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Health and Fitness for the Female Football Player

A guide for players and coaches

FIFA

100 YEARS FIFA 1904 - 2004

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Foreword from the FIFA President

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Dear members of the football family,

Although women's football has been part and parcel of the sports arena for over thirty years, it has come on in leaps and bounds since FIFA staged the first Women's World Championship in the People's Republic of China in November 1991. Today, according to the latest Big Count survey, you are one of some 26 million girls and women who play football in over 180 countries.

The high standards of play, the creation of new youth competitions at world level, the establishment of professional leagues in various countries, the broadening of grassroots football and the growing public interest are testimony to the dynamic upswing in your branch of our sport.

That said, FIFA cannot rest on its laurels. Living up to our motto "For the Game. For the World.", FIFA also has to look – for both genders and at every level – at all of the aspects around the game itself in order to ensure that the women's game can continue its impressive growth on a comprehensive and solid foundation.

In that respect, football medical matters take a prominent position. It goes without saying that in terms of medical research and instruction, women's football deserves the same attention as the men's game. In addition, you also have to be able to rely on information and strategies for training and injury prevention that is geared towards your specific needs.

This booklet – published on the occasion of the FIFA Women's World Cup 2007 in China – will, I hope, fulfil these exact requirements and help you to play your favourite sport under safe and enjoyable conditions.

Joseph S. Blatter
FIFA President

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. Most of the research in football medicine is about men, mostly professionals. Research on women has a long way to go to catch up with the volume of work done on men. Our goal here is to summarise what we know about women's football injuries.

You may not be aware of it, but most of football's current growth around the world is because more and more women are playing. FIFA's records show that in the last 10 years, women's participation in football has increased by 210% in the USA, by 250% in Switzerland and by 160% in Germany. Many other countries have shown similar explosive growth in women's football.

FIFA has not ignored this boom in football. The first women's world championship was held in China in 1991 and is currently staged every four years, just like the men's. The largest sporting audience ever for a women's event was the 90,000 spectators who watched the 1999 Women's World Cup final between the USA and China; a game that was broadcast live worldwide. Women's football is an Olympic event for full national teams. FIFA has been organising women's U-20 world championships every two years since 2002 and will start an equivalent competition for U-17 women in 2008.

This development has opened up an opportunity for women to play 'the beautiful game' and be active participants in the global community of football. The social and health benefits of sports participation is enjoyed by an ever increasing number of women across all cultures and ages. Despite the increase in participation, research into the various details about the game has continued to be directed at men with little work being done on women. This means that most of the advances in the women's game is based on research that was directed at men.

In the same way, most of the injury work is about men, mostly professionals, playing at major tournaments. The best research on injuries to women focuses on professional or other high-level players. With a few exceptions, the overall injury rate for women is lower than the rate for men. We will direct our attention to FIFA's research because the constant data collection methods make comparisons between tournaments and with the men a little easier.

Injuries to women at FIFA tournaments

FIFA has injury data on 174 women's matches from seven international tournaments: the FIFA Women's World Cup (1999, 2003), Olympics (2000, 2004) and youth championships (U-19 2002, 2004; U-20 2006). A total of 387 injuries were reported. This worked out to 2.2 injuries per match (for men, this is about 2.7). The two Women's World Cups had the lowest injury rate (1.5 injuries per match) and the youth championships had the highest (2.7 injuries per match). Why are the younger players hurt more often than older players? Good question. This trend is also seen in the men. Perhaps the younger players are simply less experienced at such a high level of play or maybe they are playing harder in an attempt to gain attention so they may be picked for more senior matches.

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 women's major international tournaments show that only half of the injuries resulted in time loss and 78% 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, as expected, to the leg. The next most common location was to the head (just under 20% of all injuries), followed by the trunk and arm. The location of injuries is fairly similar for both men and women. The majority of injuries affected the leg, especially the ankle, knee and thigh. Most injuries were diagnosed as contusions, sprains or ligament ruptures and strains or muscle fibre ruptures. An ankle sprain is the single most often diagnosed injury. Almost all studies on injuries amongst female football players stress the high rate of knee and especially of anterior cruciate ligament

Figure 1: Location of injuries in female football players (FIFA tournaments)

(ACL) injuries. In this booklet, we have devoted whole chapters to injuries of the ankle, knee and head, so refer to them for more details on those specific locations.

Risky activities during play

If you were asked what is the most dangerous part of the game, what would you say? You would probably say tackling is quite dangerous. An overwhelming number of injuries come from just that – tackling, only 16% of all injuries arising from non-contact activities only. Nearly 30% of injuries to women due to tackling were a foul, while almost half of all match injuries to men are due to foul play. Thus, it seems that the mechanisms of injury differ substantially between male and female players.

What most players might find interesting is that tackling injuries happen to both the tackling player (45%) as well as the player in control of the ball (55%). This finding is in contrast to men's football where 26% to 34% of the injured players were tackling. Furthermore, female players have a much higher injury risk of sliding-in tackles and a lower risk for tackles from behind than males.

During a match, when do you think you are most at risk of an injury? At the start of a game or the second half when you are keen to begin playing again? Or later in each half as you start feeling tired? You would be correct if you said later in each half. The lowest injury rates are in the first 15 minutes of each half. Afterwards, injuries become more frequent. There does not seem to be a time factor associated with specific injuries, just all injuries.

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. When a research project looks at training and matches, the injury rate in matches is 6–8 times higher in matches than in training. In general, legs are most often injured in training and matches. But some types of injury differ between the setting, e.g. far more head and neck injuries happen in matches.

"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

If you continue to play long enough and travel considerably, you will probably play some games on artificial turf. There is much discussion about whether there is a difference in injury rates on grass or artificial turf. Here, research can give an objective answer: the general injury rate on turf or grass is similar for both training and matches.

What can we conclude about injuries to women?

1. The overall injury rate for women is lower than for men.
2. The general pattern of injury is about the same for men and women, but women do sustain more head and knee ligament injuries than men.
3. The injury rate in games is significantly higher than the injury rate for training.
4. So far, research does not show any real differences in injuries when women play football on artificial turf or on grass.

Author:
Don Kirkendall, PhD

based on the following articles:

– Junge A, Dvorak J (2007) Injuries in Female Football Players in Top-level International Tournaments. Br J Sports Med, Suppl.
– Fuller CW, Dick RW, Corlette J, Schmalz R (2007) 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, Suppl.
– Tscholl P, O'Riordan D, Fuller CW, Dvorak J, Gutzwiller F, Junge A (2007) Causation of Injuries in Female Football Players during Top-level Tournaments. Br J Sports Med, Suppl.

Injury prevention

Injury prevention

When you decide to play football, one of the last things you think of is the possible injuries that might keep you off the pitch or even stop you playing altogether.

Many sports injuries are accidents that simply happen, others follow a predictable pattern. When the circumstances of an injury are predictable, there might be a way of avoiding them. If an injury can be prevented, you will be a healthier player who can stay on the pitch and, in doing so, become a better player. In other words, preventing injury improves your chances of developing as a player.

There are many ideas with regard to preventing injury. Many make good sense, but the medical profession prefers to test the effects of any prevention programme in order to prove that it actually works.

Prevention programmes can be designed to have some impact on a multitude of injuries, or they can be specific to a certain injury. The process of proving if a programme works is much the same in all cases. Firstly, experts must establish how frequently the injury in question occurs. Next, they determine what causes the injury. Thirdly, they develop prevention programmes and put them into practice. Finally, they determine the injury rate after introducing the programme. If the programme works, the new injury rate will be lower than the initial injury rate.

Another concept that helps when studying the mechanics of an injury is to determine factors that increase the risk of suffering it. To determine risk factors, a large number of players are screened, then the players who sustained an injury have their screening data reviewed and features that are common to the injured players are thought to be risk factors.

A key element in all prevention programmes is compliance, which means, simply doing it on a regular basis. A great programme that is followed only once per week is not going to have much of an effect, but would be far more effective if followed three or more times per week. The important thing is not what you do but that you do it regularly!

Author:
Don Kirkendall, PhD

based on the following article:

– van Mechelen W, Hlobil H, Kemper HC (1992) Incidence, severity, aetiology and prevention of sports injuries. A review of concepts. Sports Med 14 (2): 82-99

“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

Ankle injuries and how to avoid them

Ankle injuries and how to avoid them

Ankle sprains are the most common injuries in football that lead to time loss, meaning that you will be unable to train or play for some time. Many injuries are accidents and just happen, but ankle sprains usually follow a pattern under typical circumstances. You might not be able to prevent your first ankle sprain, but you can do a great deal to avoid further ones.

When the circumstances of an injury are predictable, coaches, players and medical professionals wonder if there might be a way to prevent that injury. If you can avoid injury, you will be a healthier player who stays on the field and improves her skills. Preventing ankle sprains has been a target of a number of research projects discussed below.

Ankle sprains are the most common joint injuries in sport. In football, around 15% of all injuries are ankle sprains. The overall injury rate for US university women football players is around 20 injuries per 1,000 match hours. Of these, ankle injuries account for about three to a little over four injuries per 1,000 match hours. The injury rate rises with higher levels of play. In FIFA tournaments, the rate of ankle sprains is ten per 1,000 match hours.

How do ankle sprains happen?

The primary ankle sprain is what is called an inversion sprain. This happens 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 on 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 and leading to bad foot placement on the ground.

Apart from this, several factors have been identified as risk factors in ankle sprains: 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.

What can I do to prevent ankle sprains?

All of the risk factors described above are factors that you, as a player, can control, except prior ankle sprain. Either you have had a prior sprain or you have not. The rest you decide to put into your training programme. So the results of prevention programmes differ according to your personal injury history.

Apart from that, the basic finding of most studies of any prevention programme is that compliance with the activities reduces the risk of most injuries, including ankle sprains.

An often-used primary preventive tool is some form of ankle support as either a semi-rigid or an air-supported brace. It appears that taping is not so effective at preventing ankle sprains, no matter what your injury history may be. In addition, taping is expensive and takes time.

"I used to tape my ankles during matches and training. I had several operations, too, and often needed to take painkillers to be able to play. Today I practise balance board exercises and sometimes use cool packs after playing. But first and foremost, I have got used to the pain and learned to live with it..."

Prisca Steinegger, 30, captain, Swiss women's national team, who suffers from recurring ankle sprains

"When I hurt my ankle, it was a bad sprain. I did a lot of balance work on a disk, ice baths, mobility work, strengthening with bands and deep-tissue massages like you wouldn't believe. I lifted weights and did toe crunches and calf stretching. It was actually quite a long process to get my ankle back to where I felt it was before the injury."

Abby Wambach, 27, forward, US women's national team

However, using one of the semi-rigid or air-supported braces is quite effective at preventing ankle sprains in players with a history of ankle sprains, especially if the prior sprain occurred in the same season. An important finding of all the preventive research is that a previously sprained ankle should be protected for 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.

Proprioceptive and coordination training, using ankle discs, has also proved to be effective in reducing the recurrence of ankle sprains. Balance training and proprioceptive training can be done on the ground or using a wobble board or ankle discs. These are boards with an unstable platform that you stand on and try to maintain your balance (see figures 1–8 pp 22–23).

The exercises aim to improve your control of the movement of your limbs and body as a whole and increase your ability to maintain your balance. The benefits of balance and proprioceptive training are greatest for those players with a prior ankle sprain. Strength and range of motion of the ankle can be improved by specific methods of resistance and flexibility training, but the evidence of their effectiveness is not as convincing as with bracing and balance training.

What can be gained by prevention

In medical research, when the question of the effectiveness of a treatment is raised, the first sentence usually begins with "It depends on certain factors". With ankle sprains, the effectiveness of a prevention programme depends on the individual player's injury history. In general, there is little that can be done to prevent the first ankle sprain. However, there is good, solid evidence that using a semi-rigid orthosis or an air-supported brace is effective at preventing the next sprain.

In addition, some supplementary training, focusing on balance and proprioception, works if you have had a prior sprain. You may think a sprained ankle is just a nuisance, but a prior injury is the best predictor of another injury either to the same location or another location. Prevention research indicates that an incompletely rehabilitated injury is predictive of another injury that can be more severe than the first one. So, if you have had a prior sprain, you should pay attention to your physician, who may say you should wear a brace for up to six months. It will protect the injury, reduce the risk of repeated injury and possibly protect you from another, more serious injury.

Balance board exercises used in preventing ankle sprains

Important points

1. Do not begin balance board routines until your doctor has given you permission.

2. Before starting any of the balance board routines, warm up for about ten minutes with light jogging, stretching, and range-of-motion activities for the trunk, lower back, hips, quadriceps, hamstrings, calves, Achilles tendons, shins and feet. When doing the balance board exercises, try to maintain an upright posture and use smooth, controlled movements. For the first few weeks, work on developing coordination and technique and try not to do many repetitions. As your skill improves, increase your movement speed, while keeping good balance and posture.

3. Perform the exercises when you are rested and not tired.

4. The "ready position" for most athletic activities includes a little knee and hip flexion. So perform the balance board exercises with your knee(s) slightly flexed.

5. When beginning a balance programme, stabilise yourself by placing the toes of the opposite (non-weight bearing) foot on the ground behind you during single-leg exercises. Using your hands for stability defeats the purpose of the balance board activities.

6. Increase the difficulty of any balance board exercise by holding dumbbells in your hands or by closing your eyes.

Beginners exercises

These first two exercises develop balance and coordination of the entire body. They also enhance the so-called "grip strength" of the feet and toes on the board, which will allow for progression into more difficult balance board exercises.

1. The two-leg stand and balance with instability from side to side: simply hold your position for 30 seconds without letting the edges of the board touch the ground.

2. The two-leg stand and balance with instability from front to back: complete the exercise by simply holding a balance position for 30 seconds, without letting the edges of the board touch the ground.

3. Side-to-side edge taps: slowly and deliberately allow the outside edges of the platform to touch or "tap" the ground (left edge, then right edge, left, right, etc.) for about one minute. This range-of-motion and strength exercise should be done under full control, without rapid swings of the board from side to side.

4. Front-to-back edge taps: slowly and deliberately allow the front and back edges of the platform to touch or "tap" the ground (front edge, then back edge, front, back, etc.) for approximately one minute. Once again, perform this exercise with smooth, rhythmic movements, without sudden jerks of the platform.

Intermediate exercises

Try the beginners exercises on one foot. These one-footed exercises may be too difficult to perform without losing your balance, so simply place the toe of your opposite (non-weight bearing) foot on the ground slightly behind the balance board. Once you are comfortable doing this with a little support, try them without touching the ground with the opposite toe.

Advanced exercises

The following advanced balance board exercises develop coordination, balance, strength and mobility in the muscles of the feet, ankles, legs, hips, and trunk. The advanced exercises require a high degree of body awareness and the skills needed to do them properly require repeated exposure so it is best to do them at least four to five times a week.

1. Side-to-side edge taps: place one foot directly in the middle of the platform using a board that is unstable in all directions. Slowly and deliberately allow the lateral edges of the platform to touch or "tap" the ground (left edge, right edge, left, right, etc.) for about one minute. Maintain full control at all times, avoiding rapid, uncontrolled motions of the balance board. If the exercise is too difficult at first, place the toes of your other foot on the ground behind the wobble board for better balance. Repeat the exercise on the opposite foot.

2. Front-to-back edge taps: these are the same, except that you are allowing the front edge of the balance board to touch the floor, then the back edge, etc. Do it for a minute then repeat with the other foot.

3. Edge circles: place your foot in the centre of the wobble board. Slowly and deliberately allow an edge of the platform to touch the floor then rotate the touching in a clockwise fashion, keeping the platform in contact with the floor at all times. The motion should be slow and controlled and for one minute without stopping. If too hard, place the toes of the opposite foot on the floor. Repeat with the other foot.

4. Anti-clockwise edge circles: this is the same as the previous exercise, but going in an anti-clockwise direction.

Author:
Don Kirkendall, PhD

based on the following articles:
– Fuller CW, Dick RW, Corlette J, Schmalz R (2007) 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, Suppl.
– Junge A, Dvorak J (2007) Injuries of Female Football Players during Top-level International Tournaments. Br J Sports Med, Suppl.
– Verhagen E, van der Beek A, Twisk J, Bouter L, Bahr R, van Mechelen W (2004) The effect of a proprioceptive balance board training program for the prevention of ankle sprains: a prospective controlled trial. Am J Sports Med 32(6):1385-93

Beginners exercises

Figures 1 and 2: The two-leg stand and balance

Figures 3 and 4: Edge taps

Intermediate exercises **Advanced exercises**

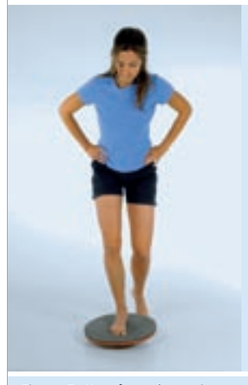

Figure 5: One-footed exercise

Figures 6, 7 and 8: Edge taps and circles

How to prevent anterior cruciate ligament tears

How to prevent anterior cruciate ligament tears

Most anterior cruciate ligament (ACL) injuries are non-contact injuries in sports that require sudden stops, landing, and rotation manoeuvres – like football. Female players suffer from these injuries up to ten times more often than men. But simply being a woman does not mean you are doomed to an ACL tear. You can considerably lower your risk.

Injuries to the knee joint are frequent, with an ACL tear being one of the most common knee injuries in football. The ACL is one of the major stabilising ligaments in the knee joint that prevents excessive movements of the lower leg against the thigh. Unlike most ligaments in the body, the ACL can be injured without external force being imposed. In fact, 70% of all ACL injuries are non-contact in nature, while the remaining 30% involve direct force such as an opposing player, a goalpost, or another object on the pitch.

Contact injuries cannot be anticipated and are difficult to avoid. If you have a good understanding of how non-contact ACL injuries happen, you might help to prevent them. Typical 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.

Factors that could influence ACL tears in women

- There are multiple differences in knee construction between men and women. At one time, it was assumed that these differences could explain the higher risk for female players. However, the current evidence of these differences is inconclusive.
- Knee bracing: the effectiveness of functional knee braces in preventing non-contact ACL injuries is not proven and therefore braces are not encouraged.
- Playing surface and shoes: normal landing and stepping mechanics can be upset by hitting uneven playing surfaces like a hole in the grass or another player's foot. A wet field poses different conditions from a dry field.
- Weather: cold weather seems to be associated with a lower risk of knee and ankle injury in outdoor stadiums, on both natural grass and artificial turf.
- Hormones: There is no solid evidence of a link between an ACL injury and a predictable time in the menstrual cycle.
- Muscular strength and balance are crucial to stabilising your knee. Basically, the muscle that extends the knee, called the quadriceps, works "against" the ACL while the ones that flex the knee, called the hamstrings, work "with" the ACL. At the same time, these two muscle groups should countervail each other when stabilising the knee. If the hamstrings are weak or their contraction is not exactly attuned to the quadriceps, the ACL may be at an increased risk of injury. The same applies to landing from a jump with an extended hip and knee.

If you tear your ACL, on average, you will miss approximately six to nine months of competitive play as a result of the injury, the subsequent reconstructive 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 of later injuries and damage, but it cannot totally avert them. Therefore, you should try to prevent ACL tears from occurring in the first place.

How to protect your ACL

There are several programmes focusing on the prevention of ACL tears in football. They have been proven to reduce severe ACL injuries by 60 to 89%. But you must undergo a programme of approximately six to eight weeks for there to be any effect. The Prevent Injury, Enhance Performance (PEP) programme presented below was developed by the Santa Monica Orthopaedic and Sports Medicine Research Foundation (http://www.aclprevent.com/pepprogram.htm).

This prevention programme consists of a warm-up, stretching, strengthening, plyometrics (training for power or explosiveness: jumping, bounding and hopping exercises) and football-specific activities to optimise the strength and coordination of the stabilising muscles around your knee joint. It is important to use the proper technique during all of the exercises. Pay full attention to correct posture, avoid excessive side-to-side movement when jumping and ensure soft, quiet landings.

This programme should be completed at least two to three times a week and should take approximately 15 minutes to complete. It can easily be included in your training programme by substituting it for your usual warm-up. Alongside each exercise you will notice a box with the approximate amount of time that should be spent on each activity. This will serve as a guideline in order for you to carry out your warm-up in a time-efficient manner.

The PEP Programme – prevent injury and enhance your performance

1. Warm-up

Warming up and cooling down are a crucial part of a training programme. The purpose of the warm-up section is to prepare your body for activity. By warming up your muscles first, you greatly reduce the risk of injury.

"I was running down the wing and wanted to cut the ball. When I turned, my foot got stuck and my knee popped... Sometimes the thought that it could happen again enters my head when I am in the same motion. But I have worked with a sports psychologist to overcome my fears about the injury."

Kelly Smith, 29, midfielder, out of action, English women's national team, suffered an ACL tear which kept her out of action for eight months

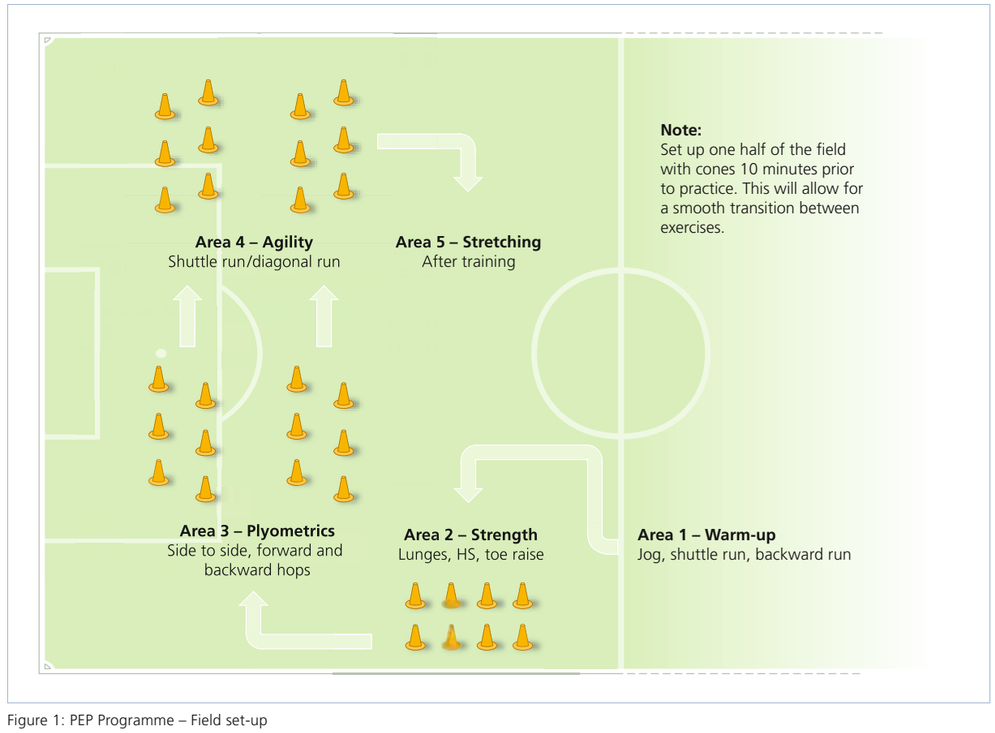

Figure 1: PEP Programme – Field set-up

1A. Jog line to line (cone to cone)

Elapsed time	0–30 seconds
Purpose	To ensure a good running technique. Keep your hip/knee/ankle in straight alignment without your knee caving in or your feet whipping out to the side.
Instructions	Complete a slow jog from the near to the far sideline.

1B. Shuttle run (side to side)

Elapsed time	30–60 seconds
Purpose	To engage your hip muscles at the inner and outer thigh. This exercise will increase speed. Carefully avoid inward caving of the knee joint.
Instructions	Start in an athletic stance with a slight bend at the knee. Leading with the right foot, sidestep, pushing off with the left foot (back leg). When you drive off with the back leg, be sure your hip/knee/ankle are in a straight line. Switch sides halfway across.

1C. Backward running

Elapsed time	1–1.5 minutes
Purpose	To continue your warm-up and engage your hip extensors/hamstrings. Make sure you land on your toes. Watch for locking of your knee joint. As you bring your foot back, make sure you maintain a slight bend to your knee.
Instructions	Run backwards from sideline to sideline. Land on your toes without snapping the knee back. Stay on your toes and keep the knees slightly bent at all times.

2. Stretching

It is important to warm-up prior to stretching – never stretch a cold muscle. By doing the exercises outlined here, you can improve and maintain your range of motion, reduce stiffness in your joints, reduce post-exercise soreness, reduce the risk of injury and improve your overall mobility and performance.

- Do a large muscle warm-up such as brisk walking for five to ten minutes before stretching.
- Do not bounce or jerk when you stretch. Gently stretch to a point of tension and hold.
- Hold the stretch for 30 seconds. Concentrate on lengthening the muscles when you are stretching.
- Breathe normally. Do not hold your breath.

2A. Calf stretch (30 seconds x 2 repetitions)

Elapsed time	1.5–2.5 minutes
Purpose	To stretch the calf muscle of your lower leg
Instructions	Stand leading with your right leg. Bend forward at the waist and place your hands on the ground (V formation). Keep your right knee slightly bent and your left leg straight. Make sure your left foot is flat on the ground. Do not bounce during the stretch. Hold for 30 seconds. Switch sides and repeat.

2B. Quadriceps stretch (30 seconds x 2 repetitions)

Elapsed time	2.5–3.5 minutes
Purpose	To stretch the quadriceps muscle of the front of your thigh
Instructions	Place your left hand on your partner's left shoulder. Reach back with your right hand and take hold of the front of your right ankle. Bring your heel to the buttock. Make sure your knee is pointing down towards the ground. Keep your right leg close to your left. Do not allow your knee to wing out to the side and do not bend at the waist. Hold for 30 seconds and switch sides.

2C. Hamstring stretch (30 seconds x 2 repetitions)

Elapsed time	3.5–4.5 minutes
Purpose	To stretch the hamstring muscles of the back of your thigh
Instructions	Sit on the ground with your right leg extended out in front of you. Bend your left knee and rest the bottom of your foot on your right inner thigh. With a straight back, try to bring your chest toward your right knee. Do not curve your back. If you can, reach down towards your toes and pull them up toward your head. Do not bounce. Hold for 30 seconds and repeat with the other leg.

2D. Inner thigh stretch (20 seconds x 3 repetitions)

Elapsed time	4.5–5.5 minutes
Purpose	To elongate the muscles of your inner thigh (adductors)
Instructions	Remain seated on the ground. Spread you legs evenly apart. Slowly lower yourself to the centre with a straight back. You need to feel a stretch in the inner thigh. Now reach towards the right with the right arm. Bring your left arm over your head and stretch over to the right. Hold the stretch and repeat on the opposite side.

2E. Hip flexor stretch (30 seconds x 2 repetitions)

Elapsed time	5.5–6.5 minutes
Purpose	To elongate the hip flexors in the front of your thigh
Instructions	Lunge forward, leading with your right leg. Drop your left knee down to the ground. Placing your hands on top of your right thigh, lean forward with your hips. The hips should be square with your shoulders. If possible, maintain your balance, lift your left ankle and pull your heel to your buttocks. Hold for 30 seconds and repeat on the other side.

3. Strength

This portion of the programme focuses on increasing leg strength. This will lead to improved leg strength and a more stable knee joint. Please note that here technique is everything! Make sure to perform the exercises accurately to avoid injury.

"The ACL tear is a devastating injury that often ends the player's career, or certainly steals a year of it. Every season we see at least one to three top players get injured and the team suffers without their presence in the national team."

April Heinrichs, former head coach, US women's national team

3A. Walking lunges (3 sets x 10 repetitions)

Elapsed time	6.5–7.5 minutes
Purpose	To strengthen the thigh (quadriceps) muscle
Instructions	Lunge forward leading with your right leg. Push off with your right leg and lunge forward with your left leg. Drop the back knee straight down. Make sure that your keep your front knee over your ankle. Control the motion and try to avoid your front knee from caving inward. If you cannot see your toes on your leading leg, you are doing the exercise incorrectly.

3B. Russian hamstring (3 sets x 10 repetitions)

Elapsed time	7.5–8.5 minutes
Purpose	To strengthen your hamstrings
Instructions	Kneel on the ground with hands at your side. Have a partner hold firmly at your ankles. With a straight back, lean forward leading with your hips. Your knee, hip and shoulder should be in a straight line as you lean towards the ground. Do not bend at the waist. You should feel the hamstrings in the back of your thigh working. Repeat the exercise in 3 sets of 10, or a total of 30 repetitions.

3C. Single toe raises (30 repetitions x 2)

Elapsed time	8.5–9.5 minutes
Purpose	To strengthen your calf muscle and improve balance
Instructions	Stand up with your arms at your side. Bend the left knee up and maintain your balance. Slowly rise up on your right toes with good balance. You may hold your arms out ahead of you in order to help. Slowly repeat 30 times and switch to the other side. As you become stronger, you may need to add repetitions to this exercise to build up the strengthening effect of the exercise.

4. Plyometrics

These exercises are explosive and help to build power, strength and speed. The most important element when considering performance technique is the landing. It must be soft! When you land from a jump, you need to drop your weight softly on the balls of your feet, slowly rolling back to the heel with a bent knee and a straight hip. Although these exercises are basic, it is critical to perform them correctly. Please take time to ensure that these exercises are carried out safely and correctly.

4A. Lateral hops over cone (20 repetitions)

Elapsed time	9.5–10 minutes
Purpose	To increase power/strength, emphasising neuromuscular control
Instructions	Stand with a 6" cone to your left. Hop to the left over the cone, landing softly on the balls of your feet and bending at the knee. Repeat this exercise, hopping to the right.

4B. Forward/backward hops over cone (20 repetitions)

Elapsed time	10–10.5 minutes
Purpose	To increase power/strength, emphasising neuromuscular control
Instructions	Hop over the cone/ball, landing softly on the balls of your feet and bending at the knee. Now hop backwards over the ball, using the same landing technique. Be careful not to snap your knee back to straighten it. You need to maintain a slight bend to the knee. Repeat 20 times.

4C. Single leg hops over cone (20 repetitions x 2)

Elapsed time	10.5–11 minutes
Purpose	To increase power/strength, emphasising neuromuscular control
Instructions	Hop over the cone/ball, landing on the ball of your foot and bending at the knee. Now hop backwards over the ball, using the same landing technique. Be careful not to snap your knee back to straighten it. You need to maintain a slight bend to the knee. Repeat 20 times. Now stand on the left leg and repeat the exercise. Increase the number of repetitions as needed.

4D. Vertical jumps with headers (20 repetitions x 2)

Elapsed time	11–11.5 minutes
Purpose	To increase height of vertical jump
Instructions	Stand forward with your hands at your side. Bend the knees slightly and push off, jumping straight up. Remember the proper landing technique: drop the weight on the ball of your foot with a slight bend to the knee. Repeat 20 times and switch sides.

4E. Scissors jump (20 repetitions)

Elapsed time	11.5–12 minutes
Purpose	To increase power and strength of vertical jump
Instructions	Lunge forward, leading with your right leg. Keep your knee over your ankle. Now push off with your right foot and propel your left leg forward into a lunge position. Be sure your knee does not cave in or out. It should be stable and directly over the ankle. Remember the proper landing technique drop the weight on the ball of your foot with a slight bend to the knee. Repeat 20 times.

5. Agility

5A. Shuttle run with forward/backward running

Elapsed time	12–13 minutes
Purpose	To increase dynamic stability of the ankle/knee/hip complex
Instructions	Starting at the first cone, sprint forward to the second cone, run backward to the third cone, sprint forward to the fourth cone (etc.).

5B. Diagonal runs (3 passes)

Elapsed time	13–14 minutes
Purpose	To encourage proper stabilisation of the outside foot
Instructions	Face forward and run to the first cone on the left. Pivot off the left foot and run to the second cone. Now pivot off the right leg and continue onto the third cone. Make sure that the outside leg does not cave in. Keep a slight bend to the knee and make sure the knee stays over the ankle joint.

5C. Bounding run (40 metres)

Elapsed time	14–15 minutes
Purpose	To increase hip flexion strength/increase power/speed
Instructions	Starting on the near sideline, run to the far side with knees up towards the chest. Bring your knees up high. Land on the ball of your foot with a slight bend at the knee and a straight hip. Increase the distance as this exercise gets easier.

6. Alternative exercises – Warm-down and cool-down

Cooling down your body is a must. It allows the muscles that have been working hard throughout the training session to elongate and deters the onset of muscle soreness. The cool-down should take approximately ten minutes. It should begin with a slow jog to allow your heart rate to come down before stretching and be followed by some gentle strength training exercises. We recommend two strengthening exercises (A and B). Finally, stretch your hamstrings, calves, inner thigh, quadriceps, and lower back, as described above. In addition to these basic stretches, try the additional stretches to target three muscle groups that are often forgotten, as described under C, D and E. Make sure you have a bottle of water by your side during the cool-down and drink enough fluid.

6A. Bridging with alternating hip flexion (30 repetitions x 2)

Purpose	To strengthen outer hip muscles (hip abductors, flexors) and buttocks
Instructions	Lie on the ground with your knees bent and feet on the ground. Raise your buttocks up off the ground and squeeze. Now lift your right foot off the ground and make sure that your right hip does not dip down. Lower your right foot and now lift your left foot, making sure your left hip does not dip down. Repeat 30 times on each side. As you become stronger, place your feet on top of a ball and repeat the exercise.

6B. Abdominal crunches (30 repetitions x 2)

Purpose	To strengthen your abdominals
Instructions	Lie on the ground with your knees bent. Place your hands behind your head with your elbows out wide. Support your neck lightly with your fingers. Take a deep breath and slowly contract your abdominal muscles as you exhale. Repeat 30 times. Drop your legs off to the right side. Slowly crunch up with your elbows out wide. You should feel your oblique muscles working on the side of your waist. Repeat 30 times and switch to the other side.

6C. Single and double knee to chest (30 seconds x 2 repetitions)

Purpose	To elongate your lower back muscles
Instructions	Lie on your back. Bring your right knee towards your chest and hug firmly. Keep your left leg straight in front of you. You should feel a stretch along your lower back and into your buttocks. Hold the stretch for 30 seconds and switch sides. Now bring both knees to the chest. If you feel any pain in the lower back, discontinue the stretch and inform your coach/trainer.

6D. Figure four piriformis stretch – supine (30 seconds x 2 repetitions)

Purpose	To elongate the rotators of the hip
Instructions	Lie on your back and bend both of your knees. Fold your left ankle over your right knee. Place your hands behind your right thigh and pull your right knee to chest. You should feel a good stretch in the left buttock and the side of the thigh. Hold for 30 seconds and repeat on the other side. If you experience lower back pain with this stretch, slowly lower your legs down and let your coach/trainer know.

6E. Seated butterfly stretch – seated (30 seconds x 2 repetitions)

Purpose	To elongate your inner thigh muscles (adductors)
Instructions	Sit up, bringing your feet in so that the soles of your feet are touching. Gently place your elbows on your knees and slowly push down. You should feel a good stretch of the inner thigh. Hold this for 30 seconds and repeat 2 to 3 times.

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based on the following articles:

– Mandelbaum BR, Silvers HJ, Watanabe DS, Knarr JF, Thomas SD, Griffin LY, Kirkendall DT, Garrett W Jr. (2005) Effectiveness of a neuromuscular and proprioceptive training program in preventing anterior cruciate ligament injuries in female athletes: 2-year follow-up. Am J Sports Med 33:1003–10
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Head injuries and how to avoid them

Head injuries and how to avoid them

The most common head injury in sport is a contusion of the head, which may vary widely in severity. Many head injuries in football are the result of unsuitable playing techniques and can be reduced by employing proper skills, ensuring good medical care and enforcing safety through the Laws of the Game.

For both men and women, the most frequent injury in football is a contusion to the lower leg. But one injury is particularly troubling, not just in football, but in all contact sports and that is an injury to the head. Numerous injuries are possible such as contusions (bruises) and abrasions, dental injuries, eye injuries (e.g. detached retina), lacerations (cuts), fractures and concussions. The injury that gets everyone's attention is concussion. Why? Because concussion has the potential to have long-term consequences affecting memory, concentration, planning, problem solving and more.

What is concussion?

Concussion is the temporary loss of normal brain function as a result of an injury. A player does not need to have lost consciousness to suffer concussion. The 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, unsteadiness/loss of balance. This a brain injury that may result in a bad headache or unconsciousness.

Head injuries are predictable. They usually occur near the halfway line when players are competing for headers, goal kicks, long passes etc. They can also happen, though much less frequently, in the penalty area when many players compete for crosses or corner kicks. Head injuries are spread out fairly evenly across female strikers, midfielders, and defenders. Goalkeepers have unique challenges when coming out to an onrushing striker or working around the goalposts.

The majority of injuries are due to head-head, head-elbow, head-ground contact or when the head impacts another hard object like the foot, knee, post or even some object near the touchline. Generally, head injuries to women happen from head-head contact; for men, it is head-elbow contact. This is why the FIFA Medical Assessment and Research Centre (F-MARC) has recommended changing the laws to the International Football Association Board (IFAB) and sanctioning every elbow blow with a red card.

Concussion can occur if the ball hits you when you are unprepared for the contact. However, purposeful heading carries little risk of concussive injury. Nevertheless, heading is a complex task. It involves skill, courage, timing and decision-making. In preparing to head the ball, you tighten your neck muscles that fix the head to the trunk giving you a large mass to overcome the mass of the ball. Then you have to time your actions according to the velocity and direction of the ball while you are running (forwards, sideways or backwards) or jumping (off one or both feet) while trying to decide what the opponent will do and then direct the ball to a specific location. All this is done in a split second. There are players who are skilled headers who seek out every chance to head the ball and there are players who rarely head the ball.

Injuries to the head are not uncommon. If we add up all the recorded head injuries, we see that between 4% and 20% of all injuries in football are to the head. Around half of all injuries to the head are common contusions and/or abrasion injuries. In men, the next most common head injury is a laceration, but in women, the next most common injury is concussion. For men, concussion is the fourth most common type of head injury. In some studies, the concussion injury rate for women is nearly 2.5 times higher than the rate for men. Why? Women seem to have some differences in how they execute some tasks relating to impact that may relate to how well they can handle impact to the head. There are two major points in concussion that everyone associated with football needs to be aware of: recognition that an injury has occurred and when to allow a player to return to play.

"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, 23, midfielder, US women's national team

The first concern is recognising that an injury has occurred. The common perception is that one needs to lose consciousness to have sustained concussion but this is not true. Medical definitions of concussion state that there has been a 'rapid onset of short-lived impairment of neurological function'. Impact, not always to the head, can lead to this impairment. So, if you see two players knock heads and one bends over, holds her head and is oblivious to the game around her, the chances are that she has suffered 'short-lived impairment of neurological function'.

When in doubt, keep them out

It is important to recognise that an injury has occurred so the player can be removed from play and assessed. While there are many recommendations regarding when to allow a player to return to play, the safest decision is to keep them out of play until a medical professional says they can return. Most coaches and players are not in a position to make such a decision on the field, so

Signs (observed by others)	Symptoms (reported by the player)
Player appears dazed	Headache
Staring, vacant expression	Nausea or vomiting
Confusion, mistakes on the field	Poor balance or dizzy
Disorientation about game, position, score	Blurred or double vision
Inappropriate or wide ranging emotions	Light sensitivity
Poor coordination, clumsy	Feeling foggy, hazy, "out of sorts"
Slow to answer questions or answers incorrectly	Change in sleep patterns (length, timing, quality)
Loss of consciousness	Poor concentration or ability to focus attention
Change in behaviour or personality	Irritable, emotional, sad
Cannot recall events before being hit	Memory problems
Cannot recall events after being hit	Concentration/memory problems
Low energy	Fatigue, feeling slowed down

Table 1: Possible reported problems after concussion

"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.

'when in doubt, keep them out' is the best suggestion. Not all medical professionals are equipped to assess and treat concussion so teams and clubs need to find a neurologist with experience in sport-related concussion.

Part of the problem is that you cannot 'see' concussion. A sprained ankle or a broken bone is quite obvious. You cannot play with a pulled muscle. But concussion? You might be clattered in a game, feel a little out of sorts, but feel you can still play. It is probably not a good idea...

Decisions are based on what the player says and on things a coach, parents, teachers or friends might be able to observe. Not all are seen on the touchline after the injury and things can change over time. Some problems may not be reported or visible for hours or days after the injury (see table 1).

The more that is learned about concussion, the more hesitant we are to return a player to play if they have any signs, symptoms or deficits. In a player who still has some problems, sustaining another head impact could well extend the duration of their recovery with longer lasting symptoms, more symptoms or more serious problems.

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 do men. We still need to learn a lot more about this complicated injury.

Do not take a head injury lightly.
No game is so important.

Author:
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based on the following articles:

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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 1,100 kcal for a 60 kg 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 off-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 our 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 other 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 5–12 g/kg body mass, but typical female players consume much less. Average daily intakes of 4.7 g/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 1 g 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 1-4 g/ kg bodyweight of carbohydrate during the 6-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 0.8 g/kg/d which can be easily achieved with normal eating habits. Even the commonly recommended intakes for football players of 1.4–1.7 g/kg/d are in fact difficult not to reach with a typical western diet provided that your energy demand is met. Even a 55-60 kg female player eating only 2200 kcal/d with 10–15% of total energy from protein will have an intake of 55-82 g/d or 1–1.5 g/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 small amount of protein just before or just after the exercise. A sandwich with cheese, ham, tuna or something similar is perfectly good, or your 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 liter 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 as 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% (4–8 g/100 ml) 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 generally are 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 generally is 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 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)

Author:
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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 bodyweight 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 bodyweight.

"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 to 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 30 kcal 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
60 kg female with 20% body fat = 48 kg fat-free body mass (FFM)
Daily energy intake is 1800 kcal (7560 kJ)
Cost of daily exercise (1 h/d) = 500 kcal (2100 kJ)
Energy availability = 1800-500 = 1300 kcal (5460 kJ)
Energy availability = 1300/48 or 27 kcal/kg FFM (113 kJ 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 your 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, 30 g 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.

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based on the following articles:

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"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 sport 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 performance 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 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 one 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 bodyweight?

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 your 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 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 labor 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 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 the 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 has been 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 at 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?

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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 (like say 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.

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