

ACL Prevention Program

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- Programs should begin at or close to puberty and have multiple components including proximal control exercises, and a combination of strength and plyometric exercises
- Each session should be greater than 20 minutes
- Performed 2-3 times per week for a minimum of 8-12 weeks for best results
- Developed to help reduce an athlete's risk of knee injury and improve overall athletic performance

- Known risk factors of knee injury include modifiable movement patterns: dynamic knee valgus (collapsing in at the knees), stiff landings, quadriceps dominance, leg dominance and lack of core control
- An estimated 250,000-400,000 ACL-related injuries occur annually in the United States
- Female athletes are 2-8 times more likely to injure their ACL

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- Clinicians, coaches and parents should implement exercise-based knee injury prevention programs in all young athletes, not just those athletes identified through screening as being at high risk for ACL injury

- Clinicians, coaches, parents, and athletes should support implementation of exercise-based knee injury prevention programs led by either coaches or a group of coaches and medical professionals

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Dynamic Warm Up

- Targets hips, glutes, quadriceps, calves and core
- These are important in executing movements correlated with ACL injuries

Each done for 25-50 yards or 20-30 seconds

A. 25 % Run

B. Backpedal on toes

C. Shuttle Run (side to side run)

D. Walking Knee Hugs

E. High Knees

F. Butt Kicks

G. Carioca

H. Normal Skip

I. Skip for Height

K. 75% Run

Flexibility

- Important to incorporate short warm-up prior to stretching
- Never stretch a "cold muscle"
- Improves and maintains your range of motion, reduce stiffness in your joints, reduce post-exercise soreness, reduce the risk of injury and improve your overall mobility and performance.

Muscle activation: approximately 2 minutes of total time, holding position and contracting the muscle for approximately 4 seconds. Stretching is only recommended in cases of limited range of motion

- Standing calf stretch
- Standing quadriceps stretch
- Half-kneeling hamstring stretch
- Half-kneeling hip flexor stretch
- Butterfly adductor stretch
- Figure-of-four stretch

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Strengthening

Strengthen the hip and knee stabilizers. The resistance band helps engage the glutes.

Double leg squat (with or without resistance band)

- 10 times

Double leg squat with ball overhead

- 10 times

Walking lunges

- 5 lunges each side

Backward lunges

- 5 lunges each side

Lateral band walks (monster walks) with resistance band

- 20 steps each side

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Double leg squat

With or without resistance band

Squat down so your thighs are parallel with the ground, while pushing your knees out against the band.

10 reps

** Do not allow your knees to go in front of your toes. **



Resistance bands come in different strengths

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Lateral band walks (monster walks) with different placement of resistance band

Get into a semi-squat position by bending slightly at the knees. Keep your hips back, trunk forward, and weight through your heels. Push your knees outward against the band and step sideways for twenty steps. Repeat this in the opposite direction, keeping your hips and core tight.

**** Do not allow knees to cave inward ****



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Strengthening

- Strengthen the hip and knee stabilizers. The resistance band helps engage the glutes

Nordic Hamstring eccentric exercises

- 10 repetitions

Plank

- 30 seconds to 1 minute

Side Plank

- 15 to 30 seconds each side

Clamshells with resistance band

- Hold 30 seconds

Glute bridge

- 10 repetitions

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Nordic hamstring curls (eccentric)

Easier with partner but can do with rig or glute/ham machine also. Keeping your hips extended, begin to lower yourself as slowly as possible until you can no longer control the descent. Once you lose control, catch yourself with your arms and hands

10 repetitions

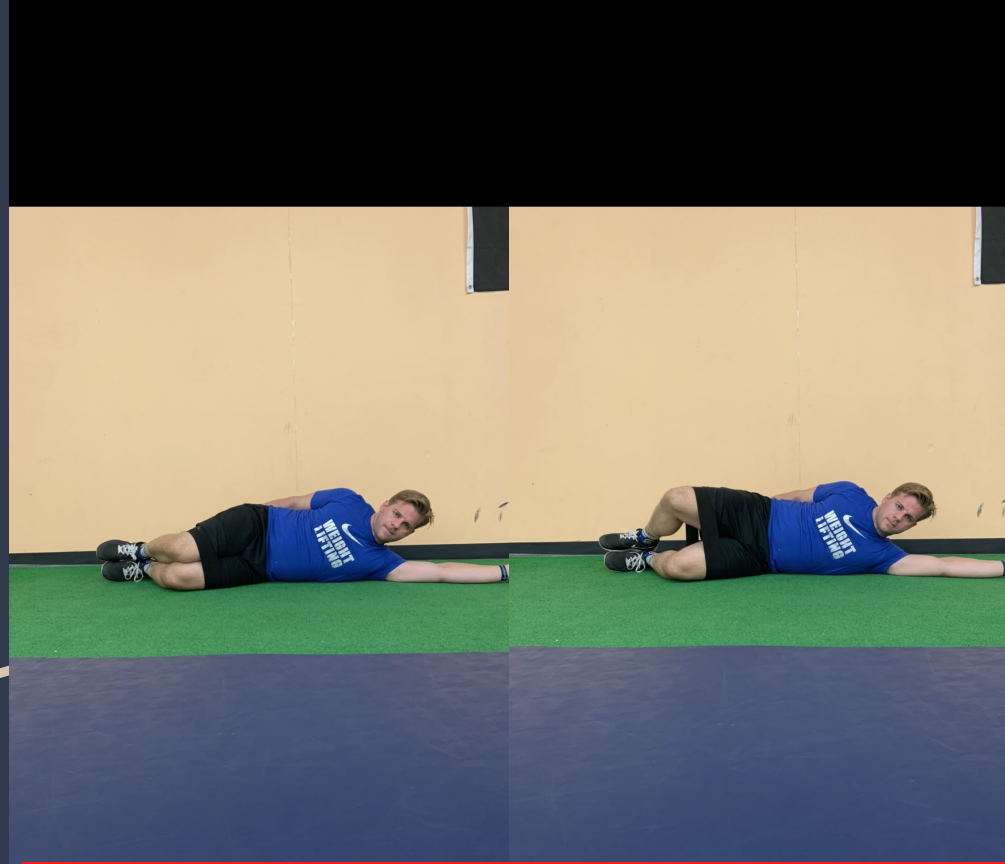


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Clamshells with resistance band

Lay on your side with your knees bent (approximately 90° , and hips flexed approximately $60-70^\circ$). With your feet together and hips stacked on top of each other, raise your top knee up like a clamshell.

Hold for 30 seconds each side



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Glute bridge

Bridge pelvis by planting feet, extending/raising pelvis and squeezing glutes.

10 repetitions

* Can repeat with one leg planted and alternate for more challenging variant



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Plyometrics

Cause muscles to exert maximum force in a minimum amount of time and can help athletes with agility, stamina and strengthening of the muscles around the knees

* Do not allow your knees to go in front of your toes and do not let your knees cave inward. *

Lateral squat jumps (over line or cone) - 3 each side

Forward/backward squat jumps - 5 forward/back (10 total reps)

180 degree jumps - 6-10 total reps

Scissor jumps - 10 each side

Skaters - 10 each side (20 total reps)

Single leg hop over line forward and lateral (land on one leg) - 4 reps each leg for FW and lateral

Hop, hop, jump (stick landing) - 6-8 reps

Single legged jumps for distance - 4 each leg

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Lateral squat jumps

Stand with line or cone to your left or right. Hop over the cone or line softly landing on the balls of your feet and land bending at the knee. Repeat this exercise hopping to the opposite side.

3 reps each side

* Do not allow your knees to go in front of your toes and do not let your knees cave inward. *



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Forward/backward squat jumps

Hop over the cone/line softly landing on the balls of your feet and bending at the knee. Now, hop backwards over the ball using the same landing technique. Be careful not to snap your knee back to straighten it. You want to maintain a slight bend to the knee.

Repeat for 10 reps.



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180 degree jumps

Stand in athletic position with knee slightly bent. Load and jump/turn 180 degrees landing on the balls of your feet and bending at the knee

6-10 total reps

* Do not allow your knees to go in front of your toes and do not let your knees cave inward. *



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Scissor jumps

Lunge forward leading with your right leg. Keep your knee over your ankle. Now, push off with your right foot and propel your left leg forward into a lunge position. Be sure your knee does not cave in or out. It should be stable and directly over the ankle. Remember the proper landing technique; accept the weight on the ball of your foot with a slight bend to the knee.

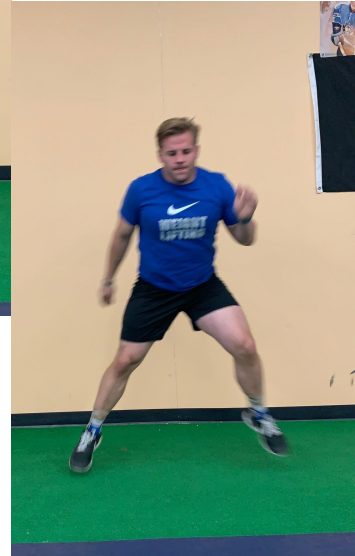
Perform 10 reps with each leg.



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Skater jumps

Stand with your legs about 3 feet apart, feet and toes pointed forward. Lower your body to a gentle squat, then bring your right foot diagonally behind your left leg and touch your toe down. Hold for one second, then fire up your glutes and push off your left foot in a jumping movement to the right. Bring the left foot diagonally behind the right, then repeat on that side. Continue to push left and right for 30 seconds—about 15 to 20 reps total.

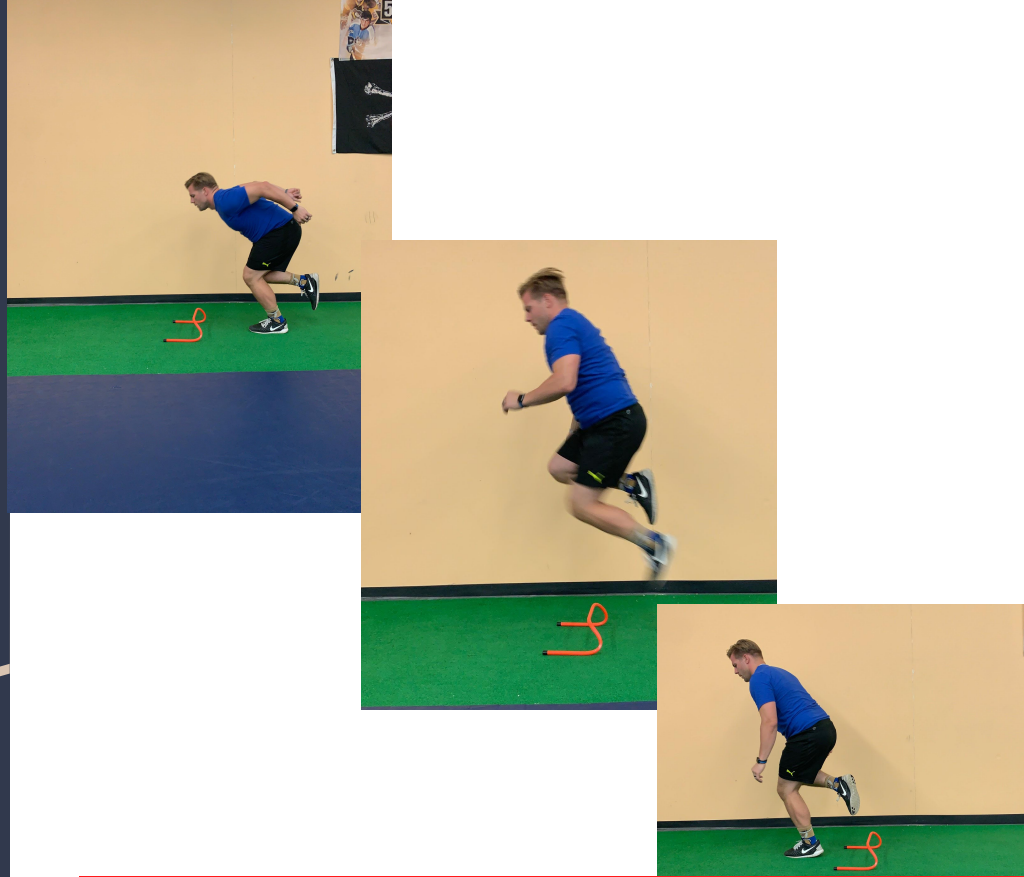


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Single leg hop over line forward/backward – land on one leg

Hop over the cone/line landing on the ball of your foot bending at the knee. Now, hop backwards over the ball using the same landing technique. Be careful not to snap your knee back to straighten it and maintain a slight bend in the knee.

Perform 4 reps backward/forward each leg.

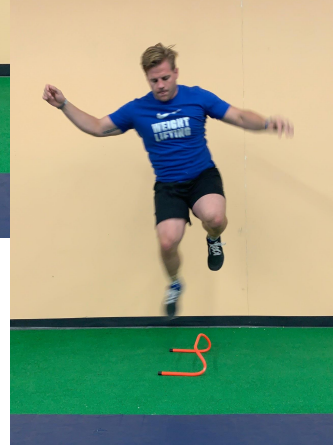


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Single leg hop over line lateral – land on one leg

Hop over the cone/line landing on the ball of your foot bending at the knee. Now, hop to the opposite side over the cone or line using the same landing technique. Be careful not to snap your knee back to straighten it and maintain a slight bend in the knee.

Perform 4 reps backward/forward each leg.



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Agility

Designed to improve the power and strength in the muscles.

Forward-Backward Shuttle Run - Run forward 5 yards, backwards 5, forward 5 yds - 2-4 times

Diagonal Runs - 5 yards, plant with one foot, 5 yards and plant and cut with opposite foot - 35 yards total and 2-4 times

Run with 3 step deceleration - Sprint 15 yards and final 3 steps short and choppy

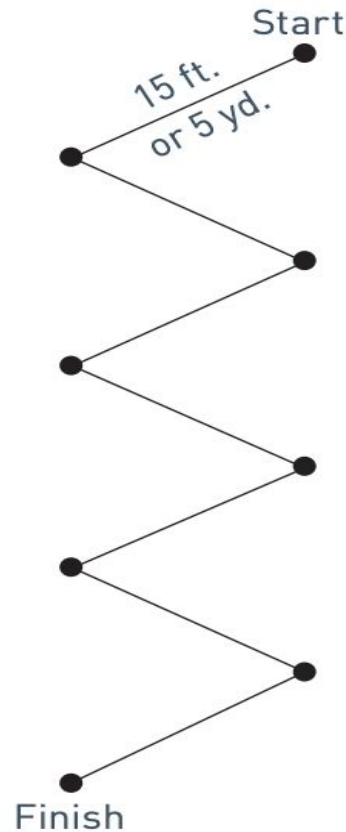
Bounding strides - 20 each side - Run with high knees pulled toward your chest from one end of the field to the other end

Side shuffle with hard planting - Shuffle 3-4 yards and plant on one foot, go opposite direction 3-4 yards and plant on opposite foot

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Diagonal runs

Face forward and run to the first marker on the left. Pivot off the left foot and run to the second cone. Now pivot off the right leg and continue onto the third cone. Make sure that the outside leg does not cave in. Keep a slight bend to the knee and make sure the knee stays over the ankle joint.



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Cool Down

Allows the muscles that have been working hard throughout the training session to elongate and deters the onset of muscle soreness

Standing quadriceps stretch - 30 sec to 1 min

Standing gastrocnemius/soleus stretch - 30 sec to 1 min per side

Supine single and double knee to chest - 30 seconds each side

Seated butterfly stretch - 30 seconds to one minute

Couch stretch - if wall or bench available

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Adjustments and implementation

Ideally, knee prevention programs start in the preseason and continue through the season. Adjustments can be made to accommodate for certain movements or movements associated with certain activities or sports. For example, jumping to head a soccer ball or catch a football are movements that can be substituted or added. Other adjustments can be made to make the program more challenging (e.g. adding weight or time).

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Current evidence

This is a proposed program based on the available evidence and programs (Harmoknee, KLIP, PEP, Sportsmetrics) and studies (Knakantröll, Myklebust, Mandelbaum, Carraffa and Achenbach)¹.

1. ARUNDALE A.J.H., BIZZINI M., GIORDANO A. et al., ExerciseBased knee and anterior cruciate ligament injury prevention, J, Orthop, Sports Phys, Ther., 2018, 48 (9), A1–A43.

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Notes

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