Health and Fitness for the Female Football Player

A guide for players and coaches

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Foreword from the FIFA President

We want every woman in the world to enjoy the many health and social benefits of playing and being physically active in a team – that is the objective of this guide.

Dear members of the football family,

The development of women's football is a worldwide success story. More and more countries have a national development strategy for women's football, and at last year's FIFA U-20 Women's World Cup in Germany, the four semi-finalists came from different confederations. This is also the result of FIFA's many efforts to ensure that the women's game continues its impressive growth on a comprehensive and solid foundation.

The technical and tactical development of the women's game has taken off at an incredible pace so that the play is becoming increasingly accomplished. Whereas in the past teams could outrun their opponents by being fitter, this is no longer the case. That, however, also means that fitness is but a basic requirement to excel in your skills and technique and maintain intensity throughout a match.

This guide for female players was first published on the occasion of the FIFA Women's World Cup 2007™ in China PR and for the first time provided comprehensive information on women's health in football. Since then, our knowledge of injuries and diseases in female players has increased. At the same time, researchers have documented not only the importance of physical activity in general to stay healthy, but also the ability of football in particular to improve the fitness and health of women, regardless of their age or training status.

In order to explore these benefits, negative consequences such as injuries need to be minimised. This brochure will provide you with the knowledge and means to play your favourite sport under safe and enjoyable conditions and protect yourself from injury so that you can fully concentrate on improving your skills and tactics.

Our aim is for women's football to be recognised everywhere, and this is one of the major objectives of the FIFA Women's World Cup Germany 2011™.

Joseph S. Blatter

Introduction

Prof. Jiri Dvorak MD
FIFA Chief Medical Officer
F-MARC chairman

Dr Michel D'Hooghe
FIFA Medical Committee chairman
FIFA Executive Committee member

Playing faster, better and safer

The sixth FIFA Women's World Cup™ in Germany will mark an important milestone in the development of the women's game. It will offer today's best players a stage to showcase their ever-improving skills to the world and hopefully motivate thousands of girls and women worldwide to play "the beautiful game".

Playing football is not only passion and a school of life, it is also a very healthy fun activity that helps you to stay fit. If you play regularly, no matter at what level, you protect yourself from all the diseases that come from an inactive lifestyle such as obesity, high blood pressure, heart disease and diabetes. Furthermore, and this is particularly important for women, playing football helps to protect your bones from osteoporosis.

So that you can fully benefit from the many health gains resulting from regular play, it is important that you do not suffer injuries that keep you away from the pitch. Unfortunately, in FIFA's elite women's competitions at senior and youth level, we have observed a continuous upward trend in injury frequency. The increased speed and dynamics of play might contribute to this finding, but they cannot fully explain it. In any case, it is not something we should simply accept but work against.

While risk is part of the game, there is a lot you can do to protect yourself and other players from getting injured. FIFA's injury prevention programme, the "11+", has been shown to reduce overall injuries in women by a third and severe injuries by a half, provided that you make the exercises your routine warm-up prior to training.

It is just as important, however, that you observe fair play and adhere to the Laws of Game. According to the technical report on the FIFA U-20 Women's World Cup 2010, fewer yellow and red cards were issued than during earlier U-19 and U-20 Women's World Cups. At the same time, a previously unknown high proportion of injuries was caused by foul play in the subjective opinion of the team physicians who documented the injuries.

In the end, injuries are caused by a multitude of factors, and therefore we must also use a multi-facetted approach to prevent them. We hope that in alliance with players, coaches, referees and team physicians, this trend towards more injuries will be reversed so that you can stay on the pitch to perfect your skills and tactics.


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Injuries to women – when and why you are at risk

Injuries to women – when and why you are at risk

The joy of playing football sometimes must be tempered by the fact that when you step onto the pitch, you accept the possibility that you may get injured. During recent years, we have continuously learnt more on women's injuries that in some aspects differ from men. This knowledge will help you to be a more confident and responsible player.

First of all, before getting into injuries as the downside of playing the game, you must know that the health benefits of football in the short- and long-term are numerous and by far outweigh the possible negatives of injury. Whether you play just for fun or ambitiously – football is a great way to stay fit and avoid all those diseases coming along with today's inactive lifestyle.

In addition, injuries in football are not an inevitable fate – there is a lot you can do to prevent injuries. This chapter gives you some facts and figures on women's injuries that will help you understand their nature and causes. In the next chapters, you will learn how exactly you can prevent injuries so that you can fully enjoy the many benefits of the game.

In general, the overall injury rate for girls and women used to be lower than the rate for boys and men. However, it is difficult to compare study results because researchers use different assessment methods. For the comparison with men, we will therefore direct our attention to FIFA's own research because FIFA's method makes such comparisons a little easier.

Injuries to women at FIFA competitions

To date, FIFA can compare injury data on 370 women's matches from 13 international tournaments: the FIFA Women's World Cup™ (1999, 2003, 2007), Olympics (2000, 2004, 2008) and youth championships (U-17 2008, 2010; U-19 2002, 2004; U-20 2006, 2008, 2010). A total of 844 injuries were reported, with about one-third of them causing absence from play for the player in question (i.e. "time-loss injuries"). This works out to 2.3 injuries per match (for men, this is about 2.5). The three Women's World Cups had the lowest injury rate (1.8 injuries per match) and the U-19 and U-20 Women's World Cups had the highest (2.6 injuries per match), followed by the Olympics (2.4) and the U-17 Women's World Cups (2.3). What is of concern, however, is the trend in injuries when we compare these competitions over time: at all women's competitions, there has been a continuous upward trend in injuries, both in total and for injuries causing absence from play (see Figure 1).

This development is contrary to that of the men's game, where we have seen a continuous downward trend in

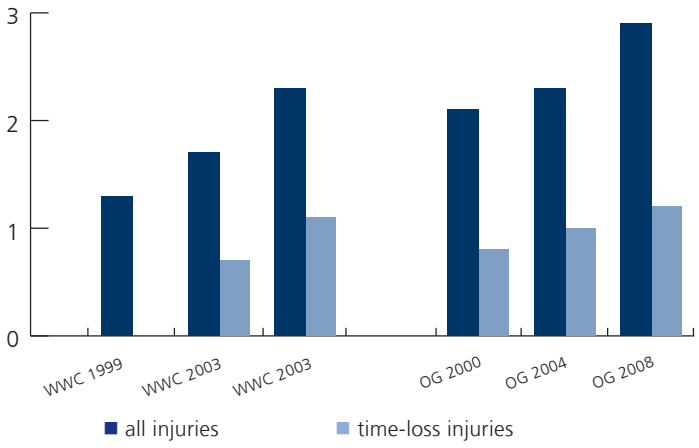


Figure 1: Injuries per match and injuries causing absence from play per match at the FIFA Women's World Cup™ and the Olympic Football Tournaments

injuries over the years. It is not easy to assess why we observe an increase in women's football. There is no doubt, however, that the women's game has become much faster.

Recovery time after an injury is the usual way to state how severe the injury is. In research, lost time of seven days or less is considered a minor injury. FIFA's data from major women's international tournaments shows that only half of the injuries resulted in time loss and the vast majority of time-loss injuries are classified as minor. Complete ligament tears and fractures lead to the most lost time.

About two-thirds of all injuries were to the leg, especially the ankle, knee and thigh. The next most common location was to the head, followed by the trunk and arm. The location of injuries is fairly similar for both men and women. Most injuries were diagnosed as contusions, sprains or ligament ruptures and strains or muscle fibre ruptures.

The causes of injury must be considered as they give us clues as to how injuries can be prevented. The majority (about 80%) of injuries in women's football come from tackling, with only every fifth injury occurring without contact with another player. On average, 38% of injuries to women due to tackling were a foul at these elite competitions, while almost half of all match injuries to men are due to foul play. However, this represents a 10% increase in women's injuries caused by foul play over the last four years. Looking at trends over time in the different groups, injuries caused by foul play have continuously increased throughout all FIFA women's competitions, with the only exception being the FIFA U-17 Women's World Cup 2010. Thus, it seems that there is now little difference in the mechanisms of injury of male and female players.

This information on injuries at international elite women's competitions does not differ substantially from those collected over 15 years in American college football players of both genders where very similar results were found with regard to location and contact as compared to non-contact injuries and the main diagnoses.

Matches, training, grass or artificial turf – does it matter?

We know from experience that most injuries happen during matches when the intensity of play and commitment is high. Whenever studies have looked at training and matches, the injury rate in matches has been shown to be 6-8 times higher in matches than in training. In general, legs are most often injured both in training and matches. But some types of injury differ between the setting, e.g. far more head and neck injuries happen in matches.

More and more matches nowadays are played on artificial turf. There has been a great deal of discussion about whether there is a difference in injury rates on natural grass and on artificial turf. Here, research can give an objective answer: the general injury rate on turf and grass is similar, both in training and in matches.

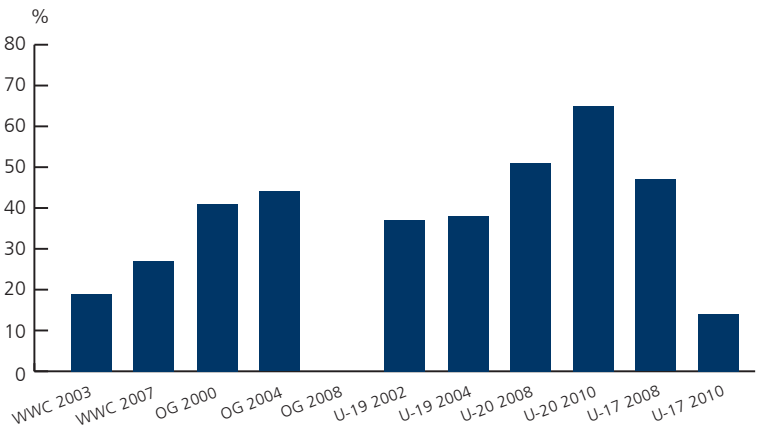


Figure 2: Percentage of contact injuries caused by foul play at FIFA Women's World Cups™, Olympic Football Tournaments, FIFA U-20 and U-17 Women's World Cups

Figure 3: Location of injuries in female football players (FIFA tournaments)

Most common injuries in female players

An ankle sprain is the single most often diagnosed injury in female players. Ankle sprains are also the most common injuries in football that lead to time loss, meaning that you will be unable to train or play for some time. Ankle sprains usually follow a typical pattern and occur under specific circumstances. While you might not be able to prevent your first ankle sprain, you can do a great deal to avoid further ones.

Most ankle sprains happen when the sole of your foot rolls under, damaging the ligaments on the outside of the ankle. This can happen when hitting an uneven surface of the field or stepping on another player's foot when running or landing from a jump. A football-specific mechanism is when an opponent slides in (usually from the side) and makes contact with the inside of the leg, forcing the foot to roll under either at the time of impact or in reaction to the slide, leading to bad foot placement on the ground.

Apart from this, several factors have been identified as risk factors of an ankle sprain: ankle strength, range of motion, postural sway, proprioception (how your body knows where your limbs are) and prior ankle injury. The presence or absence of these risk factors contributes to your personal risk of spraining your ankle.

With the exception of a previous ankle sprain, you can control all of the risk factors described above. Either you have had a prior sprain or you have not. If you regularly perform the "11+" presented later in this booklet, this will reduce your risk for ankle injuries. In addition, when you are at increased risk, e.g. when you have already had an ankle sprain, you may want to do additional balance and proprioception training using ankle discs or a wobble board. These are boards with an unstable platform that you stand on and try to maintain your balance.

If you have suffered from an ankle sprain in the same season, using a semi-rigid or air-supported brace is quite effective at preventing a further sprain and should be

worn for several months after the injury. Most players view an ankle sprain as a nuisance, but you really need to protect the ankle so that you do not injure it again.

The knee is another commonly injured joint in female players, and particularly anterior cruciate ligament (ACL) injuries seem to be up to ten times more frequent than in males. Most ACL injuries are non-contact injuries due to the sudden stops, landing and rotation manoeuvres that occur frequently in football. But simply being a female does not mean you are doomed to an ACL tear. You can considerably lower your risk.

"From my experience, the injury most feared would be a cruciate ligament injury."

Fran Hilton-Smith, Women's Football Technical Director, South African Football Association

The ACL is one of the major stabilising ligaments in the knee joint that prevents excessive movements of the lower leg against the thigh. Seventy per cent of all ACL injuries are non-contact in nature, while the remaining 30% involve a direct force such as an opposing player, a goalpost or another object on the pitch.

Typical non-contact injury mechanisms in football involve a one-step stop deceleration, a sudden change of direction, landing from a jump with the knee and hip at or near full extension – or simply a lapse of concentration. The "11+" exercises presented later in this booklet will teach you how to perform these moves in a way that decreases your risk of injury.

If you tear your ACL, you may miss six to nine months of competitive play as a result of the injury, the subsequent surgery and rehabilitation. In about two-thirds of all complete ACL tears, there is also damage to the menisci and the cartilage of the knee joint. In addition, complete ACL tears can lead to long-term problems, including instability and an early onset of arthrosis of the knee. Usually, arthrosis is found in elderly people as a consequence of ageing. Having your ACL reconstructed can significantly reduce your risk for later injuries and damage, but it cannot totally avert them. All of these are only further arguments to try to prevent ACL tears from occurring in the first place by regularly performing the "11+".

What can we conclude about injuries to women?

1. The overall injury rate for women used to be lower than for men, but it has continuously increased to measure up to men's rates.
2. Most injuries are caused by contact with another player, with injuries due to foul play being on the rise in women.
3. The general pattern of injury is about the same for men and women, but women do sustain more head and knee ligament injuries (particularly anterior cruciate ligament) than men.
4. An ankle sprain is the most common joint injury in women's football. Protecting the ankle with a brace after a sprain helps to prevent further sprains.
5. Far more injuries occur during matches than during training.
6. No relevant differences in injuries are found when women play football on artificial turf or on grass.

References:

Junge A, Dvorak J. Injuries in female football players in top-level international tournaments. Br J Sports Med. 2007;41 Suppl 1:i3-7.

Fuller CW, Dick RW, Corlette J, Schmalz R. Comparison of the incidence, nature and cause of injuries sustained on grass and new generation artificial turf by male and female football players. Part 2: training injuries. Br J Sports Med. 2007;41 Suppl 1:i27-32.

Fuller CW, Dick RW, Corlette J, Schmalz R. Comparison of the incidence, nature and cause of injuries sustained on grass and new generation artificial turf by male and female football players. Part 1: match injuries. Br J Sports Med. 2007;41 Suppl 1:i20-26.

Tscholl P, O'Riordan D, Fuller CW, Dvorak J, Gutzwiller F, Junge A. Causation of injuries in female football players in top-level tournaments. Br J Sports Med. 2007;41 Suppl 1:i8-14.

Dick R, Putukian M, Agel J, Todd AE, Marshall SW. Descriptive epidemiology of collegiate women's soccer injuries: National Collegiate Athletic Association injury surveillance system, 1988-1989 through 2002-2003. J Athlet Train. 2007;42(2):278-285.

Injury prevention

Injury prevention

Some football injuries happen just as accidents at home, at work or on the road do: unpredictably and inevitably. But more often, injuries can be avoided by taking certain measures. You can do a lot to protect yourself – so make sure you know how.

Every injury to your body tissues requires more or less complex healing processes before you can play like before. Depending on the severity, you may miss only one training session or match, a few weeks to several months of playing or, in the worst case, the injury might end your career. If an injury can be prevented, you will be a healthier player who can stay on the pitch, continue to perfect your skills and, in doing so, become a better player. In other words, preventing injury is as important as training to develop as a player.

There are many ideas with regard to preventing injury. Many intuitively make sense, others emanate from many years of experience as a coach, team physician or player. Here, we want to focus on those measures for which there is scientific proof that they can effectively prevent you from getting injured.

All research into injuries is ultimately aimed at preventing them from occurring. Injury recording, if conducted properly, can not only tell us what kind of injuries happen to which body parts, but also why they happen. Was it caused by a collision or a foul, or did the injury happen without contact with another player? Was it due to poor pitch conditions or failure of equipment?

Just as there are different causes of injury, there are different ways to prevent them that need to complement each other. If you follow all of the points below, you will make an important contribution towards preventing yourself and everyone else on the pitch from getting injured.

Protecting yourself and others

1. Always fully recover after an injury

If there is one definitely proven risk factor for injury, it is an incompletely cured previous injury. Return to play too early and you risk that your body might not yet be able to cope with the stresses placed upon it. No match or competition is so important as to risk your health. Second injuries are often more severe than the first one. Discuss intensely with your doctor and physio, and make sure you understand their aims and that you are all in agreement.

2. Protect yourself with the right equipment

Shin guards are mandatory during matches to protect your lower leg from fractures. It is your own responsibility to also wear them during training. Shin guards need to be individually fitted for you. Make sure they are long and wide enough to cover your lower leg and do not leave areas unprotected.
Furthermore, it is advisable to use taping or a brace after an ankle sprain as it can help to prevent this injury from recurring. Knee braces can protect the joint after an injury during rehabilitation, but it is not known if they can prevent injuries in the first place. Goalkeepers should wear adequately padded kit to protect their hips, elbows and shoulders (and knees during training), plus, of course, proper gloves.

"Women injure their knees more often than men. Therefore, preventive action is of crucial importance, especially regarding coordination, strength, flexibility. Prevention of injuries needs to be integrated in the training programme throughout the year. Quality of training means less stress for the body."

Tina Theune-Meyer, former head coach, German women's national team

3. Fair play: respect the Laws of the Game

One important objective of the Laws of the Game is to protect your health. In its studies, F-MARC has been able to identify particularly dangerous actions on the pitch that cause severe injuries, for example when you thrust your elbow outwards while jumping for the ball in aerial duels, or when you challenge an opponent with a two-foot sliding tackle from behind or the side. These actions have therefore been prohibited and referees are instructed to rigorously sanction players who act so ruthlessly and ignore fair play.

4. Regularly practise exercise-based prevention

Your body has some natural defence mechanisms against injuries that you can train to become more "resistant" to injuries. For example, there are some muscles which play an important role in stabilising joints, and strengthening them helps to protect that joint. If you train your balance, this will make you less susceptible to loss of balance and falls. There are certain techniques, e.g. how you jump or land, that protect you from getting injured in these critical situations. A number of programmes have been developed that combine exercises that train the above mechanisms in a structured way in order to protect you from injuries. Examples directed at specific injuries are balance-board exercises to prevent ankle sprains or the "Prevent Injury, Enhance Performance" (PEP) programme to prevent tears of the anterior cruciate ligament. In the next chapter, you will learn about the "11+" – a complete warm-up to prevent injuries. This F-MARC programme includes exercises of different programmes to provide you with general protection from injuries. But, no matter what programme you follow, the key element is always compliance. A great programme that is followed only once per week is not going to have much of an effect.

The important thing is that you make these exercises part of your training routine!

“11+” – a complete warm-up to prevent injuries

"11+" – a complete warm-up to prevent injuries

In your training sessions, your coach teaches you various skills and abilities, including endurance, agility, speed and a technical and tactical understanding of the game. To fully benefit, you must regularly participate in training sessions. Any injury is a setback and hinders your improvement through training and match play. Therefore, injury prevention is an indispensable part of developing as a player.

The "11+" is an injury prevention programme developed by international experts. It is a complete warm-up to be performed prior to every training session. You should be at least 14 years of age to start the "11+".

In a scientific study with almost 2,000 female youth players, teams performing the "11+" at least twice a week had 30-50% fewer injured players than teams who warmed up as usual. For the programme to be fully effective, it is paramount that you do the exercises regularly and correctly. The greater care you take to correctly perform each exercise, the greater the effect. Your coach will supervise how you do the exercises and correct your movements as necessary.

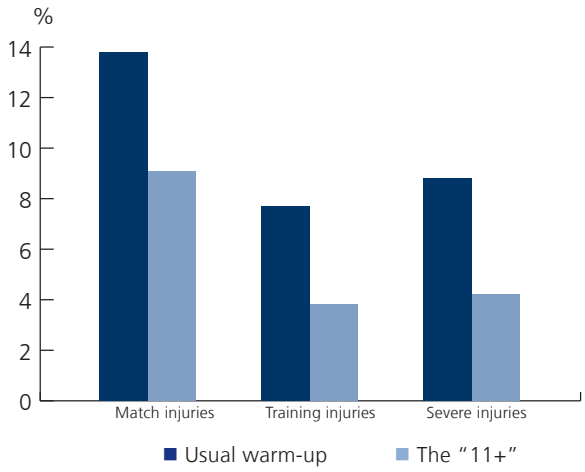


Figure 1: Percentage of training, match and severe injuries in female youth players performing the "11+" compared with injuries in players warming up as usual.

"11+" – your injury prevention programme

The "11+" consists of three different parts. It is important to perform the 15 exercises exactly in the sequence described below as your routine warm-up prior to each training session, but at least twice a week.

Part 1: running exercises at a slow speed combined with stretching;

Part 2: six sets of exercises, focusing on core and leg strength, balance and agility, each with three levels of increasing difficulty; and

Part 3: running exercises at moderate/high speed combined with planting/cutting movements.

Prior to matches, you do only the **running exercises** (parts 1 and 3).

"It is not easy to motivate yourself to do preventive exercises before training sessions – you don't see the results immediately. Unfortunately, you only realise how important your health is once you have been injured. Then, you are grateful for effective, structured prevention programmes such as the '11+'."

Birgit Prinz, German national team striker and physiotherapist

Progression to the next level in part 2

As a general rule, you begin with level 1. Only when you master an exercise without difficulty for the duration and number of repetitions given can you progress to the next level of this exercise.

There are three options for your team:

a) Ideally, you progress to the next level based on your individual capability.

b) Alternatively, your whole team progresses to the next level for some exercises but continue with the current level for other exercises until everyone masters them.

c) For simplicity, your whole team progresses to the next level of all exercises after three to four weeks.

Important:
It is paramount that you perform all exercises correctly. Pay attention to correct posture and good body control, especially straight leg alignment, knee-over-toe position and soft landings.

Figure 2: Correct (left) v. incorrect (right) positioning of the knee during landing/jumping

Field set-up

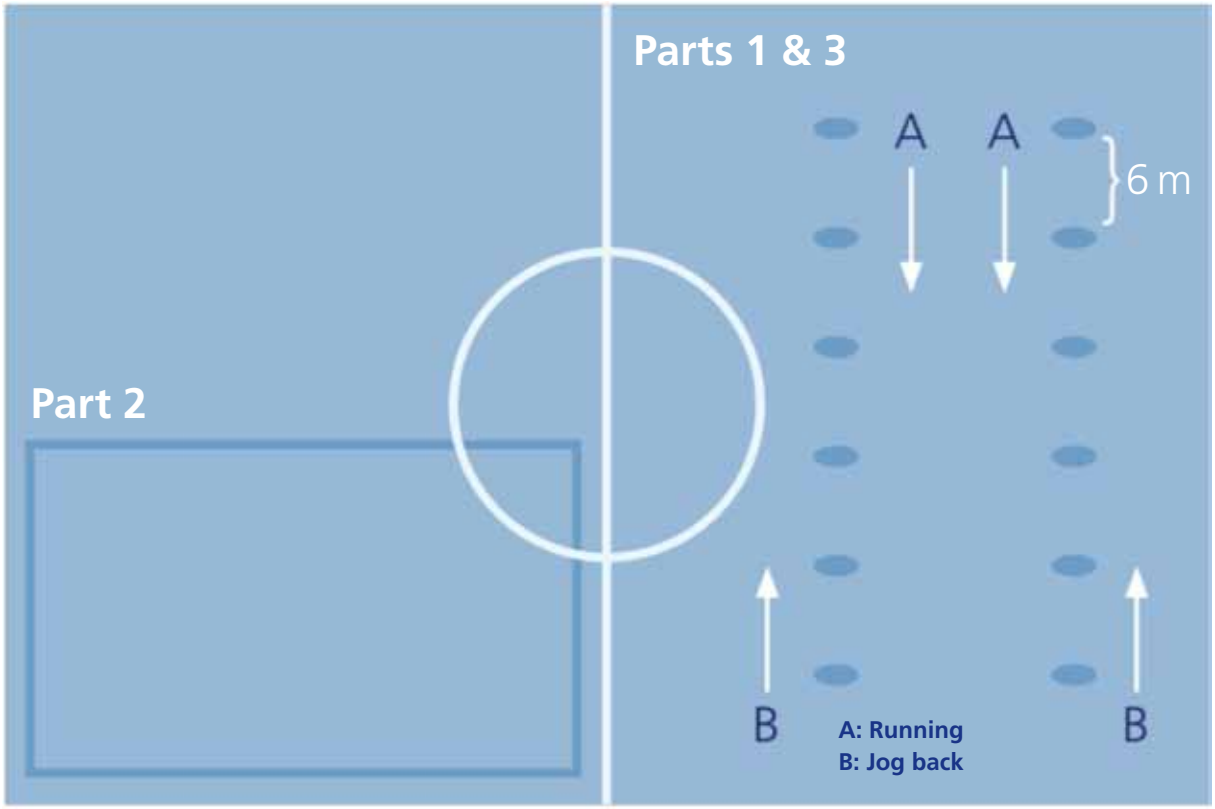
The course to be set up for the running exercises (parts 1 and 3) consists of twelve cones, placed approximately five to six metres apart in two parallel lines.

No specific field set-up is required for the exercises of part 2.

References:

Soligard T, Myklebust G, Steffen K, Holme I, Silvers H, Bizzini M, Junge A, Dvorak J, Bahr R, Andersen TE (2008) A comprehensive warm-up programme to prevent injuries in female youth football: a cluster randomised controlled trial. BMJ Dec 9; 337:a2469. doi: 10.1136/bmj.a2469.

Soligard T, Nilstad A, Steffen K, Myklebust G, Holme I, Dvorak J, et al. Compliance with a comprehensive warm-up programme to prevent injuries in youth football. Br J Sports Med 2010;44(11):787-793.



"We are seeing an ever-increasing number of injuries in the women's game. It is essential to recognise the demands that the game places on the body. Players can reduce the risk of injury by introducing into their conditioning programmes elements of strength, balance, agility and core stability work. This must become a natural part of their training routine."

Hope Powell, women's football national coach, The Football Association

The "11+" exercises

PART 1: RUNNING EXERCISES · 8 MINUTES

1. RUNNING – STRAIGHT AHEAD

Jog straight to the last cone. Make sure you keep your upper body straight. Your hip, knee and foot are aligned. Do not let your knee buckle inwards. Run slightly more quickly on the way back. **2 sets**.

2. RUNNING – HIP OUT

Jog to the first cone, stop and lift your knee forwards. Rotate your knee to the side and put your foot down. At the next cone, repeat the exercise on the other leg. Repeat until you reach the other side of the pitch. **2 sets**.

3. RUNNING – HIP IN

Jog to the first cone, stop and lift your knee to the side. Rotate your knee forwards and put your foot down. At the next cone, repeat the exercise on the other leg. Repeat until you reach the other side of the pitch. **2 sets**.

4. RUNNING – CIRCLING PARTNER

Jog to the first cone. Shuffle sideways towards your partner, shuffle an entire circle around one another (without changing the direction you are looking in) and then shuffle back to the first cone. Repeat until you reach the other side of the pitch. **2 sets**.

5. RUNNING – JUMPING WITH SHOULDER CONTACT

Jog to the first cone. Shuffle sideways towards your partner. In the middle, jump sideways towards each other and make shoulder-to-shoulder contact. Land on both feet with your hips and knees bent. Shuffle back to the first cone. Repeat until you reach the other side of the pitch. **2 sets**.

6. RUNNING – QUICK FORWARDS AND BACKWARDS SPRINTS

Run quickly to the second cone then quickly run backwards to the first cone, keeping your hips and knees slightly bent. Repeat, running two cones forwards and one cone back until you reach the other side of the pitch. **2 sets**.

PART 2: STRENGTH, PLYOMETRICS, BALANCE · 10 MINUTES

7.1 THE BENCH – STATIC

Starting position: Lie on your front, support the upper body with your forearms. Keep your elbows directly under your shoulders.
Exercise: Lift the upper body, pelvis and legs up until your body forms a straight line from head to foot. Pull in stomach and gluteal muscles and hold the position for 20-30 sec. **3 sets**.
Important: Do not sway or arch your back. Do not move your buttocks upwards.

7.2 THE BENCH – ALTERNATE LEGS

Starting position: Lie on your front, support the upper body with your forearms. Keep your elbows directly under your shoulders.
Exercise: Lift the upper body, pelvis and legs up until your body forms a straight line from head to foot. Pull in stomach and gluteal muscles. Lift each leg in turn, holding for a count of 2 sec. Continue for 40-60 sec. **3 sets**.
Important: Do not sway or arch your back. Do not move your buttocks upwards. Keep pelvis stable and do not let it tilt to the side.

7.3 THE BENCH – ONE LEG LIFT AND HOLD

Starting position: Lie on your front, supporting your upper body with your forearms. Keep your elbows directly under your shoulders.
Exercise: Lift the upper body, pelvis and legs up until your body forms a straight line. Pull in stomach and gluteal muscles. Lift one leg about 10-15 cm off the ground and hold the position for 20-30 sec. Repeat with other leg. **3 sets**.
Important: Do not sway or arch your back. Do not move your buttocks upwards. Ensure the pelvis is stable and do not let it tilt to the side.

8.1 SIDEWAYS BENCH – STATIC

Starting position: Lie on your side with the knee of your lower leg bent to 90 degrees, support yourself on your forearm and lower leg. Keep the elbow of your supporting arm directly under the shoulder.
Exercise: Lift pelvis and upper leg until they form a straight line with your shoulder and hold the position for 20-30 sec. Repeat on other side. **3 sets**.
Important: Keep pelvis stable and do not let it tilt downwards. Do not tilt shoulders, pelvis or leg forwards or backwards.

8.2 SIDEWAYS BENCH – RAISE AND LOWER HIP

Starting position: Lie on your side with both legs straight, support yourself on your forearm. Keep the elbow of your supporting arm directly under the shoulder.
Exercise: Raise pelvis and legs until your body forms a straight line from the upper shoulder to the upper foot. Lower hips to the ground and raise them back up again. Continue for 20-30 sec. Repeat on other side. **3 sets**.
Important: Do not tilt shoulders or pelvis forwards or backwards. Do not rest your head on your shoulder.

8.3 SIDEWAYS BENCH – WITH LEG LIFT

Starting position: Lie on your side with both legs straight, support yourself on your forearm and lower leg. Keep the elbow of your supporting arm directly under the shoulder.
Exercise: Raise pelvis and legs until your body forms a straight line from the upper shoulder to the upper foot. Lift upper leg up and slowly lower it down again. Continue for 20-30 sec. Repeat on other side. **3 sets**.
Important: Keep pelvis stable and do not let it tilt downwards. Do not tilt shoulders or pelvis forwards or backwards.

9.1 HAMSTRINGS – BEGINNER

Starting position: Kneel with knees apart at hip's width; partner pins your ankles firmly to the ground with both hands.
Exercise: Slowly lean forward while keeping your body straight from the head to the knees. When you can no longer hold the position, gently take your weight with your hands, falling into a press-up position. **3-5 repetitions**.
Important: Do exercise slowly at first, but once you feel more comfortable speed it up.

9.2 HAMSTRINGS – INTERMEDIATE

Starting position and exercise: As described in 9.1.
7-10 repetitions.

9.3 HAMSTRINGS – ADVANCED

Starting position and exercise: As described in 9.1. Minimum of **12-15 repetitions**.

10.1 SINGLE-LEG STANCE – HOLD THE BALL

Starting position: Stand on one leg, knee and hip slightly bent and hold the ball in both hands.
Exercise: Hold balance and keep body weight on the ball of your foot. Hold for 30 sec. and repeat on the other leg. The exercise can be made more difficult by lifting the heel from the ground slightly or passing the ball around your waist and/or under your other knee. **2 sets** on each leg.
Important: Do not let your knee buckle inwards. Keep pelvis horizontal and do not let it tilt to the side.

10.2 SINGLE-LEG BALANCE – THROWING BALL WITH PARTNER

Starting position: Stand on one leg, face a partner at a distance of 2-3 m.
Exercise: Maintain your balance while you throw the ball to one another. Hold in your stomach and keep your weight on the ball of your foot. Continue for 30 sec. and repeat on the other leg. The exercise can be made more difficult by lifting the heel from the ground slightly. **2 sets** on each leg.
Important: Do not let your knee buckle inwards. Keep pelvis horizontal and do not let it tilt to the side.

10.3 SINGLE-LEG BALANCE – TEST YOUR PARTNER

Starting position: Stand on one leg, at arm's length from your partner.
Exercise: Maintain your balance while you and your partner take it in turns to try to push the other off balance in different directions. Continue for 30 sec. and repeat on the other leg. **2 sets** on each leg.
Important: Do not let your knee buckle inwards. Keep pelvis horizontal and do not let it tilt to the side.

11.1 SQUATS – WITH TOE RAISED

Starting position: Stand with your feet apart under your hips, hands on your hips.
Exercise: Slowly bend hips, knees and ankles until your knees are flexed to 90 degrees. Lean your upper body forwards. Then straighten the upper body, hips and knees, and stand up on your toes. Then slowly lower yourself again, and straighten up slightly more quickly. Repeat for 30 sec. **2 sets**.
Important: Do not let your knee buckle inwards. Lean upper body forward with a straight back.

11.2 SQUATS – WALKING LUNGES

Starting position: Stand with feet apart under your hips, hands on your hips.
Exercise: Lunge forward slowly at an even pace. Bend hips and knees slowly until your leading knee is flexed to 90 degrees. The bent knee should not extend beyond the toes. 10 lunges on each leg. **2 sets**.
Important: Do not let your knee buckle inwards. Keep upper body straight and pelvis horizontal.

11.3 SQUATS – ONE-LEG SQUATS

Starting position: Stand on one leg, loosely hold on to your partner.
Exercise: Slowly bend your knee, if possible until it is flexed to 90 degrees, and straighten up again. Bend slowly then straighten slightly more quickly. Repeat on the other leg. 10 squats on each leg. **2 sets**.
Important: Do not let your knee buckle inwards. Keep upper body facing forward and pelvis horizontal.

12.1 JUMPING – VERTICAL JUMPS

Starting position: Stand with your feet apart under your hips, hands on your hips.
Exercise: Slowly bend hips, knees and ankles until your knees are flexed to 90 degrees. Lean upper body forwards. Hold this position for 1 sec. then jump as high as you can, and straighten your whole body. Land softly on the balls of your feet. Repeat for 30 sec. **2 sets**.
Important: Jump off both feet. Land gently on the balls of both feet with your knees bent.

12.2 JUMPING – LATERAL JUMPS

Starting position: Stand on one leg. Bend hips, knee and ankle slightly and lean upper body forwards.
Exercise: Jump off your supporting leg, landing approximately 1m sideways onto the other leg. Land gently on the ball of your foot and bend your hips, knee and ankle. Hold this position for about a second and then jump onto the other leg. Repeat for 30 sec. **2 sets**.
Important: Do not let your knee buckle inwards. Keep upper body stable and facing forward and pelvis horizontal.

12.3 JUMPING – BOX JUMPS

Starting position: Stand with feet apart under your hips, imagine you are standing in the middle of a cross.
Exercise: Jump with both legs forwards and backwards, from side to side, and diagonally across the cross. Keep upper body slightly leaned forwards. Jump as quickly and explosively as possible. Repeat for 30 sec. **2 sets**.
Important: Land softly on the balls of both feet. Bend hips, knees and ankles on landing. Do not let your knee buckle inwards.

PART 3: RUNNING EXERCISES · 2 MINUTES

13. RUNNING – ACROSS THE PITCH

Run approx 40m across the pitch at 75-80% of maximum pace and then jog the rest of the way. Keep your upper body straight. Your hip, knee and foot are aligned. Do not let your knees buckle inwards. Jog back gently. **2 sets**.

14. RUNNING – BOUNDING

Take a few warm-up steps then take 6-8 high bounding steps with a high knee lift and then jog the rest of the way. Lift the knee of the leading leg as high as possible and swing the opposite arm across the body. Keep your upper body straight. Land on the ball of the foot with your knee bent and spring. Do not let your knee buckle inwards. Jog back gently to recover. **2 sets**.

15. RUNNING – PLANT & CUT

Jog 4-5 steps straight ahead. Then plant the right leg and cut to change direction to the left and accelerate again. Sprint 5-7 steps (80-90% of maximum pace) before you decelerate and plant the left foot and cut to change direction to the right. Do not let your knee buckle inwards. Repeat the exercise until you reach the other side of the pitch, then jog back. **2 sets**.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Head injuries – never to be underestimated

Head injuries – never to be underestimated

One injury that is particularly troubling is an injury to the head. You need to be aware of two major points: firstly, with every head injury, you may suffer a concussion that must be carefully looked for. Secondly, if you have suffered a concussion, the crucial question is when you can safely return to play.

Injuries to the head occur far more often during match play than in training and are the second most common location of injuries after the lower extremity. About half of all head injuries are contusions (bruises of the soft tissues). In men, the next most common head injury is a laceration, but in women, the next most common injury is concussion. Most studies to date have shown that women suffer a concussion about twice as often as men. They also report more severe symptoms and seem to have less favourable outcomes. Whether or not this is a true difference or the result of more vigilant self-observation is unclear.

A concussion is a brain injury that is particularly feared because it may cause long-term deficits affecting your memory, concentration, planning, problem-solving and more. But what exactly is a concussion? In medical terms, a concussion is the "temporary loss of normal brain function as a result of an injury" or a "rapid onset of short-lived impairment of neurological function". In reality, it might in fact not be at all easy to recognise that this has occurred in a player. The situation is complicated by the fact that the concussed player herself often does not realise the severity of her injury.

It is important to know that contrary to common belief, you do not need to have lost consciousness to suffer concussion. A player may be confused or unaware of the time, date or place for a while after the injury. Other typical symptoms are headache, dizziness, nausea and unsteadiness/loss of balance. For example, you may see two players clash heads, after which one bends over, holds her head and is oblivious to the match happening around her.

But the signs might be far more subtle, therefore the most important thing whenever you or any of your team-mates suffer a head injury is to be alert to the fact that she might have suffered a concussion, too. This should be actively excluded and you will find a short test to do so on the next page after we have looked at what you can do to prevent head injuries in the first place.

Fair play is crucial

F-MARC has carefully looked at how head injuries happen in football. They found that in women, it is most often with head-to-head clashes whereas in men it is head-to-elbow contact. Based on these study results, the Laws of the Game have been changed and referees today are called upon to rigorously sanction every elbowing with a red card. Therefore, adherence to the rules and fair play are a vital step when you want to protect yourself and others from head injuries (see chapter "Injury prevention").

Other, less common causes are head-to-ground contact or when the head impacts another hard object like the foot, knee, post or even some object near the touchline. Goalkeepers have unique challenges when coming out on an onrushing striker or working around the goalposts. Although it is a common concern of parents, purposeful heading carries little risk, but concussion can occur if the ball accidentally hits you when you are unprepared for the contact.

It has been shown that the headgear and helmets that are currently available do not protect football players from

"I had a severe concussion when I got kicked in the head a few years ago. I couldn't play for six months, and that was difficult, but I knew I needed to take a break for the future of my career. The doctors told me not to do too much of anything, so I didn't. When I came back, it took a while for me to get back into shape."

Lori Chalupny, midfielder, US women's national team

concussion. Also, injury prevention programmes such as the "11+" cannot prevent concussions. Therefore, head injuries will continue to occur, particularly in matches and when you challenge for high balls. But there is a lot that can be done to prevent serious consequences of head injuries from occurring.

As mentioned above, the two major points everyone involved in the care of players need to be aware of are: recognition that a concussion has occurred and when to allow a player who has suffered a concussion to return to play.

When in doubt, keep her out

With every impact to the head, by whatever object, it is important that you always think of the possibility of concussion and purposefully watch out for signs of it. As a player, you feel a little out of sorts, but feel you can still play. That, however, is not a good idea as it puts you at increased risk for further injuries.

While there are many recommendations regarding when to allow a player to return to play, the safest decision is to keep the player out of play until a medical professional says she can return. Most coaches and players are not in a position to make such a decision on the field, so "when in doubt, keep her out" is a safe suggestion. However, in important matches or with minor incidents, that might be very difficult to enforce.

Recently, a group of experts in the field developed a short touchline assessment that will help your coach or physician to find out if you or one of your team-mates has suffered a concussion. The "Pocket SCAT" entails typical symptoms, a number of questions and a balance test to aid in establishing a suspected concussion. If any of the described signs or symptoms is present, the player might have suffered a concussion and needs to be removed from play and not left alone until she has been assessed by a doctor. It is highly advisable to use this test for all head injuries as a general rule so as not to miss anything.

Pocket SCAT2

Concussion should be suspected in the presence of **any one or more** of the following: symptoms (such as head-ache), or physical signs (such as unsteadiness), or impaired brain function (e.g. confusion) or abnormal behaviour.

1. Symptoms

Presence of any of the following signs & symptoms may suggest a concussion.

- Loss of consciousness
- Seizure or convulsion
- Amnesia
- Headache
- "Pressure in head"
- Neck Pain
- Nausea or vomiting
- Dizziness
- Blurred vision
- Balance problems
- Sensitivity to light
- Sensitivity to noise
- Feeling slowed down
- Feeling like "in a fog"
- "Don't feel right"
- Difficulty concentrating
- Difficulty remembering
- Fatigue or low energy
- Confusion
- Drowsiness
- More emotional
- Irritability
- Sadness
- Nervous or anxious

2. Memory function

Failure to answer all questions correctly may suggest a concussion.

"At what venue are we at today?"
"Which half is it now?"
"Who scored last in this game?"
"What team did you play last week/game?"
"Did your team win the last game?"

3. Balance testing

Instructions for tandem stance

*"Now stand heel-to-toe with your **non-dominant** foot in back. Your weight should be evenly distributed across both feet. You should try to maintain stability for 20 seconds with your hands on your hips and your eyes closed. I will be counting the number of times you move out of this position. If you stumble out of this position, open your eyes and return to the start position and continue balancing. I will start timing when you are set and have closed your eyes."*

Observe the athlete for 20 seconds. If they make more than 5 errors (such as lift their hands off their hips; open their eyes; lift their forefoot or heel; step, stumble, or fall; or remain out of the start position for more that 5 seconds) then this may suggest a concussion.

Any athlete with a suspected concussion should be IMMEDIATELY REMOVED FROM PLAY, urgently assessed medically, should not be left alone and should not drive a motor vehicle.

Figure 1: Pocket SCAT2 to assess a player after head injury

When to return to play

Deciding when a player may return to play after a concussion is one of the most difficult challenges for your team physician. Recovery is very individual and can last from minutes to months or even longer and can affect all aspects of your daily life. Some research points out that women take longer to recover from a head injury than men.

In general, the majority of concussions will heal on their own over several days. During this time, absolute rest, both physically and mentally, is required. The latter means that no activities in which you need to concentrate or pay attention are allowed, such as text messaging, video games or learning. When you are free of symptoms, you should follow a step-by-step guide that takes you gradually back to light exercise, then football-specific exercise, then non-contact training drills before full contact training and finally return to play. At each of these levels, if any of your previous symptoms come back or if you suffer new ones, that means it is too early for you to proceed and you should go back one level. If you do not experience any symptoms, the step-by-step return process will take you back to play in about one week.

A more rapid return can only be encouraged in some exceptional situations. This applies for adults in a professional setting and with supervision by experts, but never in players under 18 years of age. As a general rule, no player should return to play if they are still suffering from any symptoms but only after a definite period of absence of any complaints, the exact duration of which is determined depending on the individual setting.

Do not take a head injury lightly.
No match is that important.

References:

Dick RW. Is there a gender difference in concussion incidence and outcomes? Br J Sports Med 2009;43 Suppl 1:i46-50.

McCrory P, Meeuwisse W, Johnston K, Dvorak J, Aubry M, Molloy M, Cantu R. Consensus Statement on Concussion in Sport: the 3rd International Conference on Concussion in Sport held in Zurich, November 2008. Br J Sports Med 2009;43 Suppl 1:i76-90.

Dvorak J, McCrory P, Kirkendall DT. Head injuries in the female football player: incidence, mechanisms, risk factors and management. Br J Sports Med 2007;41 Suppl 1:i44-46.

McCrory P, Johnston K , Meeuwisse W, Aubry M , Cantu R, Dvorak J, Graf-Baumann T, Kelly J, Lovell M, Schamasch P. Summary and agreement statement of the 2nd International Conference on Concussion in Sport, Prague 2004. Clin J Sport Med 2005;15(2):48-55.

Aubry M, Cantu R, Dvorak J, Graf-Baumann T, Johnston K, Kelly J, et al. Summary and agreement statement of the First International Conference on Concussion in Sport, Vienna 2001. Recommendations for the improvement of safety and health of athletes who may suffer concussive injuries. Br J Sports Med 2002;36(1):6-10.

"The worst concussion I had happened in an indoor competition. I was fouled and I toppled down directly on the back of my head. I instantly had a severe headache and nausea which persevered for two weeks... After that, I avoided heading and was cautious in challenges for some time."

Vanessa Bernauer, 19, midfielder, Swiss women's national team, has suffered several head injuries and concussions. After the incident described, she was supposed to rest for two weeks.


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First aid on the pitch

First aid for football injuries

Not every team has a team doctor looking after you all the time. But effective first aid for the most common acute football injuries can be provided without being a medical expert by simply applying some basic principles. Ideally, a first-aider trained and equipped to manage injuries should be present at training sessions and during matches.

S A L T A P S

If you need to decide whether or not you or a team-mate should continue to play or train, the mnemonic SALTAPS aims to help you and your coach make this decision:

S is for Stop play if a player goes down.

A is for Ask the player what happened and how they feel. Check facial expressions and posture (position either standing or lying down).

L is for Look at injured limbs for obvious signs of injury: bleeding, bruising, swelling, deformity. Take the player off if there are significant signs of injury.

T is for Touch the injured site if the player will let you. Gently palpate to find source of pain. If you are unsure, don't touch or move the limb until a qualified person can assess the player.

A is for Active movement: Can the player move the limb, with or without pain? If unable to move – take the player off.

P is for Passive movement: If A applies, move the limb/joint to full extent and note reaction.

S is for Stand up (and play on): Is the player up and running or rather trying to "run it off"? Whatever the case, keep a close eye on her and replace if in doubt.

Never move a player with a suspected neck or spine injury or an unconscious player!

Symptoms and signs of common injuries

Ankle sprain: Swelling – within minutes or slowly over several hours.
- Pain when trying to move the ankle and when walking
- Stiffness and inability to place full weight on the foot

Knee injuries:
- Popping or snapping sound in the knee at time of injury
- Pain, swelling and inability to completely straighten the knee
- Inability to place weight on the knee, feeling loose or unstable

Hamstring strain:
- Popping or cracking at the time of injury, sudden pain down the back of the leg
- Pain, swelling and bruising of the posterior thigh
- Walking is affected, and flexing (bending) the knee causes pain

First aid

The PRICE regime is a simple five-step protocol that even an untrained person can use to minimise the effects of a muscle or joint injury. You should use PRICE immediately when an injury occurs – the earlier, the better.

P is for Protection – Protect any injury from further damage. Stop playing, use padding and protection, splints or use crutches to take the weight off a knee, thigh or ankle injury. If a fracture or dislocation is suspected, do not attempt to straighten any deformity; instead, try to stabilise in current position, protect and remove to safety.

R is for Rest – Allow the injury time to heal. Being brave and playing on is not always wise. Even a minor injury needs time to heal.

I is for Ice – Applying ice either from a freezer, an ice pack or even a wet towel from a fridge to the injured area will

reduce the pain and inflammation. Very cold products can induce cold burn so always wrap the ice in a cloth and/or plastic and never apply directly to the skin. The ice should be put on for 15-20 minutes and then removed and reapplied after 1½ to two hours for another 15-20 minutes.

C is for Compression – Compression of the swollen area will help to reduce the swelling. Use cohesive tear tape, crepe or any stretch bandage but not an elastic adhesive bandage as this should only be applied by qualified persons. Ensure that this is not too tight and check every few minutes because continued swelling can make a compression too tight even if relatively loose in the beginning.

E is for Elevation – Elevating the injury to above the level of the heart reduces the swelling.

Immediate treatment of other minor injuries

Nose injuries: Direct blows, e.g. in aerial challenges or tackles, may cause nosebleeds or broken noses. First aid for nosebleeds includes:

- Stop playing and sit down with the head leaning forward.
- Pinch the nostrils together and breathe through your mouth.
- Hold the nose for at least ten minutes.
- If bleeding continues for more than 30 minutes, or if your nose shows severe swelling and deformation, see a doctor.

Dislodged teeth: Direct blows, e.g. in aerial challenges or tackles, may crack, break or dislodge teeth. To save the tooth, you need prompt treatment (best within 30 minutes). Do not touch the root. Rinse the tooth in water or milk and see a dentist or hospital casualty unit immediately.

Bruises: Small bleeds under the skin caused by a blow. No specific acute treatment required, but ice may help reduce swelling and pain.

Cuts and abrasions: Collision with other players or falls may cause skin wounds.

- Any player with a blood injury must stop playing until the bleeding has stopped and the wound has been properly dressed.
- Clean any blood injury with appropriate antiseptic and bandage, wash skin exposed to blood or body fluids with soap and water.
- Change any shirts or shorts saturated with blood.
- If the bleeding cannot be stopped, if the wound is split open, if your last tetanus immunisation was more than ten years ago or if there is any doubt, see a doctor.

Emergency situations

Always have emergency numbers available. Call for an ambulance with:

- Loss of consciousness (never move an unconscious player!)
- Neck or spine injuries (never move a player with a suspected neck injury!)
- Broken bones
- More severe injuries to the head or face
- Eye injuries
- Abdominal injuries
- Any uncertainty about the degree of injury
- Any breathing difficulties

Be prepared – first-aid kit

A first-aid kit containing the most useful equipment should always be at hand at training sessions and during matches. Some items are to be considered as desirable basic contents, allowing you to deal with common situations. These include:

- Crepe bandages
- Elastic adhesive bandage in various sizes
- Elastic/self-adhesive/tearable bandages in various sizes
- Zinc oxide tape in various sizes
- Disposable gloves
- Gauze swabs
- Plasters (non-allergenic/waterproof)
- Sterile non-adherent wound dressings in various sizes
- Triangular bandages
- Eye pads
- Spray bottle (for iced water)
- Scissors
- Small bottle of disinfectant
- Plastic bags that can be used for ice and also to dispose of used gauze etc.


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Football food – promoting health, fitness and performance

Football food – promoting health, fitness and performance

When talented, motivated and well-trained sportswomen meet in competition, the margin between victory and defeat can be small. Attention to detail can be the all-important difference. After training, the factor that probably has the greatest effect on your performance is your diet – but you do not need to be a nutrition expert to achieve benefits.

There is no need for meticulous planning of all your meals, for sophisticated diet foods or nutrition supplements. If you are open to variation, are willing to explore new foods and recipes, try variations of different food and combine all the colours of the rainbow, you will obtain everything you need to support excellent performance.

You may not be too surprised to learn that while there is abundant information on nutrition and hydration in male footballers, information specific to female players is harder to find. This means that nutrition and hydration guidelines developed for male players are applied to the female player. This is sometimes, but not always, appropriate. The nutritional needs of the elite player who trains most days of the week and competes more than once a week over a long season are different from those of the girl or woman playing recreationally 1-2 times a week. The general principles of their diet are the same, however, and are aimed at promoting health, fitness and match performance.

Your benefits of a sound diet in a nutshell

- Maximum benefit from your training programme
- Enhanced recovery within and between workouts and events
- Achievement and maintenance of an ideal body weight and physique
- A reduced risk of injury and illness
- Confidence in being well prepared for match play
- Increased consistency in achieving high-level performances in matches
- Enjoyment of food and social eating occasions

Energy demands and body fat

The typical energy expenditure during a match is about 1,100kcal for a 60kg player. Heavier players generally need more, and lighter players less, but this depends very much on work rate and the pace of the game as well as on individual variation.

Your energy needs depend not only on the demands of training and match play, but also on your activities outside the game. Energy needs are lower if you train infrequently, or when your training sessions are short or easy as well as during periods of inactivity such as the pre-season or while you are injured.

If you play in one or more games per week and train most days of the week, you must eat enough to meet the energy demands of training and matches, and to prevent chronic fatigue that leads to poor performance and possible injury.

Looking good and playing well

As an ambitious player, you need to eat sufficient food to provide your body with energy for training and competition as well as your other daily activities. The major energy warehouse in your body is fat, where excess energy is stored to be used in times of need. You will perform best when the amount of body fat is within your individual optimum range.

"We encourage players to obtain the required nutrients from a well-balanced diet. However, when competing overseas, where access to appropriate nutrition is not guaranteed, supplements may be consumed. As the purity of supplements cannot be 100% guaranteed, there is always a risk of producing a positive drug test."

Helen Tunstall, Injury Prevention Manager, New Zealand Soccer Inc.

At the same time, as a modern woman, you might want to conform to today's ideal of beauty – which means being as slim as possible. It has been shown that some female players are in precarious energy balance, and maintain their low

weight by undergoing chronic energy restriction. You have to make a choice: do you want to be as slim as possible, or do you want to play well and stay healthy?

Prolonged energy deficits cannot be sustained without harm to your health and performance. Low energy intake may delay your recovery from exercise, impair your body's adaptation to training, compromise your immune system and your reproductive function. Any change in your menstrual function can be a serious warning sign. You should immediately consult your doctor to avoid irreversible bone damage (see below).

Losing body fat

This can be difficult – ask for help from your doctor, a nutritionist or another qualified health care professional. Losing weight may not be necessary; if it is, it should be done sensibly and gradually. This is a medium-term goal, not something to be achieved by next week. The basic principle is simple – your energy expenditure should be greater than your intake. But it is a mistake to reduce your energy intake too much, as very low intake increases fatigue in training and daily life while reducing your overall energy levels and thus limiting weight loss.

If you really need to lose weight, try this:

- Reduce portion sizes at meals rather than skip meals altogether.
- Use well-chosen snacks between meals to maintain fuel levels for training sessions. Save part of a meal for a later snack, rather than eat extra food.
- Maintain carbohydrate intake for maintaining fuel levels during exercise.
- Use low-fat strategies in choosing foods and while cooking or preparing meals.
- Limit alcohol intake or eliminate it altogether – alcohol is not an essential part of the diet.
- Make meals and snacks more "filling" by including plenty of salads and vegetables and by taking the higher-fibre option.

Carbohydrate

Your body stores carbohydrate in the liver and muscles, and this is an essential fuel during training and match play. The recommended daily carbohydrate intake for male players is about 5-12g/kg body mass, but typical female players consume much less. Average daily intakes of 4.7g/kg were reported for USA international U-21 players, with extremely low values in some. While most women may be able to cope at this level, those at the lower end might well benefit from an increase without having to exceed their normal energy intake. Limiting carbohydrate intake has far-reaching effects beyond just poor performance.

In male players, it has been shown that an inadequate intake of carbohydrate in the days before a match will impair running performance, especially sprinting speed during the second half of a game. There is no reason to expect females to be different. It seems prudent to ensure that your muscle stores of carbohydrates have been replenished since the last training session or game. Women, like men, can achieve super-compensation of muscle stores – provided they eat enough carbohydrate. The main "mistake" is to eat too little carbohydrate – that is, less than 1g per kg bodyweight – during the 1-6 hours before exercise and then not take in carbohydrate during exercise. This low carbohydrate supply is insufficient to sustain you throughout a match. If you want to optimise your performance, eat 1-4g/kg bodyweight of carbohydrate during the six-hour period before a match.

Protein

An adequate intake of protein is essential for muscle growth and repair, a healthy immune system and a whole range of other normal body functions. This applies especially for the essential amino acids, which are building blocks of protein that your body cannot produce.

For both men and women, the recommended protein intake is about 0.8g/kg/d which can be easily achieved with normal eating habits. Even the commonly recommended intakes for football players of 1.4-1.7g/kg/d are in fact difficult not to reach with a typical western diet, provided that your energy demand is met. Even a 55-60kg female player eating only 2,200kcal/d with 10-15% of total energy from protein will have an intake of 55-82g/d or 1-1.5g/kg/d. Nevertheless, some women with restrictive eating practices and limited food choices may be at risk for inadequate supply.

For training purposes, it seems that not only is the amount of protein important, but the timing of intake and the presence or absence of other nutrients can affect your adaptation to the training stimulus. Training promotes changes in tissue structure and function that lead to improved performance. The nature and extent of this adaptation depend on the type of stimulus and the training load.

It used to be thought that nutrition mainly enhanced recovery. Now it is recognised that good eating habits may allow the same training adaptations with a reduced training load. This is important to your coach, since it means that more time and effort can be devoted to technical training and the risk of chronic fatigue and injury can be reduced. In practice, your training may be more effective when you consume a 20-25g amount of protein just before or just after the exercise. A sandwich with cheese, ham, tuna or something similar is perfectly good, or you could try a high-protein energy bar.

How much and when to drink?

The consumption of fluid enjoys the reputation as a proven – and permitted – performance enhancer. Dehydration adversely affects your skill, stamina, work output and decision-making. Your performance begins to be impaired when your sweat-induced loss of weight reaches about 1-2% of your pre-exercise body mass. So how do you ensure you drink the right amount of the right fluid at the right time?

You do this by developing your personal hydration strategy. You can self-monitor your body's fluid balance by paying attention to your urine frequency, volume and colour. You may follow the recommendations below, but you will need to fine-tune these recommendations to find your own winning formula. And just like new boots, do not try out new plans for fluid and fuel intake during important competitions. Do it in daily practice and find out what fits you best.

"The most important things are water and having a good balance between carbs and protein. You really have to make sure you eat enough, especially the night before the game. You also need to be consistent in your nutrition."

Shannon Boxx, 30, midfielder, US women's national team

On the day before a competition, you should drink sufficient fluid with meals to ensure you are well hydrated. You should also continue to drink water or carbohydrate-containing fluids during the hours leading up to competition. In hot weather, it is recommended that about half a litre be ingested during the 60-90 minutes before the start of the game. This will allow your body sufficient time to excrete excess fluid before the game begins.

When do you need more than water?

Where sweat losses are small, there is little need to drink during training or match play and drinking water afterwards is sufficient. Where you anticipate large sweat losses in games or hard training in the heat, you should be careful to ensure you are well hydrated beforehand. Here, drinking fluids containing small amounts of carbohydrate and electrolytes may be better than drinking plain water. During a match, you may drink during warm-up, at half time and during game stoppages. During training, your coach should organise drink breaks according to the weather and intensity of exercise.

Depletion of your fuel stores can be an issue for you, especially if you are in a mobile position or have a running game style. A better match intake of fluid and fuel may not only keep you running further and faster in the second half, but may help you to maintain skills and judgment when you would otherwise become fatigued. A commercial sports drink with a carbohydrate content of about 4-8% (4-8g/100ml) allows you to meet your carbohydrate and fluid needs simultaneously.

Rehydrate after exercise

Recovery after exercise is part of the preparation for your next exercise session, and replacement of sweat losses is an essential part of this process. Both water and salts lost in sweat must be replaced. Aim to drink about 1.2-1.5 litres of fluid for each kg of weight lost. Drinks should contain sodium (the main salt lost in sweat) if no food is eaten at this time. Sports drinks that contain electrolytes are helpful, but many foods can also supply the salt that is needed. Be very cautious with salt tablets; they can do more harm than good.

Some players try to match sweat losses with fluid intake and actually gain weight during a training session. The idea is to drink just enough to keep your weight loss to no more than 1-2% of your starting weight, not to match loss with intake. Try the following to acquire a feel for your sweat losses:

- Measure your body weight (kg) both before and after at least one hour of exercise under conditions similar to competition or hard practice. Measure your body weight wearing minimal clothing and while barefooted.
- Dry with a towel after exercise and obtain body weight as soon as practical after exercise (i.e. less than 10 min).
- Note the volume of fluid you consumed during exercise (litres).

Sweat loss (litres) =

body weight before exercise (kg)
– body weight after exercise (kg)
+ fluid consumed during exercise (litre)

Small, but essential

Your diet also needs to provide an adequate intake of all of the so-called micronutrients (as compared to the macronutrients fat, carbohydrate, protein) that are essential for the normal function of your body. Deficiencies are generally rare if you eat a varied diet in amounts sufficient to meet your energy needs, but the risk is increased by any dietary restriction, such as vegetarianism, avoidance of dairy products, etc.

Iron

Iron is a key component of haemoglobin, the protein in the red blood cells transporting oxygen from the lungs to the tissues. Low levels of haemoglobin may lead to reduced exercise performance and fatigue. As a female, you have higher iron requirements due to menstrual blood losses matched against a smaller intake of food. Therefore, the prevalence of iron deficiency in women is generally high, but it seems to be alarmingly high in female athletes. Of the football players in the Swedish national squad prior to one FIFA Women's World Cup™, 59% were found to have iron deficiency prior to the competition. Almost one in every three players experienced anaemia, a deficiency of red blood cells, due to iron deficiency.

Iron-rich eating will help you to reduce the risk of iron deficiency:

- Consume moderate servings of red meats in 3-5 meals per week.
- Choose iron-fortified cereal products such as breakfast cereals.
- Combine plant and non-meat sources of iron (e.g. legumes, cereals, eggs, green leafy vegetables) with food that enhances iron absorption (e.g. vitamin C). Examples of clever matching: fruit juice or fruit with breakfast cereal, chilli con carne (meat and beans).
- Reduce your intake of inhibitors of iron uptake, such as fibre and tannic acid (e.g. in tea)

Routine use of iron supplements is not advisable and may do more harm than good. Your doctor may treat you with iron tablets if your blood results show that you are suffering from anaemia due to iron deficiency. Such treatment needs to be supervised medically and will take months to be effective.

Calcium

Most of your body's calcium is stored in your bones, where it accounts for bone density and mass. To protect the health of your bones – something you should take very seriously – you need to take in sufficient calcium in combination with Vitamin D. Please refer to the article "Protecting your bones" on how you ensure sufficient calcium intake.

Be aware of supplements

Despite the widespread use of dietary supplements in football, they have little effect on performance. While many producers claim that their supplements reduce body fat or build stronger muscles or speed up recovery, the truth is that many products are either on the banned list or may be harmful to your health – or both.

In general, the risk of a positive doping test when using supplements is considerable. Often, the critical ingredients that could trigger a positive doping test are not declared on the product label. But this is not an excuse. According to the World Anti-Doping Code, you are responsible for everything you eat and drink. Therefore, check all supplements with your doctor. Do not take them if there is any doubt at all. It is also important to realise that the use of supplements does not compensate for poor food choices.

"In the ideal world you should not need to take supplements, and should be able to get all the nutrients from a diet with good quantity and quality..."

Dawn Scott, exercise scientist, The Football Association, England

Ideas for diversified and nutrient-rich eating

- Be open to trying new foods and new recipes
- Make the most of foods in season
- Explore all the varieties of different foods
- Mix and match foods at meals
- Think carefully before banishing a food or group of foods from your eating plan
- Include fruit and vegetables at every meal. The strong colours of many fruits and vegetables are a sign of a high content of vitamins and antioxidants. It is good to ensure that you "eat a rainbow" each day by choosing fruit and vegetables from each of the following schemes:
  - White (e.g. cauliflowers, bananas, onions, potatoes)
  - Green (e.g. broccoli, spinach, lettuce, green apples, grapes)
  - Blue/purple (e.g blueberries, plums, purple grapes, raisins)
  - Orange/yellow (e.g. carrots, apricots, peaches, oranges, cantaloupe, mangoes)
  - Red (e.g. tomatoes, watermelon, cherries, berries, red apples, red peppers)


adidas

Protecting your bones

Protecting your bones

In osteoporosis, bones become fragile and are likely to break. Commonly considered an elderly women's disease, it is now affecting more and more young, modern sportswomen. Osteoporosis may handicap your career now and your life later. Protect your bones and keep them strong and healthy.

Osteoporosis, which literally means "porous bone", is a disease in which the density and quality of the bone are reduced. If left untreated, over the years, osteoporosis will progress until a bone breaks, also known as a fracture. Typically, the loss of bone occurs silently and painlessly without any symptoms until the first fracture occurs. Since osteoporotic bones are weak and brittle, this may be caused by even mild stresses like bending over, lifting your sports bag or coughing. In young sportswomen, repeated stress fractures may be a hint of weakened bones too.

How does your doctor diagnose osteoporosis?

The definite method for determining your bone status is called Dual Energy X-ray Absorptiometry or DXA. It will measure the density of your thigh bone or your spine which is referred to as the T-value. Your T-value will be compared to the average bone density of women your age. A normal bone density is defined as one that is higher than -1 compared to this average. The American College of Sport Medicine (ACSM) uses the term "low bone mineral density" for female athletes with scores between -1.0 and -2.0. For scores less than or equal to -2.0, the ACSM recommends that the term "osteoporosis" should be used to reflect the increased risk of fracture.

Bone density depends on the mineral content of your bones. Bone mineral content is influenced by age, sex and race. In addition, heredity plays an important role. The most important mineral in this regard is calcium. Most of your body's calcium is stored in your bones where it accounts for bone density and mass. The amount of calcium deposited in the bones reaches a peak in young adulthood. If you reach adult life with a low peak bone mass, or experience greater losses later on, you are at risk of osteoporosis.

While you cannot change your genes, age or sex, you can influence many other factors determining the mineral content of your bones. These include aspects of your lifestyle like smoking and alcohol consumption, physical activity and nutrition. Your hormones are another important factor

Hormones and bone

The female sex hormones influence calcium levels in women and play an important role in the formation and remodelling of bone throughout a woman's life. It is well known that women with a late onset and an early cessation of their menstrual cycles are at higher risk of osteoporosis. But in fact, any factor that interferes with your normal menstrual function can have a direct or indirect influence on bone density and put you at risk for fractures.

In active sportswomen, it is not uncommon that their menstruation is irregular or even completely absent. This so-called exercise-induced menstrual dysfunction is due to decreases in oestrogen, the hormone that helps to regulate the menstrual cycle, and can significantly affect your health and performance. It has been reported that menstrual dysfunction occurs in anywhere between 6% and 79% of sportswomen. The actual prevalence depends on how investigators exactly define menstrual dysfunction but also on the sport and the competitive level. As an example, it has been shown that the phenomenon is less common in football and handball than it is in women participating in endurance or aesthetic sports like gymnastics or dance.

The complete absence of menstrual bleeding, called amenorrhea, represents the most extreme form of menstrual dysfunction. It is characterised by low female sex hormone levels and may severely affect your bone health and fertility. While the absence of regular bleeding might appear to you as a pleasant convenience at times, it is in fact a serious condition and a sign that your bones could be suffering irreversible damage.

A number of factors have been identified that may disturb your hormonal balance and lead to menstrual dysfunction, such as insufficient energy intake, abnormal eating practices, the intensity of your match and training, your body weight and composition as well as all kinds of physical and emotional stress. There is also a great deal of variation in the individual reaction of the reproductive system to exercise and diet-related stresses.

Stress fractures

While the loss of bone usually happens unnoticed for a long time, a stress fracture may be a warning sign. Basically, the lower your bone mass, the greater your risk of developing a stress fracture. A stress fracture occurs when the bone is unable to withstand repetitive bouts of mechanical loading – which actually happens permanently in your lower limbs when playing football. You will experience localised pain and tenderness in the affected area.

Female football players, like women in general, suffer more often from stress fractures than their male counterparts. Beyond that, stress fractures occur more often in players with menstrual disturbances. In the complete absence of menstruation, the risk of stress fractures is increased between two and four times. Stress fractures are more likely to occur when you restrict your calorie intake, avoid high-fat dairy foods, consume low-calorie products, suffer from eating disorders and have low body weight.

"We are aware of the problem of osteoporosis and encourage players to maintain a calcium-rich diet and report any changes to their menstrual cycle. As part of the education process, players are advised to avoid alcohol, excessive salt, caffeine and smoking to reduce their risk of developing osteoporosis and other conditions."

Helen Tunstall, Injury Prevention Manager, New Zealand Soccer Inc.

How to protect your bones

As mentioned, the loss of bone is a silent process, and you will usually be unaware that a problem exists until a related injury, such as a stress fracture, occurs. Nevertheless, osteoporosis is not inevitable and you can do a great deal to protect your bones:

1. Watch your menstrual cycle

As explained above, any disruption of your regular periods carries the risk of irreversible damage to your bones. You should take this as a very serious sign and act immediately. In amenorrhea, it is vital to intervene within the first year of its onset since bone loss is most rapid in the beginning. Therefore, it is of paramount importance that you inform your doctor as soon as possible if you suffer from irregular or complete absence of bleeding.

It has been shown that the prescription of contraceptive pills containing hormones will not only normalise cycles, but may also increase bone density in sportswomen with menstrual disturbances.

2. Exercise

Weight-bearing exercise is protective against bone damage, and it may slow or even reverse bone loss since imposed stress stimulates the formation of new bone. The good news is that football training seems to increase bone mass in the lower limbs and thus may decrease your risk for developing osteoporosis in later life. In a study among Norwegian female athletes, football and handball players had higher values of bone density than endurance athletes and inactive women. It is assumed that the mechanical loading related to football is the main reason for this finding.

3. Meet your energy needs

You should avoid prolonged periods of low-energy availability since they may cause serious damage to your bones. What does this mean? If you consume less than 30kcal per kilogram of your fat-free body mass, this is called low-energy availability. You can calculate your fat-free body mass (FFM) if you take your body weight and deduct about 20% as a normal body fat content in women. If you want to ensure a sufficient energy intake, you need to take the energy you spent on training and match play into account.

Example of low energy availability
60kg female with 20% body fat = 48kg fat-free body mass (FFM)
Daily energy intake is 1,800kcal (7,560kJ)
Cost of daily exercise (1h/d) = 500kcal (2,100kJ)
Energy availability = 1,800-500 = 1,300kcal (5,460kJ)
Energy availability = 1,300/48 or 27kcal/kg FFM (113kJ per kg FFM)

4. Ensure sufficient intake of calcium

To protect the health of your bones, you need to take in sufficient calcium but also Vitamin D. This vitamin can also be synthesised in the skin upon exposure to sunlight. Nevertheless, a lean player may be at risk from insufficient calcium intake, and this even more so if she suffers from amenorrhoea.

Dairy produce is the best source of dietary calcium. If you are worried because of the fat content, go for the low-fat option which provides a good way to meet calcium needs. You should aim to eat at least three servings of dairy foods – e.g. 200ml of low-fat milk, 30g cheese or a 200ml carton of low fat yoghurt – every day. Calcium-fortified soy versions are also suitable – e.g. soy milk, soy yoghurt. When you are pregnant or breast feeding, add one to two daily servings more. Fish eaten with bones (e.g. tinned salmon, sardines) and leafy green vegetables (e.g. broccoli, spinach) provide another source of additional dietary calcium.

It is important for you to know that there is no evidence that calcium intake will prevent bone loss in women suffering from complete absence of periods. This means that no matter how much calcium you may include in your diet, it will not compensate for any hormonal deficits. You need to see your doctor immediately when your period is irregular.

"In my experience, we have seen a small number of stress fractures – all located at the foot and lower leg – in the last eight years and all associated with repetitive forces with no evidence of osteoporosis. In our medical care of players, injury prevention is essential and this will include careful monitoring of training load, menstruation and nutrition."

Pippa Bennett, MBChB MRCGP MScSEM MFSEM, team doctor, English women's national teams, The Football Association of England

Questions and answers on female football players

Questions and answers on female football players

Are there any typically female injuries in football?

Injuries that could be called typically female are hard to find, apart from a substantially higher rate of ACL injuries in contact team sports such as football, handball and basketball. Overall, in football, women do not seem more prone to injuries than men. The female reproductive organs are far better protected from injury than the male ones. Breast injuries, which could be a concern, are extremely rare even in contact sports. Nevertheless, with regard to the type of football injuries, some differences have been observed. In particular, women seem to incur more ankle sprains, knee ligament injuries and concussions than men. A special concern is tears of the anterior cruciate ligament of the knee, which have been found to occur up to ten times more often in women than in men playing football. The reasons for this higher frequency are not fully understood (see chapter on prevention of ACL tears).

Can women play during their menstruation?

There is no reason whatsoever why you should not participate in sports during menstruation. All kinds of sports are possible, and so is football. In fact, physical activity may even alleviate cramps and spasms causing menstrual pain as well as ease some pre-menstrual symptoms.

In one survey, it was reported that more than 80% of women turned in normal or better performances during menstruation. Nevertheless, the remaining women performed below standard. At the same time, women have frequently recorded personal best performances during menstruation. That means that the reaction of your body to menstruation can differ considerably from the reaction of your team-mates' bodies. Some players may have problems while others may not. Therefore, your personal well-being or discomfort is a decisive factor when deciding on the duration and intensity of your training.

What is the best birth control method for football players?

Notwithstanding her physical activity, each woman may have different requirements and expectations with regard to her method of contraception, and these personal concerns may principally preclude some methods. In addition, there are factors that need to be considered such as lifestyle (smoking) and existing medical conditions like diabetes (high blood sugar) or a history of thrombosis (formation of blood clots). Thus, there is no ideal method that applies to all players at all times. Selection of a method of birth control is very individual. The fact that you are playing football will be only one consideration in the decision process.

Apart from the highly reliable and reversible action of birth control pills as compared to other methods, there are some aspects of their use which could be seen as an advantage for players:

- reduction of premenstrual discomfort and pain
- reduction of blood loss
- improvement of menstrual disturbances
- ability to manipulate the timing of menstrual bleeding.

In addition, contraceptive pills may reduce breast tenderness and may improve symptoms of acne.

Since their introduction during the 1960s, the hormone content of birth control pills has continually been reduced. As a consequence, the unwanted side effects could be reduced, too. Each pill has certain characteristics because of its specific content of female sex hormones (oestrogen and progestin) or a possible male hormone effect. Every woman responds differently to the different components and sometimes the general principles just do not apply. While side effects of the pill have been considerably reduced, some are still felt in some women. During the first three months of any new oral hormonal contraceptive pill, a variety of side effects can occur (e.g. breast tenderness, headache, vomiting, nausea, bleeding disorders). Their intensity will decrease with time. Be sure to give any oral contraceptive a trial of at least 2-3 months.

In all women considering oral contraceptives, the family history for cardiovascular disease must be carefully taken (e.g. cerebral stroke in parents below age 45, myocardial infarction of the mother, diseases due to formation of blood clots).

There are also implants that are inserted in the upper arm and continuously release hormones into the circulation for three years. Nevertheless, in football, you might need to consider that a blow or kick against the upper arm may lead to a haematoma in the area where the implant has been inserted.

There are also intrauterine contraceptives which are oestrogen-free and provide long-term birth control. They are especially suitable for women who have already had their babies. Another method is a flexible ring that is inserted into the vagina once a month and slowly releases low doses of hormones to prevent pregnancy.

All methods, including natural ones, will have their pros and cons in your personal situation. Individual counselling by your doctor is crucial to find out what is the best method for you – as a woman and a football player – at this time of your life. Please be aware that whatever contraception method you may choose, the use of condoms should be a matter of course, particularly when you have a new or one-time partner or one you do not know very well. This will protect you not only from HIV but also from hepatitis and other sexually transmitted diseases.

Does taking birth control pills increase body weight?

It is a widely held myth that birth control pills (oral contraceptives) cause weight gain, but the answer according to scientific evidence is that they do not. A recent review of a number of so-called "randomised controlled" trials (the "gold standard" of medical research) found no scientific proof that oral contraceptive pills cause an increase in body weight.

We know from older birth control pill studies that weight gain was a problem both from fluid retention and from fat deposition. But compared to modern pills, these early-generation pill preparations had a much higher hormone content. Oestrogen in high doses is known to cause weight gain, especially due to fluid retention. The more oestrogen there is in a pill, the greater the tendency to gain weight. If you use the lowest possible oestrogen-containing pill, this should minimise weight gain and swelling from water retention. You also need to be aware that if 5-10% of women report weight gain when starting the pill, there is an identical 5-10% of women who gain weight even though they do not take the pill. In other words, the weight gain with pills is coincidental and not a cause and effect.

Is manipulating the cycle according to match schedules detrimental?

As a player who travels and plays regularly, you may sometimes wish to delay your menstruation for better comfort and convenience during these activities. This can be achieved with a monophasic pill, meaning that the hormone dose is constant throughout the cycle. After the first three weeks of active pills, you need to skip the week of placebo pills and continue with the active pills. This will lead to menstruation after six weeks. With a triphasic pill, where hormone doses vary three times in order to mimic the "natural" cycle, skipping a period in this manner is not recommended. There are also three-month pills where you continually take active pills for 84 days, followed by a week of inactive pills. Your menstruation will occur in week 13, meaning that you only menstruate four times a year.

If you are not taking a pill for contraception, there is a progestogen hormone in tablet form, which is taken three times a day for three days before your period is due and then for the duration of time you wish to delay the period. When the tablets are stopped, your period starts as normal.

Delay of menstruation and long-acting contraceptive pills are frequently used and also advocated by doctors. Nevertheless, the long-term consequences of such permanent practice remain unknown to date. While the acute side effects of continual pill use seem to be similar to normal pill use, many open questions exist, e.g. regarding the influence of continuous hormone intake on maturation in girls.

What does the term "female athlete triad" mean?

The term refers to the combination of disordered eating, amenorrhea (the absence of menstrual periods) and osteoporosis (loss of bone and improper bone formation) as a well-known phenomenon in sportswomen. You may suffer from one, two, or all three parts of the triad. While the triad is more frequently observed in sports like gymnastics or ballet, where a thin appearance is mandatory, there is an increased focus on leanness in football, too. Being a highly competitive football player and training very hard is a risk factor. You may care so much about football that you would do almost anything to improve your performance.

But, contrary to popular belief, losing weight does not necessarily improve your performance. On the contrary, prolonged energy deficits cannot be sustained without harm to your health and performance. Low energy intake may delay your recovery from exercise, impair your body's adaptation to training, compromise your immune system and your reproductive function. In the long term, your bones may suffer irreversible damage.

Is it dangerous if your menstrual periods stop?

A total absence of menstrual periods is called amenorrhea. Amenorrhea is due to suppressed levels of the female sex hormone oestrogen and can be a consequence of intense exercise and low energy intake. While some players may consider menstruation as an unnecessary annoyance and welcome this situation as rather convenient, it is dangerous to shrug off several months of missed periods. In the short term, you may have muscle weakness, stress fractures and reduced performance. Over the long term, you may suffer from bone loss and irreversible damage to your reproductive system. Therefore, obtaining help from your doctor right away is vital.

Does football have an impact on the ability to have children?

In general, exercise and fertility are very closely linked. In fact, exercising either too little or too much can hinder your fertility. This is because exercise affects the amount of body fat, which is involved in the production of oestrogen, the female sex hormone regulating your cycle. Moderate exercise is known to increase your chances of becoming pregnant. In addition, women who exercise usually have an easier pregnancy and birth.

"I worked with the ball up until seven months. I was never afraid about getting injured or getting hit with the ball. I was mostly worried about my heart rate getting too high, so I was just conscious of that. I had a very good pregnancy, no problems at all, but I had a very long labour and a tough birth. After that, things went great. I breastfed for six-and-a-half months after Rylie was born."

Christie Rampone, 32, defender, made her return to the US women's national team just 112 days after the birth

If you exercise so much that your periods are irregular or missing completely, you probably will not be able to become pregnant because your body will have temporarily shut down its ovulation schedule. As stated above, if your periods are missing, you should immediately consult your doctor.

Can women play and train when they are pregnant?

It is generally agreed that the benefits of exercising during pregnancy clearly outweigh the potential risks. Women who exercise control their weight more easily and have fewer complications during pregnancy and birth. Studies have shown that healthy women undergoing normal pregnancies can participate safely in moderate fitness programmes and maintain physical fitness without harm to their baby. Exercise during pregnancy may contribute to the prevention of pregnancy-induced diabetes, hypertension, varicose veins and depressive mood. While general exercise programmes during pregnancy have been studied more extensively, very little is known about football in particular. There are no reports of injury or death of the unborn baby in relation to trauma or contact during sporting activities. Nevertheless, the general recommendation of obstetricians is not to participate in sport activities which put you at risk of stumbling, falling or blows and kicks to your abdomen. All these may lead to severe damage of the placenta and consequently compromise the blood flow to the unborn baby with fatal consequences as well as constitute considerable and even life-threatening health risks to the mother. Also, bouncing up and down when running and jumping is discouraged in later pregnancy.

Nevertheless, as a top-class player, you might want to continue vigorous training during your pregnancy. To date, there are no guidelines on exercise for high-level athletes. It seems that healthy women and babies can tolerate short bouts of very strenuous exercise and prolonged bouts of

endurance exercise and probably also continual high-volume training. Nevertheless, the data on training and performing at a maximum level is scarce and contradictive. The safe upper limit of exercise in pregnancy is unknown. Therefore, the general recommendation from experts is to not participate in such activities to avoid the risk of a spontaneous abortion.

General recommendations for training during pregnancy

During pregnancy, the resting heart rate increases and the maximum heart rate decreases. This means that your heart rate becomes a less precise method of monitoring exercise intensity. It will overestimate intensity at lower work rates and underestimate it at higher work rates. Therefore, modified heart rate target zones have been developed for pregnant women.

Modified heart rate target zone for exercise in pregnancy

Player's age	Heart rate target zone (beats per minute)
< 20	140-155
20-29	135-150
30-39	130-145
> 40	125-140

Avoid strenuous exercise in hot and humid conditions. Always ensure that you drink enough before, during and after training. After exercise, you should make a gradual cool-down in your routine in order to avoid sudden changes in the blood flow to your placenta. Some kinds of exercise are not safe for pregnant women: e.g. squatting and abdominal exercises in particular should be avoided during the second and third trimester.

It is important that you decide for yourself, and in consultation with your doctor, if and how intensively you train and play during your pregnancy. This decision will depend on the stage and course of your pregnancy and the condition of your baby. As an elite player, you should be supervised by an obstetrician who knows about the impact of maximum exercise on pregnant mothers and their babies.

Can women play when they are breastfeeding?

Moderate exercise during lactation does not affect the quantity or the composition of breast milk or impact infant growth. After training at maximum intensity, lactic acid has been shown to be increased in breast milk. It is not clear if this transient increase makes the milk less palatable to the baby. If your baby does not feed as well right after training or match play, you may postpone breastfeeding for an hour or express milk prior to your exercise.

"Two weeks after the delivery, I started to train again, and I played again after five weeks. But breastfeeding proved to be difficult, on the one hand because of lactate formation and on the other hand because organisation in between training and matches was really hard. Finally, I weaned after eight weeks."

Martina Voss, former Germany international

"I played until the end of the fourth month, under surveillance of my obstetrician. I was never afraid, but my opponents were when they got to know I was pregnant. It was difficult for my coach and entourage, too – they did not know if they should let me play. When I played in the national team, it was my own responsibility and I waived all insurance claims in case anything happened."

Martina Voss, former Germany international

Are there any differences between men and women and the amount of physical training they can handle?

The answer depends on your age and competitive level. Pre-pubescent players will train and play at a similar level, so there is little difference in how young boys and girls train. After puberty, the growth and development of men allows them to train harder and longer than women in almost any type of activity.

In general, women cannot work at the same absolute intensity as men. Women can train at the same relative intensity (e.g. 70-75% of maximum capacity) that will be a slower pace than men, but the absolute intensity (as in metres/second or minutes/mile) is less than men. If you tried to run as fast as a man, you would not be able to maintain the speed as long. Biological differences in women reduce their endurance capacity, strength, speed, power and more.

Scientific adviser:
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