

**TABLE 2**

CONTENTS OF PROGRAMS FREQUENTLY REFERENCED IN THE CPG

Area/Study or Program	Equipment Needed	Time for Each Activity	Activities/Muscles Included in Program
<b>Flexibility</b>			
HarmoKnee	None	Muscle activation: approximately 2 minutes of total time, holding position and contracting the muscle for approximately 4 seconds, focusing on "finding" your muscles. Stretching is only recommended in cases of limited range of motion	<ul style="list-style-type: none"> <li>• Standing calf stretch</li> <li>• Standing quadriceps stretch</li> <li>• Half-kneeling hamstring stretch</li> <li>• Half-kneeling hip flexor stretch</li> <li>• Butterfly adductor stretch</li> <li>• Modified figure-of-four stretch</li> </ul>
PEP	None	50 yd each, 30 × 2 repetitions each	<ul style="list-style-type: none"> <li>• Calf stretch</li> <li>• Quadriceps stretch</li> <li>• Figure-of-four hamstring stretch</li> <li>• Inner thigh stretch</li> <li>• Hip flexor stretch</li> </ul>
Sportsmetrics	None	3 sets of 30 seconds each, or 2 laps	<ul style="list-style-type: none"> <li>• Gastrocnemius</li> <li>• Soleus</li> <li>• Quadriceps</li> <li>• Hamstrings</li> <li>• Hip flexors</li> <li>• Iliotibial band/lower back</li> <li>• Posterior deltoids</li> <li>• Latissimus dorsi</li> <li>• Pectorals/biceps</li> </ul>
<b>Running</b>			
HarmoKnee	None	As part of warm-up, 10 minutes total, separate times for each	<ul style="list-style-type: none"> <li>• Jogging (4-6 minutes)</li> <li>• Backward jogging on toes (1 minute)</li> <li>• High-knee skipping (30 seconds)</li> <li>• Defensive pressure technique: sliding slowly, zigzag backward (30 seconds)</li> <li>• Alternating forward zigzag running and pressure technique: zigzag backward (2 minutes)</li> </ul>
KLIP	None	4 phases, each lasting 2 wk. Time/repetitions for each exercise not specified	<ul style="list-style-type: none"> <li>• Agility: "W" drill</li> <li>• Agility: figure-of-eights</li> <li>• Agility: left/right cuts</li> </ul>
Olsen et al <sup>49</sup>	None	30 seconds and 1 repetition each	<ul style="list-style-type: none"> <li>• Jogging</li> <li>• Backward running with sidesteps</li> <li>• Forward running with knee lifts and heel kicks</li> <li>• Sideways running with crossovers ("carioca")</li> <li>• Sideways running with arms lifted ("parade")</li> <li>• Forward running with trunk rotations</li> <li>• Forward running with intermittent stops</li> <li>• Speed run</li> <li>• Bounding strides</li> <li>• Planting and cutting</li> </ul>

Table continues on page 2.

**TABLE 2**

CONTENTS OF PROGRAMS FREQUENTLY REFERENCED IN THE CPG (CONTINUED)

Area/Study or Program	Equipment Needed	Time for Each Activity	Activities/Muscles Included in Program
PEP	None	50 yd each, 2 repetitions each	<ul style="list-style-type: none"> <li>Jog from line to line of soccer field (cone to cone)</li> <li>Shuttle run (side to side)</li> <li>Backward running</li> <li>Shuttle run with forward/backward running (40 yd)</li> <li>Diagonal runs (40 yd)</li> <li>Bounding run (45-50 yd)</li> </ul>
Sportsmetrics	None	3 sets of 30 seconds each, or 2 laps	<ul style="list-style-type: none"> <li>Skipping</li> <li>Side shuffle</li> <li>Cool-down walk (2 minutes)</li> </ul>
<b>Balance</b>			
Achenbach et al <sup>1</sup>	Ball optional	Not specified	<ul style="list-style-type: none"> <li>Standing on 1 leg with eyes closed, try to destabilize the partner by pressing against their body</li> </ul>
Caraffa et al <sup>5</sup>	Rectangular wobble board, round balance board, combined round/rectangular board, BAPS board	2.5 minutes, 4 times a day for each exercise	<ul style="list-style-type: none"> <li>Phase 1: single-leg stance, no board</li> <li>Phase 2: single-leg stance on rectangular board (on 45°)</li> <li>Phase 3: single-leg stance on round board</li> <li>Phase 4: single-leg stance on a combined round and rectangular board</li> <li>Phase 5: single-leg stance on a BAPS board</li> </ul>
Myklebust et al <sup>46</sup>	Balance mat, wobble board	Not specified	<ul style="list-style-type: none"> <li>Single-leg stance on mat with throw</li> <li>Standing on mat with partner, try to push partner off</li> <li>Jump onto mat while catching ball, then turn 180°</li> <li>Double-leg balance on wobble board with throwing</li> <li>Double-leg squat on wobble board</li> <li>Single-leg squat on wobble board</li> <li>Single-leg stance on wobble board with bounding ball</li> <li>Two players on wobble boards: try to push the other off</li> </ul>
Olsen et al <sup>49</sup>	Balance mat or wobble board	4 minutes and 2 × 90 seconds each	<ul style="list-style-type: none"> <li>Passing the ball (2-leg stance)</li> <li>Squats (1- or 2-leg stance)</li> <li>Passing the ball (1-leg stance)</li> <li>Bouncing the ball with eyes closed</li> <li>Pushing each other off balance</li> </ul>
<b>Strength</b>			
Achenbach et al <sup>1</sup>	None	Not specified	<ul style="list-style-type: none"> <li>Nordic hamstring eccentric strengthening</li> </ul>
Caraffa et al <sup>5</sup>	Step	Not specified (prior to balance training)	<ul style="list-style-type: none"> <li>Anterior step-up</li> <li>Posterior step-up</li> </ul>
HarmoKnee	None	1 minute each	<ul style="list-style-type: none"> <li>Lunges in place (alternating anterior lunges)</li> <li>Nordic hamstring eccentric strengthening</li> <li>Single-leg squat with toe raise</li> </ul>
Knäkontroll	Ball	3 sets, 8-15 repetitions. Each exercise with 4 levels of difficulty	<ul style="list-style-type: none"> <li>Level 1: double-leg squat</li> <li>Level 2: double-leg squat with heel raise</li> <li>Level 3: double-leg squat with ball over head</li> <li>Level 4: double-leg squat with ball held in front of body</li> <li>Level 5 (partner exercise): partner stands next to you approximately 1 m away, facing opposite directions; hold ball between you with one hand and the other hand on hip; apply slight pressure on ball while performing knee squat</li> <li>Level 1: forward walking lunge</li> <li>Level 2: forward lunge with ball, lateral trunk rotation</li> <li>Level 3: forward lunge with ball over head</li> <li>Level 4: lateral lunge</li> <li>Level 5 (partner exercise): partner stands in front of you 5-10 m away; perform forward lunge while making throw-in with ball</li> <li>Level 1: single-leg squat</li> <li>Level 2: single-leg squat with overhead ball</li> <li>Level 3: single-leg squat with off leg at differing positions</li> <li>Level 4: single-leg Romanian deadlift</li> <li>Level 5 (partner exercise): partner stands slightly oblique in front of you, and ball is pressed between lateral sides of feet of nonsupporting legs</li> </ul>
Olsen et al <sup>49</sup>	None	2 minutes and 3 × 10 repetitions each	<ul style="list-style-type: none"> <li>Squats to 80° of knee flexion</li> <li>Nordic hamstring eccentric strengthening</li> </ul>

Table continues on page 3.

**TABLE 2**

CONTENTS OF PROGRAMS FREQUENTLY REFERENCED IN THE CPG (CONTINUED)

Area/Study or Program	Equipment Needed	Time for Each Activity	Activities/Muscles Included in Program
PEP	None	Varies based on exercise	<ul style="list-style-type: none"> <li>Walking lunges, 20 yd × 2 sets</li> <li>Russian hamstring, 3 sets × 10 repetitions or 30 seconds</li> <li>Single toe raises, 30 repetitions each side</li> </ul>
Sportsmetrics	Weight equipment/machines	1 set of 12 repetitions for upper body, 1 set of 15 repetitions for trunk and lower body	<ul style="list-style-type: none"> <li>Back hyperextension</li> <li>Leg press</li> <li>Calf raise</li> <li>Pullover</li> <li>Bench press</li> <li>Latissimus dorsi pull-down</li> <li>Forearm curl</li> </ul>
Core stability			
Achenbach et al <sup>1</sup>	None	Not specified	<ul style="list-style-type: none"> <li>Plank</li> <li>Side plank</li> </ul>
HarmoKnee	None	1 minute each	<ul style="list-style-type: none"> <li>Sit-ups</li> <li>Plank on elbows</li> <li>Bridging</li> </ul>
Knäkontroll	None	15-30 seconds	<ul style="list-style-type: none"> <li>Level 1: prone plank on knees</li> <li>Level 2: prone plank on toes</li> <li>Level 3: prone plank on toes with lateral step</li> <li>Level 4: side plank</li> <li>Level 5 (partner exercise): plank with partner holding feet</li> <li>Level 1: bridge, double leg</li> <li>Level 2: bridge, single leg</li> <li>Level 3: bridge, single leg on ball</li> <li>Level 4: bridge, single leg with hop</li> <li>Level 5 (partner exercise): partner stands with flexed knees and supports heel of one of your feet in her hands</li> </ul>
Sportsmetrics	Weight equipment	1 set of 12 repetitions for upper body, 1 set of 15 repetitions for trunk and lower body	<ul style="list-style-type: none"> <li>Abdominal curl</li> </ul>
Plyometrics			
Achenbach et al <sup>1</sup>	None	Not specified	<ul style="list-style-type: none"> <li>Multidirectional single-leg jumps</li> <li>"Ice-skater" jumps</li> <li>Jump run</li> </ul>
HarmoKnee	Ball optional	30 seconds each	<ul style="list-style-type: none"> <li>Forward and backward double-leg jumps</li> <li>Lateral single-leg jumps</li> <li>Forward and backward single-leg jumps</li> <li>Double-leg jump with or without ball</li> </ul>
KLIP	None	4 phases, each lasting 2 wk. Time/repetitions for each exercise not specified	<ul style="list-style-type: none"> <li>Straight jumps</li> <li>Tuck jumps</li> <li>Standing broad jump</li> <li>Bound in place</li> <li>180° jump</li> <li>Single-leg lateral leaps</li> <li>45° lateral leaps</li> <li>Combination jumps</li> <li>Single-leg forward hops</li> <li>Single-leg 45° lateral hops</li> <li>Single-leg forward hops × 3</li> </ul>
Knäkontroll	None	3 sets, 5-15 repetitions	<ul style="list-style-type: none"> <li>Level 1: single-leg forward/backward hops</li> <li>Level 2: double-leg lateral jumps, landing on single leg</li> <li>Level 3: take a few quick steps on same spot and make short jump straight forward, landing on 1 foot</li> <li>Level 4: take a few quick steps on same spot and make short jump, but change direction and jump to 1 side (90° turn); alternate sides</li> <li>Level 5 (partner exercise): partner stands in front of you approximately 5 m away; make 2-legged jump while heading soccer ball and land on 2 legs</li> </ul>
Myklebust et al <sup>46</sup>	None	Not specified	<ul style="list-style-type: none"> <li>Run and plant</li> <li>Double-leg jump forward/backward; partner pushes player (perturbation)</li> <li>Jump shot (handball) from 30- to 40-cm box with soft landing</li> <li>Step off 30- to 40-cm box with single-leg landing</li> </ul>

Table continues on page 4.

**EXERCISE-BASED KNEE AND ANTERIOR CRUCIATE LIGAMENT INJURY PREVENTION: CLINICAL PRACTICE GUIDELINES**

**TABLE 2**

**CONTENTS OF PROGRAMS FREQUENTLY REFERENCED IN THE CPG (CONTINUED)**

Area/Study or Program	Equipment Needed	Time for Each Activity	Activities/Muscles Included in Program
Olsen et al <sup>49</sup>	None	4 minutes and 5 × 30 seconds each	<ul style="list-style-type: none"> <li>• Jump-shot landings</li> <li>• Forward jumps</li> </ul>
PEP	Cones (5-15 cm tall)	20 repetitions or 30 seconds each	<ul style="list-style-type: none"> <li>• Lateral hops over cone</li> <li>• Forward/backward hops over cone</li> <li>• Single-leg hops over cone</li> <li>• Vertical jumps with headers</li> <li>• Scissors jump</li> </ul>
Sportsmetrics	None	Varies based on exercise	<ul style="list-style-type: none"> <li>• Wall jumps (20 seconds, progressing to 30 seconds)</li> <li>• Tuck jumps (20 seconds, progressing to 30 seconds)</li> <li>• Broad jumps, stick (hold) landing (5-10 repetitions)</li> <li>• Squat jumps (10 seconds, progressing to 25 seconds)</li> <li>• Double-legged cone jumps (30 seconds/30 seconds side to side and back to front)</li> <li>• 180° jumps (20-25 seconds)</li> <li>• Bounding in place (20-25 seconds)</li> <li>• Jump, jump, jump, vertical jump (5-8 repetitions)</li> <li>• Bounding for distance (1-2 runs)</li> <li>• Scissors jump (30 seconds)</li> <li>• Hop, hop, stick landing (5 repetitions per leg)</li> <li>• Step, jump up, down, vertical (5-10 repetitions)</li> <li>• Mattress jumps (30 seconds/30 seconds side to side and back to front)</li> <li>• Single-legged jumps for distance (5 repetitions per leg)</li> <li>• Jump into bounding (3-4 runs)</li> </ul>

Abbreviations: BAPS, Biomechanical Ankle Platform System; CPG, clinical practice guideline; KLIP, Knee Ligament Injury Prevention; PEP, Prevent Injury and Enhance Performance.

**Flexibility (dynamic stretches)**

- Quadriceps
- Hamstrings
- Hip adductors
- Hip flexors
- Calf

**Running**

- Forward running
- Backward running
- Zigzag running, forward and backward
- Bounding

**Strength**

- Double-leg squat
- Single-leg squat
- Lunges
- Nordic hamstring exercise

**Core**

- Prone plank
- Bridges

**Plyometrics**

- Single-leg hopping, anterior/posterior
- "Ice skaters"
- Jump to header or catch ball over head (depending on sport)

**FIGURE 2.** Exercises included in the 2 videos are available at <https://www.jospt.org/doi/suppl/10.2519/jospt.2018.0303>.