

INJURY PREVENTION IN FOOTBALL

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INTRODUCTION

The bad news: Football, at all levels, carries a substantial risk of injury—some severe and some even career-threatening. The good news: Many injuries can be prevented—even the serious ones.

If you do nothing - what can you expect?

Typically, a team will suffer one injury every second match and one anterior cruciate (ACL) injury – a serious, career-threatening injury – every two seasons¹. Male teams have had more injuries than females in the past², but an unfortunate consequence of the rapid development of female football is that the injury risk also seems to catch up. Female players are also at a 3-4 greater risk of ACL injuries than men. Although the overall risk is somewhat lower in younger players, with growing athletes, it is important to be aware of apophysitis and other injuries to the growth plates.

As a practitioner, you need to be aware of the typical injury pattern in football. Figure 1 gives a good indication of what you can expect. Acute injuries dominate over overuse injuries. This pattern is also your guide to preventing injuries; acute knee

(especially ACL), thigh (hamstrings), groin, and ankle injuries should be a priority, as Figure 1 clearly illustrates.

Can you do something about it?

Fortunately, there are also patterns to how injuries happen—they are often referred to as internal and external factors. Some external factors are difficult to control; football is a complex game with frequent player-to-player contact, which may cause an injury. Internal factors are player traits, such as strength or coordination. Some of these are related to injury risk—these can be trained to shrink injury risk³. Evidence shows that targeted exercise programs can prevent at least half of all sports injuries (e.g., FIFA11+, Knäkontrol)⁴⁻⁷. Specific exercises focusing on specific injury types show even better results: The Nordic Hamstring Exercise lowers the risk of hamstring muscle injuries by 57-70% and even more in players with a recent injury⁸. Another example is groin problems: The Adduction Strengthening Programme, based on a tailored eccentric exercise, reduces this risk substantially⁹.

Other factors also affect injury risk; field conditions, equipment, fitness and

psychological factors are examples¹⁰. Many sports-related health problems, not just injuries, can be avoided if players and their coaching staff routinely adopt well-established health-promoting behaviors: healthy training patterns, healthy diet/sleep, managing anxiety and stress, and avoiding interventions that can cause more harm than good¹¹.

Injury prevention programs are effective—they reduce the risk of injury and shrink healthcare costs. In the next chapter, we describe what you can do to prevent injuries in your team.

EXERCISE-BASED INJURY PREVENTION PROGRAMS

Warm-up programs

Structured exercise programs prevent injuries in general. They are often designed to be used as warm-up programs; this makes it easier to include them in the team's training routine.

One specific target for all programs designed for football is ACL injuries, for reasons outlined above. Excessive valgus stress to the knee is one of the major risk factors. So, controlling movements that

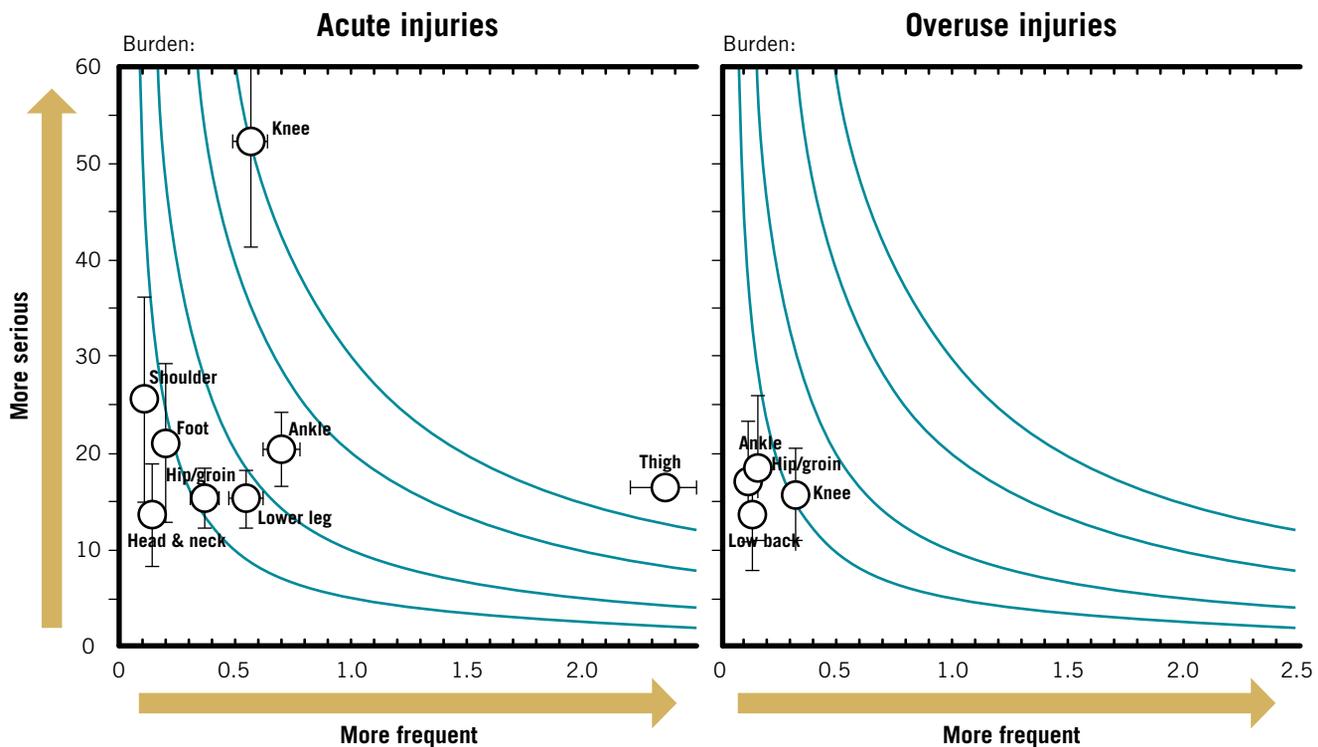


Figure 1: This diagram shows the typical injury pattern in football. The darker the background color, the bigger the problem. The numbers on the horizontal axis represent injury incidence shown as the number of injuries per 1000 h of exposure, while the vertical axis represents injury severity (the average number of days lost for each injury in the categories shown). Unpublished data from the Qatar Stars League.

cause excessive dynamic valgus of the knee is a key part of any ACL injury prevention program^{12,13}.

FIFA (Fédération Internationale de Football Association) is promoting the FIFA 11+ program as a prevention program, targeting “the big 4”: the knee, hamstrings, groin, and ankle⁶. The 11+ program combines a series of 15 structured warm-up exercises (see Figure 2): core stabilization, eccentric thigh muscle training, proprioceptive training, dynamic stabilization, and plyometric exercises. Each of the strength, plyometrics, and balance exercises has three levels of challenge to allow players to progress. Performing these with proper postural alignment (“knee over toe”) is a key element emphasized for all movements from start to end. One key feature of this program—to make it appropriate to be used as a warm-up program—is that it starts and ends with a running exercise to fully prepare the players for activity with the ball. For the same reason, it works equally well before a game. The 11+ program, with videos of all exercises, is available online¹⁴. (Online source 1 - <https://fit4football.co.nz/>)

The 11+ program lowers injury risk substantially. Female teams using the program can expect a 29% reduction

in overall injury rate and an even more substantial effect on severe injuries⁶. It also works well in male football. When the 11+ program is implemented correctly, male teams also decrease the overall injury rate (46%) and the rate of ACL injuries (58%)^{15,16}. Teams using the program correctly, 2-3 times per week during the pre-season and at least once weekly during the season, have better results than inconsistent users.

The impressive effects of the 11+ program have also led FIFA to develop specific warm-up/prevention programs for kids (FIFA 11+ for kids), referees (FIFA 11+ for referees), and for goalkeepers to prevent shoulder injuries (FIFA 11+S)¹⁷⁻²¹, recognizing that their injury risks and patterns are different.

The 2019 FIFA Women’s World Cup hailed “the competition’s best generation of goalkeepers ever” and raised attention on their health. Their role differs from other players, requiring a specific warm-up program meeting their demands. This program, the FIFA 11+ shoulder program, 11+S, provides guidance on a warm-up for adolescent goalkeepers with minimal equipment needed¹⁷. (Online source 2 - <https://www.youtube.com/playlist?list=PLCGIzmTE4dogA--gAWtkIcwObk3ifAJPV>).

Another well-documented multi-component program is Knäkontroll (Knee Control), a neuromuscular warm-up program based on six exercises targeting knee control and core stability: one-legged knee squat, pelvic lift, two-legged knee squat, the bench, the lunge and jump/landing technique⁷. Similar to the 11+ program, exercises progress from basic to more difficult (4 levels) and are preceded by low-intensity running. This program has been shown to reduce the risk of ACL injuries by 64% in young adolescent girls. An extended version of the Knee Control program, with the same six main exercises but with more exercise variations to make it more attractive, reduces the risk of lower extremity injuries in general by 26%^{22,23}.

Strength training programs

In addition to the multicomponent warm-up programs 11+ and Knäkontroll, specific strength-training programs are designed to target specific injuries, mainly based on eccentric exercises. The hamstrings are one example since muscle strains in the posterior thigh are the most common injury in football. Hamstring injuries also often recur, again and again. The exercise best studied and most commonly used to

FIFA 11+

PART 1 RUNNING EXERCISES • 8 MINUTES



1 RUNNING STRAIGHT AHEAD

The course is made up of 6 to 10 pairs of parallel cones, approx. 5-6 metres apart. Two players start at the same time from the first pair of cones. **Jog together** all the way to the last pair of cones. On the way back, you can increase your speed progressively as you warm up. **2 sets**



2 RUNNING HIP OUT

Walk or jog easily, stopping at each pair of cones to lift your knee and **rotate your hip outwards**. Alternate between left and right legs at successive cones. **2 sets**



3 RUNNING HIP IN

Walk or jog easily, stopping at each pair of cones to lift your knee and **rotate your hip inwards**. Alternate between left and right legs at successive cones. **2 sets**



4 RUNNING CIRCLING PARTNER

Run forwards as a pair to the first set of cones. Shuffle sideways by 90 degrees to meet in the middle. **Shuffle an entire circle around one other** and then return back to the cones. Repeat for each pair of cones. Remember to stay on your toes and keep your centre of gravity low by bending your hips and knees. **2 sets**



5 RUNNING SHOULDER CONTACT

Run forwards in pairs to the first pair of cones. Shuffle sideways by 90 degrees to meet in the middle then **jump sideways towards each other to make shoulder-to-shoulder contact**. Note: Make sure you land on both feet with your hips and knees bent. Do not let your knees buckle inwards. Make it a full jump and synchronize your timing with your team-mate as you jump and land. **2 sets**



6 RUNNING QUICK FORWARDS & BACKWARDS

As a pair, run quickly to the second set of cones then run **backwards quickly to the first pair of cones keeping your hips and knees slightly bent**. Keep repeating the drill, running two cones forwards and one cone backwards. Remember to take small, quick steps. **2 sets**

PART 2 STRENGTH • PLYOMETRICS • BALANCE • 10 MINUTES

LEVEL 1



7 THE BENCH STATIC

Starting position: Lie on your front, supporting yourself on your forearms and feet. Your elbows should be directly under your shoulders.
Exercise: Lift your body up, supported on your forearms, pull your stomach in, and hold the position for 20-30 sec. Your body should be in a straight line. Try not to sway or arch your back. **3 sets**



7 THE BENCH ALTERNATE LEGS

Starting position: Lie on your front, supporting yourself on your forearms and feet. Your elbows should be directly under your shoulders.
Exercise: Lift your body up, supported on your forearms, and pull your stomach in. Lift each leg in turn, holding for a count of 2 sec. Continue for 40-60 sec. Your body should be in a straight line. Try not to sway or arch your back. **3 sets**



7 THE BENCH ONE LEG LIFT AND HOLD

Starting position: Lie on your front, supporting yourself on your forearms and feet. Your elbows should be directly under your shoulders.
Exercise: Lift your body up, supported on your forearms, and pull your stomach in. Lift one leg about 10-15 centimetres off the ground, and hold the position for 20-30 sec. Your body should be straight. Do not let your opposite hip dip down and do not sway or arch your lower back. Take a short break, change legs and repeat. **3 sets**



8 SIDEWAYS BENCH STATIC

Starting position: Lie on your side with the knee of your lowermost leg bent to 90 degrees. Support your upper body by resting on your forearm and knee. The elbow of your supporting arm should be directly under your shoulder.
Exercise: Lift your uppermost leg and hips until your shoulder, hip and knee are in a straight line. Hold the position for 20-30 sec. Take a short break, change sides and repeat. **3 sets on each side**



8 SIDEWAYS BENCH RAISE & LOWER HIP

Starting position: Lie on your side with both legs straight. Lean on your forearm and the side of your foot so that your body is in a straight line from shoulder to foot. The elbow of your supporting arm should be directly beneath your shoulder.
Exercise: Lower your hip to the ground and raise it back up again. Repeat for 20-30 sec. Take a short break, change sides and repeat. **3 sets on each side**



8 SIDEWAYS BENCH WITH LEG LIFT

Starting position: Lie on your side with both legs straight. Lean on your forearm and the side of your foot so that your body is in a straight line from shoulder to foot. The elbow of your supporting arm should be directly beneath your shoulder.
Exercise: Lift your uppermost leg up and slowly lower it down again. Repeat for 20-30 sec. Take a short break, change sides and repeat. **3 sets on each side**



9 HAMSTRINGS BEGINNER

Starting position: Kneel on a soft surface. Ask your partner to hold your ankles down firmly.
Exercise: Your body should be completely straight from the shoulder to the knee throughout the exercise. Lean forward as far as you can, controlling the movement with your hamstrings and your gluteal muscles. When you can no longer hold the position, gently take your weight on your hands, falling into a push-up position. Complete a minimum of 3-5 repetitions and/or 60 sec. **1 set**



9 HAMSTRINGS INTERMEDIATE

Starting position: Kneel on a soft surface. Ask your partner to hold your ankles down firmly.
Exercise: Your body should be completely straight from the shoulder to the knee throughout the exercise. Lean forward as far as you can, controlling the movement with your hamstrings and your gluteal muscles. When you can no longer hold the position, gently take your weight on your hands, falling into a push-up position. Complete a minimum of 7-10 repetitions and/or 60 sec. **1 set**



9 HAMSTRINGS ADVANCED

Starting position: Kneel on a soft surface. Ask your partner to hold your ankles down firmly.
Exercise: Your body should be completely straight from the shoulder to the knee throughout the exercise. Lean forward as far as you can, controlling the movement with your hamstrings and your gluteal muscles. When you can no longer hold the position, gently take your weight on your hands, falling into a push-up position. Complete a minimum of 12-15 repetitions and/or 60 sec. **1 set**



10 SINGLE-LEG STANCE HOLD THE BALL

Starting position: Stand on one leg.
Exercise: Balance on one leg whilst holding the ball with both hands. Keep your body weight on the ball of your foot. Remember: try not to let your knees buckle inwards. Hold for 30 sec. Change legs and repeat. The exercise can be made more difficult by passing the ball around your waist and/or under your other knee. **2 sets**



10 SINGLE-LEG STANCE THROWING BALL WITH PARTNER

Starting position: Stand 2-3 m apart from your partner, with each of you standing on one leg.
Exercise: Keeping your balance, and with your stomach held in, throw the ball to one another. Keep your weight on the ball of your foot. Remember: keep your knee just slightly flexed and try not to let it buckle inwards. Keep going for 30 sec. Change legs and repeat. **2 sets**



10 SINGLE-LEG STANCE TEST YOUR PARTNER

Starting position: Stand on one leg opposite your partner and at arm's length apart.
Exercise: Whilst you both try to keep your balance, each of you in turn tries to push the other off balance in different directions. Try to keep your weight on the ball of your foot and prevent your knee from buckling inwards. Continue for 30 sec. Change legs. **2 sets**



11 SQUATS WITH TOE RAISE

Starting position: Stand with your feet hip-width apart. Place your hands on your hips if you like.
Exercise: Imagine that you are about to sit down on a chair. Perform squats by bending your hips and knees to 90 degrees. Do not let your knees buckle inwards. Descend slowly then straighten up more quickly. When your legs are completely straight, stand on your toes then slowly lower down again. Repeat the exercise for 30 sec. **2 sets**



11 SQUATS WALKING LUNGES

Starting position: Stand with your feet hip-width apart. Place your hands on your hips if you like.
Exercise: Lunge forward slowly at an even pace. As you lunge, bend your leading leg until your hip and knee are flexed to 90 degrees. Do not let your knee buckle inwards. Try to keep your upper body and hips steady. Lunge your way across the pitch (approx. 10 times on each leg) and then jog back. **2 sets**



11 SQUATS ONE-LEG SQUATS

Starting position: Stand on one leg, loosely holding onto your partner.
Exercise: Slowly bend your knee as far as you can manage. Concentrate on preventing the knee from buckling inwards. Bend your knee slowly then straighten it slightly more quickly, keeping your hips and upper body in line. Repeat the exercise 10 times on each leg. **2 sets**



12 JUMPING VERTICAL JUMPS

Starting position: Stand with your feet hip-width apart. Place your hands on your hips if you like.
Exercise: Imagine that you are about to sit down on a chair. Bend your legs slowly until your knees are flexed to approx. 90 degrees, and hold for 2 sec. Do not let your knees buckle inwards. From the squat position, jump up as high as you can. Land softly on the balls of your feet with your hips and knees slightly bent. Repeat the exercise for 30 sec. **2 sets**



12 JUMPING LATERAL JUMPS

Starting position: Stand on one leg with your upper body bent slightly forwards from the waist, with knees and hips slightly bent.
Exercise: Jump approx. 1 m sideways from the supporting leg on to the free leg. Land gently on the ball of your foot. Bend your hips and knees slightly as you land and do not let your knee buckle inward. Maintain your balance with each jump. Repeat the exercise for 30 sec. **2 sets**



12 JUMPING BOX JUMPS

Starting position: Stand with your feet hip-width apart. Imagine that there is a cross marked on the ground and you are standing in the middle of it.
Exercise: Alternate between jumping forwards and backwards, from side to side, and diagonally across the cross. Jump as quickly and explosively as possible. Your knees and hips should be slightly bent. Land softly on the balls of your feet. Do not let your knees buckle inwards. Repeat the exercise for 30 sec. **2 sets**

PART 3 RUNNING EXERCISES • 2 MINUTES



13 RUNNING ACROSS THE PITCH

Run across the pitch, from one side to the other, at 75-80% maximum pace. **2 sets**



14 RUNNING BOUNDING

Run with high bounding steps with a high knee lift, landing gently on the ball of your foot. Use an exaggerated arm swing for each step (opposite arm and leg). Try not to let your leading leg cross the midline of your body or let your knees buckle inwards. Repeat the exercise until you reach the other side of the pitch, then jog back to recover. **2 sets**



15 RUNNING PLANT & CUT

Jog 4-5 steps, then plant on the outside leg and cut to change direction. Accelerate and sprint 5-7 steps at high speed (80-90% maximum pace) before you decelerate and do a new plant & cut. Do not let your knee buckle inwards. Repeat the exercise until you reach the other side, then jog back. **2 sets**



prevent hamstring strains is the Nordic Hamstring Exercise. This exercise is also included in both the 11+ and Knäkontroll programs. (Online source 3 - [https:// utbildning.sisuforlag.se/fotboll/tranare/spelarutbildning/knakontroll-engelska/](https://utbildning.sisuforlag.se/fotboll/tranare/spelarutbildning/knakontroll-engelska/))

The Nordic Hamstring Exercise involves kneeling on a pad (for more knee comfort) and lowering the body forward under control. At the same time, the ankles are held in place by a partner or an immovable object. The hamstring muscles are loaded eccentrically by leaning forward from the knee, not the hip²⁴. A 10-week program of Nordic hamstring exercise training improves eccentric strength by 11% and also changes muscle architecture favorably²⁵. Teams using this exercise reduce their risk of hamstring injuries by as much as 68% and re-injuries by an even more impressive 85%^{26,27}. But note that player compliance is critical; players with low compliance with the NHE exercise are at greater risk compared to those adhering with the prescribed program²⁷.

Another preventive strengthening exercise-based program targets groin injuries, another problematic football injury. Groin injuries are most often located in the adductors, accounting for about two-thirds of all²⁸ and weak hip adductors increase groin injury risk. The Copenhagen Adduction Exercise increases hip adduction strength²⁹; an 8-week trial with this exercise led to 35.7% gains in eccentric hip adductor strength and a 20.3% increase in eccentric hip abductor strength³⁰. Even more important is that a training program based on this exercise, the Adductor Strengthening Program, reduces the risk of groin problems in football players by 41%⁹. Like the Nordic hamstring exercise program, the Adductor Strengthening Program calls for training 2-3 times a week during the preseason and one weekly maintenance session in-season. And in the same way as the other programs, teams training consistently have better results than inconsistent users.

Note that the Copenhagen Adduction Exercise has not yet been added to FIFA 11+, so this is something you should consider.

Other exercise-based programs

Multi-component programs based on a variety of movement patterns are more efficient than single-component programs in reducing overall injury risk. Such programs and movements can target

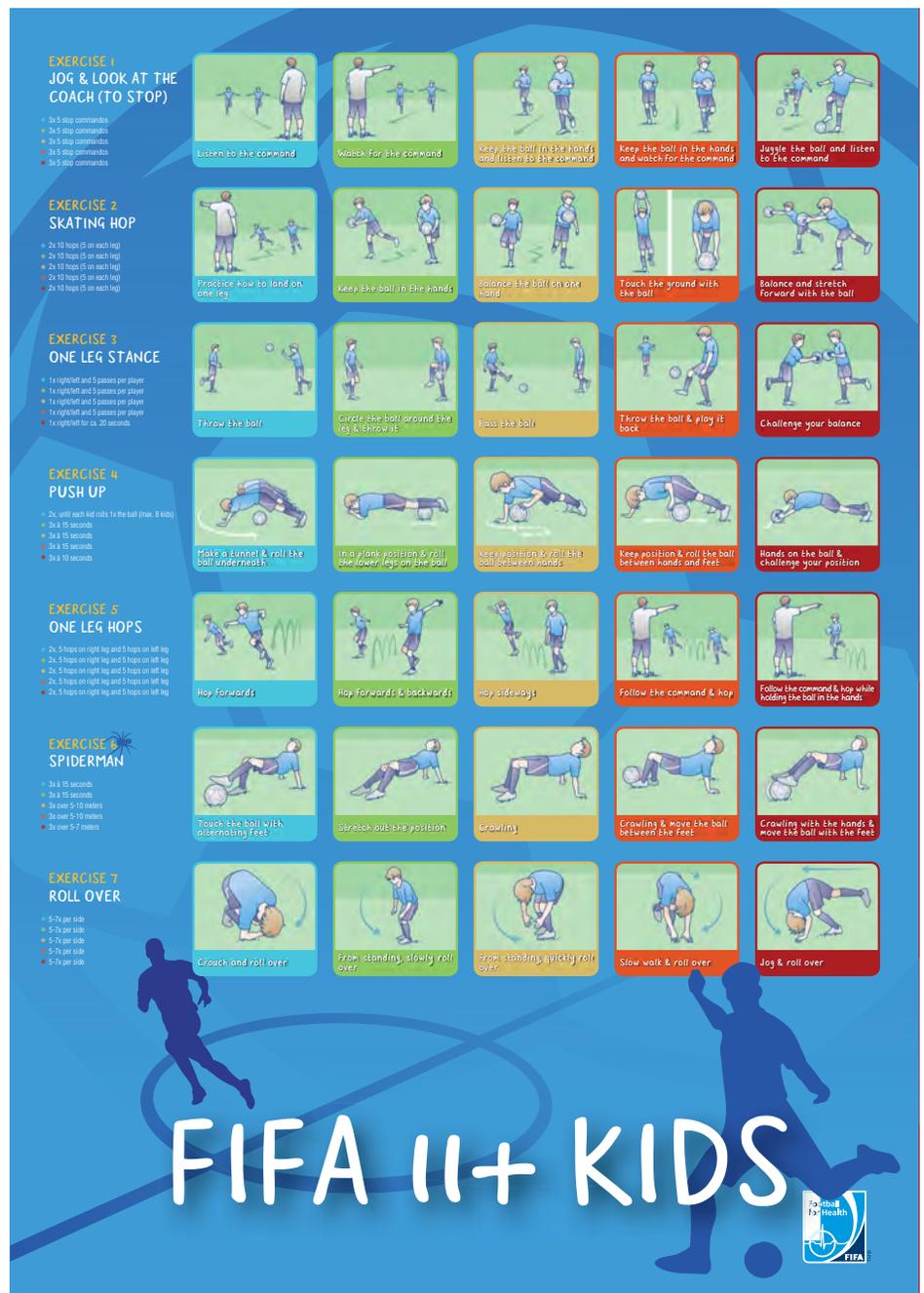


Figure 2 (previous page): The FIFA 11+ Program. The program starts and ends with running exercises – focusing on knee alignment. The middle part has three difficulty levels; players should advance to the next level when they master the first level with good knee control. *With acknowledgment to FIFA Medical for the provision of this resource.*

Figure 3 (above): FIFA 11+ for kids. The 11+ Kids program takes about 15-20 minutes to complete and consists of seven different exercises: three for unilateral, dynamic stability of the lower limbs (hopping, jumping, and landing); three for the whole body and trunk strength/stability, and one on falling technique. *With acknowledgment to FIFA Medical for the provision of this resource.*

different neuromuscular qualities such as core and dynamic stability, static and dynamic balance, flexibility, plyometric strength, impact force control during landing after a jump, control of valgus and varus stresses on the knee and ankle, pelvic

control. In general, all the programs based on various forms of neuromuscular training are effective for ACL injury prevention³²⁻³⁴.

It is unknown which component is the most important, but balance and core stability training are the most popular.

They are among the five most common injury prevention exercises Premier League clubs use and the three most commonly used exercises for clubs in the UEFA Elite Clubs study, which includes the Champions League clubs^{35,36}.

Players with functional ankle instability, which is not uncommon after an ankle sprain, display deficits in postural control and reflex stabilization³⁷. Players with greater sway when they balance on one leg are at greater increased risk for ankle sprains³⁸. Balance training reduces the risk of ankle sprains by about 50%, but this effect is only seen in players with a recent sprain (within the last year). Balance training should therefore always be considered for players with a history of ankle sprains and is the key component of the rehabilitation program after a sprain. Balance exercises should get progressively more difficult, starting on a stable surface, moving to softer surface and finally to a foam mat, wobble board or sand, and gradually also introduce perturbations and distractions. Players should also be exposed to a range of conditions, such as landing from various directions, both with and without perturbations.

Plyometric exercises (exercises using speed and force of different movements to build muscle power) are thought to be highly relevant. They perfectly match the multifaceted nature of the physical demands in football, improving performance through greater maximal strength, sprinting speed, shooting power, endurance, jumping ability and change of direction in players of all ages³⁹⁻⁴¹. Plyometric exercises enhance joint awareness and postural control and in this way can improve lower extremity control and prevent injuries⁴². This is also why plyometrics reduce the risk of first-time noncontact ACL injuries⁴³.

Traditionally, stretching has been advocated as a way to prevent injuries. Static stretching improves musculotendinous stiffness. However, while static and dynamic stretching modalities affect performance and range of motion positively, no studies show any effect on injury risk⁴⁴.

NON-EXERCISE-BASED INJURY PREVENTION MODALITIES

Exercise programs are not the only way to prevent injuries. Other factors can also play an important role. In this section, we will discuss some of them.

FIFA 11+S

Part I – Warm-up exercises*

- 1 Run**
Relaxed walking or running, the speed can be progressively increased. 5 min
- 2** Throw the ball in the chest line. Ask for help from a partner. With both hands in front of the body, throw and catch the ball, first with your elbows flexed and then with your arms over your head. 1 min
- 3** Spinning movements with the hands. Interlace the fingers and make spinning movements with the hands. 1 min

Part II – strength and balance of the shoulder, elbow, wrist, and finger muscles**

- 1A External rotation**
Initial position: Standing with the elbow flexed at 90° to the side.
Exercise: Rotate the arm from neutral to external rotation.
- 1B External rotation**
Initial position: standing with the elbow flexed at 90° and 45° abducted.
Exercise: Rotate the arm from the neutral to external rotation.
- 1C External rotation**
Initial position: standing with the elbow flexed at 90° and 90° abducted.
Exercise: Rotate the arm from the neutral to external rotation.
- 2A Internal rotation**
Initial position: standing with the elbow flexed at 90° to the side.
Exercise: Rotate the arm from neutral to internal rotation.
- 2B Internal rotation**
Initial position: standing with the elbow flexed at 90° and 45° abducted.
Exercise: Rotate the arm from neutral to internal rotation.
- 2C Internal rotation**
Initial position: standing with the elbow flexed at 90° and 90° abducted.
Exercise: Rotate the arm from neutral to internal rotation.
- 3A Scaption**
Raise the arm with external rotation in the scapular plane (30° in the frontal plane) to shoulder height. Hold a weight.
- 3B Scaption**
Raise the arm with external rotation in the scapular plane (30° in the frontal plane) to shoulder height. Hold heavier weight than the previous level.
- 3C Scaption**
Raise the arm with external rotation in the scapular plane (30° in the frontal plane) to shoulder height. Hold heavier weight than the previous level.
- 4A Push-up-plus**
In the prone position. The hands should be placed at a distance corresponding to the width of the shoulders.
Exercise: Rise the body and then lower the body.
- 4B Push-up-plus**
In the same position. Place an ankle of 5 kg on your back.
Exercise: Rise the body and then lower the body.
- 4C Push-up-plus**
In the same position but on one foot. Place an ankle of more than 5 kg on your back.
Exercise: Rise the body and then lower the body.
- 5A Inferior and mid trapezius**
In the prone position, arms in 90° abduction. After changing the arms to 120° of abduction. Exercise: Hold a weight and bring the arm back slightly.
- 5B Inferior and mid trapezius**
In the prone position, arms in 90° abduction. After changing the arms to 120° of abduction. Exercise: Hold heavier weight than the previous level and bring the arm back slightly.
- 5C Inferior and mid trapezius**
In the prone position, arms in 90° abduction. After changing the arms to 120° of abduction. Exercise: Hold heavier weight than the previous level and bring the arm back slightly.
- 6A Biceps**
Position: Arms at your sides, palms facing inwards. Hold a weight.
Exercise: Bend your elbows, turning the palms upward.
- 6B Biceps**
Position: Arms at your sides, palms facing inwards. Hold heavier weight than the previous level.
Exercise: Bend your elbows, turning the palms upward.
- 6C Biceps**
Position: Arms at your sides, palms facing inwards. Hold heavier weight than the previous level.
Exercise: Bend your elbows, turning the palms upward.

Figure 4: FIFA 11+S. The FIFA 11+ shoulder program targets shoulder injuries in goalkeepers. The program has three parts: 1. Warm-up exercises, 2. Exercises for improving strength and balance of the shoulder, elbow, wrist and finger muscles, and 3. Core stability and muscle control exercises. The videos are available online. *With acknowledgment to FIFA Medical for the provision of this resource.*

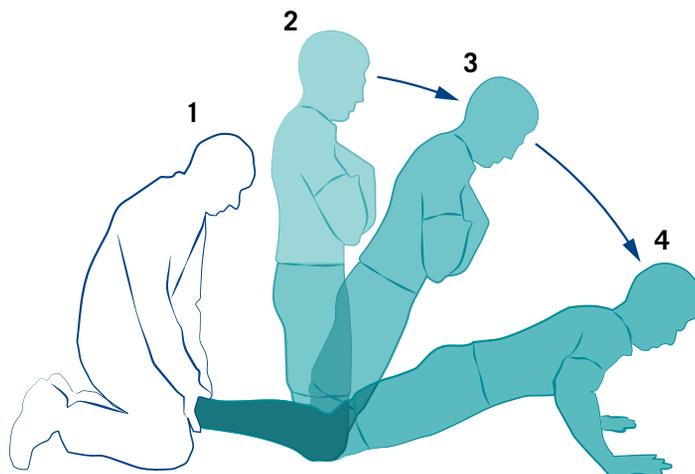


Figure 5: The Nordic Hamstring Exercise. When the player can control speed all the way down, the load is increased by adding starting speed (push from partner) or holding a weight at the chest.

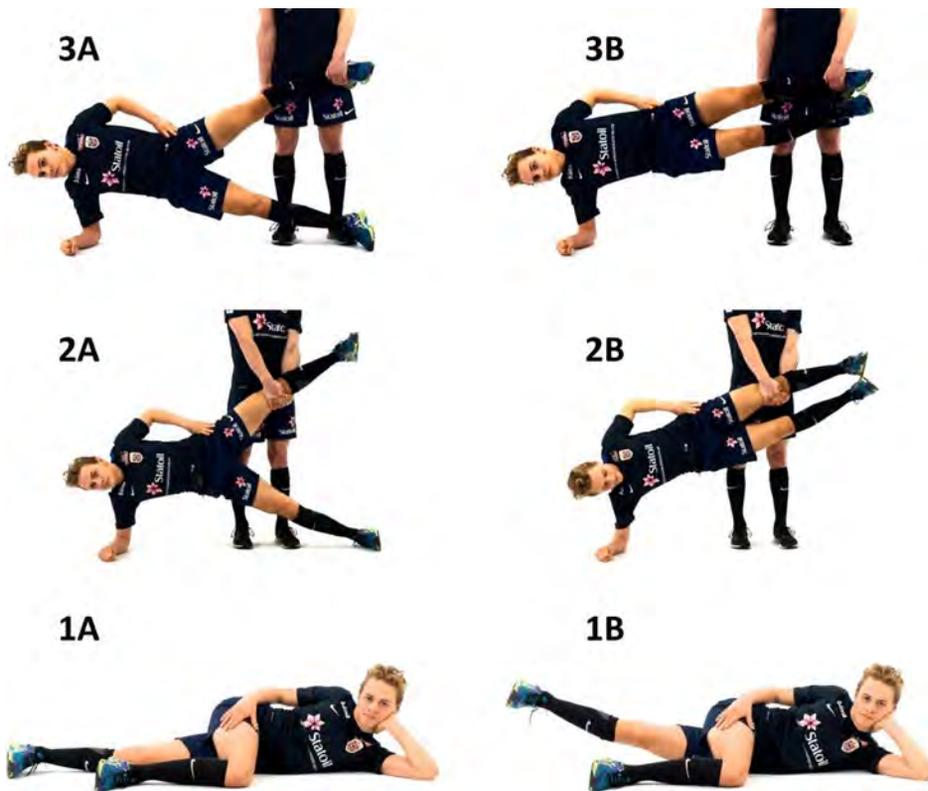


Figure 6: Adductor Strengthening program. The program includes a single exercise with three levels of difficulty designed based on the Copenhagen Adductor exercise (2 and 3), which requires the support of a partner. The partner holds the knee and the ankle (or just holding knee by both hands), while the athlete supports himself on his elbow in a side plank position. The player then brings his bottom foot up to touch the top foot and then returns towards the ground in a controlled manner. A: Starting/ending position, B: Mid-position³¹. *Reprinted with permission.*

Sleep

Sleep is associated with the risk of injury. Players who sleep less than 7 hours daily have an increased risk of injury compared to those who sleep longer. If this sleep deprivation is sustained for at least 14 days, the risk of musculoskeletal injury is 1.7 times greater. However, we do not know if sleep loss predisposes the athlete to specific musculoskeletal injuries⁴⁵. Poor sleep quality also affects performance, increases the risk of injury⁴⁶ and negatively affects recovery after training. Following a sleep hygiene protocol can be helpful in reducing injury risk.

Nutrition, hydration, and supplements

Nutrition is essential for improving the health, performance, and recovery of athletes. A player's hydration deficit at the beginning of a match can compromise performance⁴⁷. It is important to maintain a fluid balance before, during, and after exercise, as it will minimize the risk of hyperthermia and exertional heat illness⁴⁸.

Whether sports supplements have any role in injury prevention is not known and there is always the risk of supplements contamination and doping rule violations for athletes. The complexity of nutrition research and potential conflicts of interest from sponsorship by industry make research in this field particularly vulnerable to bias⁴⁹. More studies involving humans, specifically athlete populations, are needed to understand if supplements give benefits for the prevention of injury or recovery of injured athletes⁵⁰.

Training load

Athletes participating in elite sports are exposed to high training loads. Poor load management represents a major risk factor for injury. Insufficient respect for the balance between loading and recovery can lead to prolonged fatigue, abnormal training responses (maladaptation), and an increased risk of injury and illness⁵¹.

High loads can positively or negatively influence injury risk in athletes. Load must

always be prescribed on an individual and flexible basis. Athletes respond significantly better to small increases (and decreases) than more significant loading fluctuations. Regular athlete monitoring is fundamental to ensure appropriate levels of external and internal loads and, thus, to maximize performance and minimize the risk of injury⁵²⁻⁵⁴.

Taping and bracing

The use of tape and brace to prevent musculoskeletal injuries or re-injuries is common in sports. Taping and bracing are individually linked to an approximately 50% reduction in ankle sprains, but like balance training, this effect is limited to players with a recent sprain (within the last 12 months). We do not know which is best, taping or bracing. Bracing is arguably the cheaper option but taping is better tolerated by football players who want optimal ball control⁵⁵.

Football shoes

Footwear is an integral piece of protective equipment. Players should select footwear based on comfort, traction and stability, while protecting from injury. Shoes should fit well and be wide enough to accommodate the foot. Natural leather uppers will "shape" around the foot, while synthetic materials will not^{56,57}.

The combination of shoe type, outsole groups (studs) and type of grass affect rotational traction, which is linked to increased lower extremity injury risk. Players should have multiple shoes with varied outsole configurations available. This way – depending on the pitch conditions – they can pick the shoes that provide optimal traction for performance, yet not too high traction at the shoe-ground interface since this increases the risk of injury, especially to the ligaments of the knee such as the ACL^{58,59}. Clinicians should educate players on these aspects, as their choices might be more because of shoe design and marketing than shoe performance.

Shin guards

Shin guards effectively prevent minor (contusions) and severe (fractures) injuries to the lower leg⁶⁰ and are mandatory during football matches since 2015⁶¹. The main function of shin guards is to protect the soft tissues and bones in the lower extremities from external impact, provide

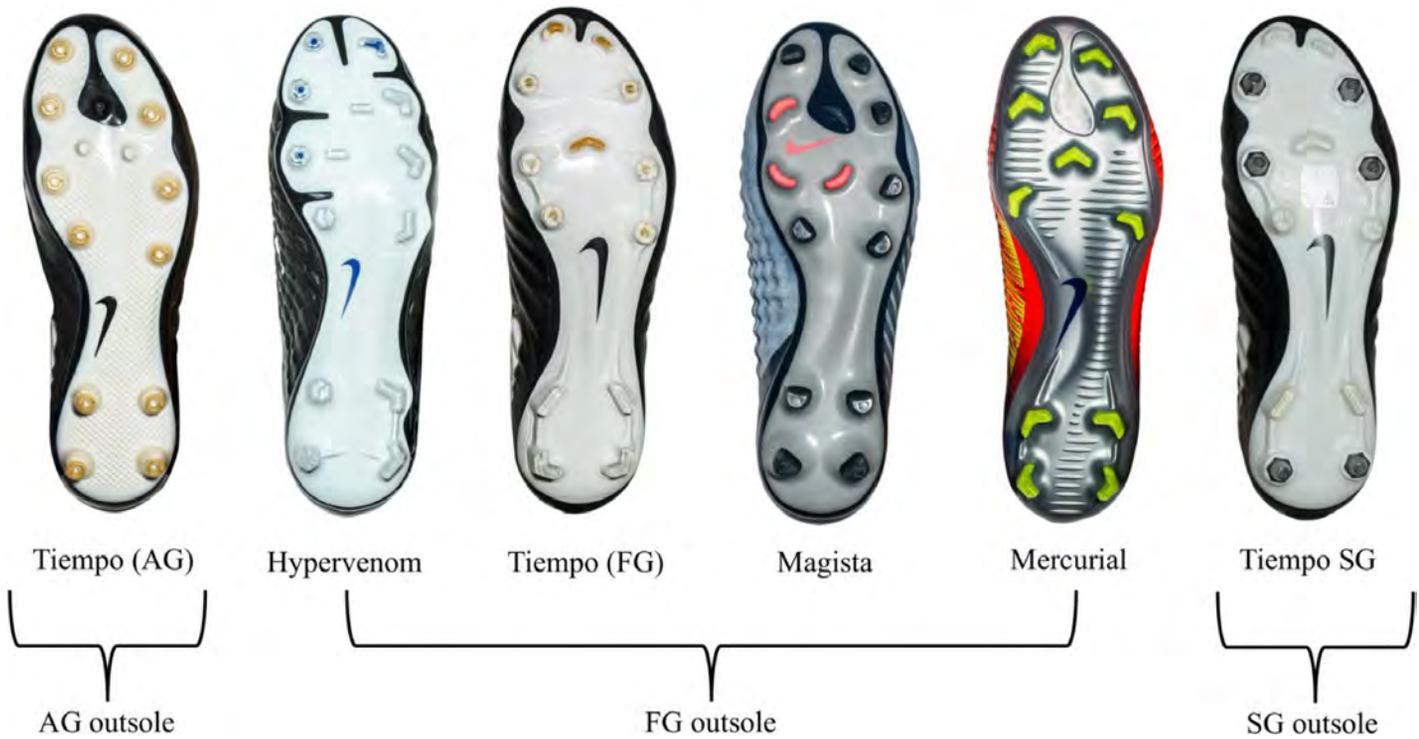


Figure 7: Football shoe models with different cleat configurations giving different traction adapted to different pitch conditions. AG: artificial grass. FG: firm ground. SG: soft ground⁵⁹.

shock absorption and facilitate energy dissipation⁶². However, they are only effective if they fit the player well and are worn properly. Unfortunately, some players use the smallest size shin guards possible, exposing a large portion of their shins to injuries. As for shoes, clinicians should educate their players on the proper utilization of protective equipment.

THE FUTURE OF INJURY PREVENTION IN FOOTBALL

Building an injury prevention program for a team requires careful planning – and that all stakeholders are involved. Ready-made programs like the 11+ and Knäkontroll are first and foremost developed for younger players. At the senior elite and professional level, the structure of the club is more complex. A recent study from the professional league in Qatar documents how injury prevention practices depend on good communication between the medical and technical teams and how the fitness coach has a crucial facilitator role as the link between stakeholders. The study also showed that a single approach to injury prevention like a warm-up program is unlikely to succeed, especially in a multicultural and multi-disciplinary setting⁶³. This is even the case at the elite

junior level; indeed, elite academy teams in Europe do not use ready-made programs like 11+, but adapt them to their setting and barriers (e.g., time and scheduling, player workload) and also employ a mix from a range of different, internally developed programs⁶⁴.

For the elite level, we suggest that a different approach is needed: A holistic approach to player preparation with complete buy-in from the players and their support staff represents the best solution teams can implement to reduce the risk of injury and illness and promote consistent high-level performance. To this end, we are now developing a novel, systematic approach to risk management in the Qatar Stars League in collaboration between Aspetar Sports Injury & Illness Prevention Program (ASPREV) and the National Sports Medicine Programme (NSMP).

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