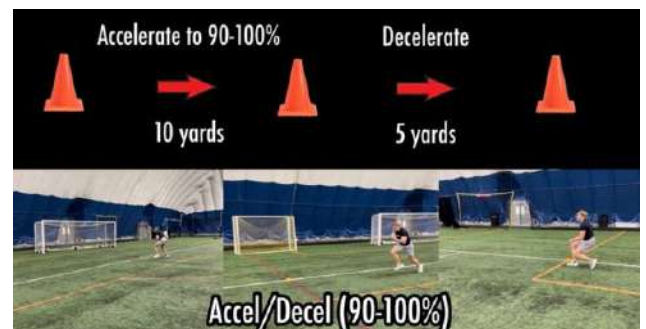
Same as workout 4 but now intensity is 100%.



ACCEL/DECEL

Accel/Decel (90-100% speed). 6 sets 10 accel, 5 decel.

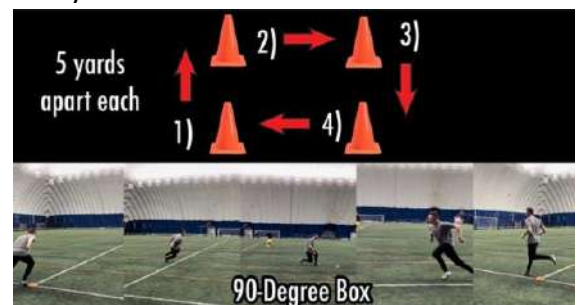
Same as the accels and decels from the last three workouts but now the intensity is 90-100%. Continue to change the starting positions between sets, you can time these sprints if it makes you more motivated.



COD

90-Degree Box (100% speed). 3 sets ea. way 3 cuts.

Same as workout 6. Intensity has changed to 100% instead of 90% and sets are 1 less each way.



WORKOUT 11

LANDING

Bilateral Jump to Unilateral Land. 3 sets 5 ea.

Try to increase the height of the jump.



JUMPING

Approach Box Jump (100% jump). 4 sets 3 ea.

Same as workout 5 but now intensity is 100% so you can raise the height of the box you're jumping on to.



ACCEL/DECEL

Accel/Decel (90-100% speed). 8 sets 10 accel, 5 decel.

Same as last workout but now sets are 8 instead of 6.



COD

180-Degree 5-10-5 (100% speed). 3 sets ea. way 2 cuts (3 cones).

Same as workout 7. Intensity has changed to 100% instead of 90% and sets are 1 less each way.



WORKOUT 12

LANDING

Bilateral Jump to Unilateral Land. 3 sets 5 ea.

Try to increase the height of the jump.



JUMPING

Continuous Approach Jump (100% jump). 4 sets 3 ea.

Same as workout 6 but now intensity is 100%.



ACCEL/DECEL

Accel/Decel (90-100% speed). 10 sets 10 accel, 5 decel.

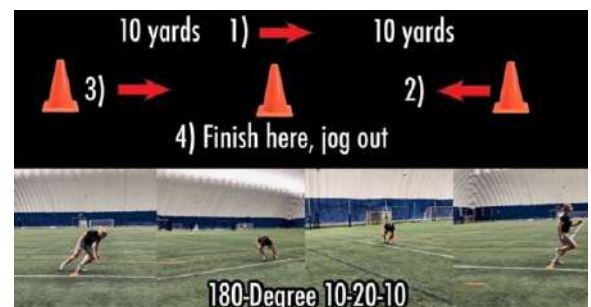
Same as last workout but now sets are 10 instead of 8.



COD

180-Degree 10-20-10 (100% speed). 3 sets ea. way 2 cuts (3 cones).

Same as workout 8. Intensity has changed to 100% instead of 90% and sets are 1 less each way.



DAY 2 (ISOMETRICS):

Same as the isometric day covered in Stage 1.

DAY 3 (SQUAT AND SPLIT SQUAT):

Same as the squat and split squat lifting day covered in Stage 2.

DAY 4 (STORE-AND-RELEASE):

Same as day 1 earlier this week. Progress as pain and function allow.

DAY 5 (ISOMETRICS + CALVES/HIPS):

Same as the isometric + calves/hips day covered in Stage 2.

DAY 6 (STORE-AND-RELEASE):

Same as the hip hinge and step up day covered in Stage 2.

Troubleshooting Stage 3 Store-And-Release:

Minimal stress sport skill activities were allowed in Stage 2. Now that you're in Stage 3, you can make these changes to continue progressing with sport:

- Basketball shots on the move can become *shots against a defender*.
- Soccer dribbling around cones can now become *dribbling against a defender*.
- Skipping for a jumper can become *light bounding*.

The level of effort will depend on what you're ready to handle. If pain increases from these changes, pull back the intensity or go back to the well-tolerated movement you did in Stage 2. You have free reign on upper body training.

Warmup the same as you would do for the Achilles Hopping progression. Running variations for distance, a low-level game like spikeball, etc. Just make sure you're completely warm and the lower body feels ready for store-and-release movements.

For every exercise, do 2-3 warmup sets where you go through the motion of the exercise at a lower intensity.

Rest as long as needed between sets. In the first 6 workouts or so, you probably won't need as much rest because the intensity is 50-70%. 1-2 minutes should be enough. In the last 6 workouts or so, you will probably need more rest because the intensity is 90-100%. 2-3 minutes will probably be right.

The weekly setup goes 1) Store-And-Release, 2) Isometrics, and 3) Lifting. This is because day 1 is most likely to provoke pain and discomfort the following day, so isometrics can settle this. By day 3, you should be feeling pretty good to do lifting and then ready for day 1 again. If you are not ready, you can take a rest day or do another isometric day while you wait to feel ready. If you have setbacks, don't panic. They're a normal part of Stage 3.

In the latter half of your Stage 3, you should really be using the sporting implement as much as possible. Add it into your **jumping**, **landing**, **accelerating**, **decelerating**, and **changing direction** movements to further prepare you for Stage 4 Return to Sport.



WHEN TO PROGRESS



BENCHMARKS TO ENTER STAGE 4 RETURN TO SPORT:

- **Next day pain is regularly at a 3/10 or less, using either:**
 - How you feel in the morning
 - Pain-provocation test
- You can confidently perform **LANDING**, **JUMPING**, **ACCELERATION/DECELERATION**, and **CHANGE OF DIRECTION** movements that closely mirror the demands of your sport and there is not much difference side-to-side.

You want to get back to the point of “thoughtless, fearless movement” – Louis Gifford, 2005.



STAGE 4

Return to Sport

There is no weekly workout for this phase, just suggestions.

If you made the ending of your Stage 3 Store-And-Release program replicate the demands of sport, you should be good to go. When returning to sport:

- Keep the same weekly sequence (Day 1 Store-And-Release, Day 2 Isometrics, Day 3 Lifting) but replace your Store-And-Release day with the sport practice/competition.
- If that's not possible, try to manage sport loads so there is no more than 3 high-intensity training/competition days in a week (a principle of elite sport in their first year of return from patellar tendinopathy).
- At least twice per week, maintain Stage 2 Lifting exercises (e.g., squats, hip hinges, step ups, split squats).
- Continue Stage 1 Isometric exercises as needed (e.g., before or after training, on a day off from sport).
- For the rest of your athletic career, keep tabs on next day pain. Take immediate action to decrease training volume/intensity if pain responses increase.



10 Things to Keep in Mind

- 1) **The Brain deficit.** You need to spend enough time with isometrics (and visual, auditory, sensory tools) to normalize the brain's inhibition and activation.
- 2) **The Muscle deficit.** You need to spend enough time strengthening your muscles with lifting (e.g., squats, split squats, hip hinges, step ups, calf raises).
- 3) **The Soleus-Hamstring deficit.** You need to get good at developing co-contractions around the knee (e.g., foam roller bridge, hopping progression).
- 4) **The Hopping deficit.** You need to develop the ankle/foot/Achilles. If that area has a deficit, the knee will be forced to deal with it and you'll likely have setbacks.
- 5) **Eat right.** You get tendon and muscle adaptations when you recover from training. Eat enough protein (~1 gram per pound bodyweight per day) from a variety of sources. Eat enough carbohydrates and fats to provide you energy. Specifically for tendons, consume some proteins higher in proline and glycine (e.g., collagen) and make sure you get enough vitamin C (e.g., oranges).
- 6) **Sleep enough.** There is some evidence in vitro and in animal models that tendon *accumulates damage* throughout the day and *cleans itself up* at night. When the circadian rhythm is interrupted, this can cause issues with tendon clean up and could potentially be the start of tendinopathy. Try to stay consistent with sleep-and-wake times and get ~8 hours per night.
- 7) **Move enough.** A Jumper's Knee Protocol training sessions lasts ~1 hour. If you lay on the couch the other 23 hours, do you think that's going to help you? Probably not. Motion is lotion and chronically high blood sugar (potentially from a sedentary lifestyle) can negatively impact tendon health. Get 10,000 steps per day.
- 8) **Don't change loads fast.** If you go from 0 jumps in one week to 100 jumps the next week, you will probably blow up your tendon. Be slow with how you change store-and-release loads.
- 9) **Appreciate the tendon healing process.** The tendinopathy continuum says that a normal tendon goes reactive, then into tendon dysrepair, then into a degenerative tendon. Along the path, it will tell you how it's feeling if you listen. Some tendons take longer to heal than others. If you had an event where you really aggravated the tendon, the reactive response could last for weeks or months. Tendons don't have a set recovery time. Listen to next day pain and give the tendon what it wants.
- 10) **Be aware of psychosocial factors.** Look into the biopsychosocial model of pain. Thoughts, emotions, and behaviors can positively or negatively impact rehab. Economical, environmental, and cultural factors can do the same.

[Watch these videos](#)