

Supplementary file 2. Knee Control exercise programme

The effect of shoulder and knee exercise programmes on the risk of shoulder and knee injuries in adolescent elite handball players: a three-armed cluster randomised controlled trial.

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KNEE CONTROL PROGRAMME

Knee Control (Knäkontroll, SISU Idrottsböcker, Sweden 2005) is an injury prevention exercise programme that focuses on lower limb and trunk strength, neuromuscular control, balance and jumping/landing technique. For this trial minor modifications were made to fit a handball setting.

Choose one exercise from each category 1-5 at a difficulty level where you can perform the exercise with good technique but it is still challenging. During the off-season and pre-season (June to August) the programme is performed 3 times per week with 3 sets of each exercise, with a pace of 1-2 second from starting position to end position.

During the handball season (September to May) the programme is meant to be performed in conjunction with the normal handball warm-up. During the handball season the programme is performed in 2 sets of each exercise, with a pace of 1-2 second from starting position to end-position.

1. One legged knee squats

Level A

Instructions:

One legged knee squat without a ball

Hands on hip. Perform a single leg squat with a smooth motion and try to maintain good knee control with the knee stable and aligned with the foot.

2-3x30 seconds



Level B

Instructions:

One legged knee squat with a ball above the head

Same as Level A but with the ball above the head

2-3x30 seconds



Level C

Instructions:

One legged knee squat with trunk rotation

Same as Level A but with the ball in front and in the end position, a trunk rotation is performed

2-3x30 seconds



Level D

Instructions:

One legged knee squat with passing the ball

Same as Level A and passing the ball during the exercise

2.-3x30 seconds



Partner exercise

Instructions:

Single leg arm wrestling

Position; One legged stance with a slightly bent knee Try to push the partner out of balance.

2-3x15 seconds



2. Pelvic lifts

Level A

Instructions:

Pelvic lifts on two feet

Supine position. Both feet on the ground. Hands across the chest. Lift the pelvis up to a neutral position while maintaining the back straight

2-3x30 seconds



Level B

Instructions:

Pelvic lift on one foot

Same as level A but one foot on the ground

2-3x30 seconds



Level C

Instructions:

Pelvic lift on one foot with a ball

Same as level B but with a ball squeezed between the knees

2-3x30 seconds



Level D

Instructions:

Pelvic lift on one foot – foot on bench/ball

Same as level B but foot on a bench or the ball

2-3x15-30 seconds



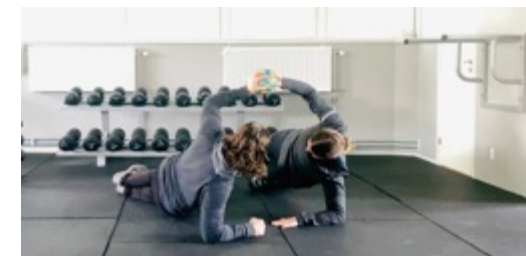
Partner exercise

Instructions:

Side plank pushes

Side plank position. Maintain the body in a straight line. Try to push the partner out of balance.

2-3x15-30 seconds



3. Two legged knee squats

Level A

Instructions:

Two legged knee squats without a ball
Shoulder-wide standing position with hands on the hips, a straight back and trunk upright. Perform a smooth squat as deep a possible without lifting your heels from the ground.

2-3x30 seconds



Level B

Instructions:

Two legged knee squats with ball in front
Same as Level A but with the ball in front

2-3x30 seconds



Level C

Instructions:

Two legged knee squats with ball above the head
Same as Level A but with the ball above the head

2-3x15-30 seconds



Level D

Instructions:

Two legged knee squats with ball above the head – up on toe
Same as Level C but in the end position go up on your toes

2-3x15-30 seconds



Partner exercise

Instructions:

Two legged knee squats – Passing your partner
Same as Level A but passing the ball to your partner

2-3x15-30 seconds



4. The bench

Level A

Instructions:

Bench – On knees and forearms

Elbows are placed beneath the shoulder.

Lift the body and maintain it in a straight line

2-3x30 seconds



Level B

Instructions:

Bench – On knees with arm raises

Same as Level A but raise one arm at a time straight forward

2-3x30 seconds



Level C

Instructions:

Bench – On toes and forearms

Same as Level A but support on toes instead of knees

2-3x30 seconds



Level D

Instructions:

Bench - On toes with leg-lifts

Same as Level C but raise one leg at a time

2-3x30 seconds



Partner exercise

Instructions:

Bench – Hit the partner's hands

In a push-up position try to hit your partner's hands

2-3x15-30 seconds



5. Lunges

Level A

Instructions:

Lunges without a ball

Stand with hand on the hips. Take a deep step forward so the forward knee is flexed 90°. The motion should be smooth and try to maintain a good knee control with the the knee aligned with the foot

2-3x30 seconds



Level B

Instructions:

Lunges with a ball above the head

Same as Level A but with the ball above the head

2-3x30 seconds



Level C

Instructions:

Diagonal lunges with a ball in front

Same as Level A but with the ball in front and the step is taken diagonally

2-3x30 seconds



Level D

Instructions:

Lunges with a ball in front with trunk rotation

Same as Level A but with the ball in front and in the end position, a trunk rotation is performed

2-3x30 seconds



Partner exercise

Instructions:

Lunges – Passing your partner

Same as Level A but passing the ball to your partner

2-3x15 seconds



6. Jumping/landing

Level A

Instructions:

Forward jumps on one leg

Stand on one leg and make a long forward jump and land on the same foot with a soft landing and “freeze” this position. Try to maintain good knee control

2-3x30 seconds



Level B

Instructions:

Jumping on the spot with 90° rotation

Stand on one leg and jump on the spot. In the air turn 90° and land with a soft landing and “freeze” the position shortly before performing another jump with a 90° turn.

2-3x30 seconds



Level C

Instructions:

Side jumps

Stand on one leg and make long side-jump and land on the opposite foot with a soft landing and “freeze” this position. Try to maintain good knee control

2-3x30 seconds



Level D

Instructions:

Drop jumps – two leg/one leg

Stand on a board and drop down and land on one foot, and instantly perform a jump on the same foot and make a soft landing and “freeze” that position. Try to maintain good knee control. Can also be performed on two feet

2-3x30 seconds



Partner exercise

Instructions:

Drop jumps – two leg/one leg with passes

Same as Level D but passing the ball to your partner

2-3x30 seconds

