

TEN FREQUENTLY ASKED QUESTIONS ABOUT WARM-UP & INJURY PREVENTION IN FOOTBALL

– Written by Donald Kirkendall, USA

1. WHAT ARE WE TRYING TO PREVENT?

Before addressing the ‘what’ we should address ‘why’ we need to be so concerned about injury prevention in sports. The very best predictor of an injury is a history of that injury. Plus, some of the earliest injury surveillance studies have shown that an incompletely healed minor injury raises the risk of a more serious injury, either to the same or some other site. Thus, preventing the first injury is most critical. There are a number of reasons why we need to be very proactive about injury prevention.

Development

A primary goal of a coach at any level should be player development. At the end of any season, every player should be better

than they were when the season began. When a season ends, nearly every player has to ask two questions:

1. Do I want to play next season (and we should hope so; no sport wants players to drop out)?
2. What level do I think I can play in next season (recreational or progressively more advanced levels)?

Players who are repeatedly injured may think there are better (and safer) ways to spend their time and therefore decide to drop out. The upper level teams may never notice players in other divisions because so many never seem to get any better. In either case, the players are not developing. Players who are injured are not training. Less training means less improvement

and lack of opportunity to play at more competitive levels. Pretty soon, players decide to go elsewhere. We should want our youth to keep playing football and to keep improving, which they can't do if they are injured and not training.

Team performance

No team has three or more players at each position to select from. Most teams are lucky to have 1.5 to 2. Take one to two players out of training and competition and the team is at a distinct disadvantage. While we want every player to improve, we should also want every team to improve too. Cohesive team play is built on individual player development. Lose a couple of players and team play declines – this is seen at every



level of play. And when injured players come back, they should not be considered as ready to step back into play at their previous level of performance because they may have missed weeks of training. We always hear of professional teams who do unexpectedly well because they were all healthy, while a big money team has faltered because so many days were lost to injury. Major League Baseball in the United States spends 20% of its annual salaries on injured players. This shows that at the professional level, injuries have a financial consequence.

Public health

Ever heard of FIFA's Big Count? It's an attempt to estimate the total number of football players around the world. The latest Big Count estimates that there are over 250 million active players. It's almost impossible to estimate how many players get injured each year and it's not practical to apply what is known about professionals to all lesser levels. But it should not be surprising that if 25% of this population sustains an injury that requires medical attention, there will be substantial health expenses. Reducing

injuries by any degree should reduce the burden on stressed healthcare systems¹.

Future health

Many disruptive injuries have longer-term consequences. Meniscal or ligamentous injury to the knee will usually lead to cartilage damage and when the cartilage is damaged, the knee has taken its first steps toward future osteoarthritis. Former athletes who have sustained cartilage damage are diagnosed with osteoarthritis at far younger ages than

their uninjured peers. The same concept can be applied to the most injured joint in footballers - the ankle. And new research verifies the early onset of osteoarthritis of the hip in some players, even in the absence of an overt, obvious injury as seen at the ankle or knee. Concussions, typically from some form of accidental impact to the head, can lead to degenerative brain disease in a small number of athletes. This is an area of very active research.

Collectively, it should be obvious why prevention needs to be part of every training session that every coach conducts.

2. WE RUN AROUND A LITTLE TO BREAK A SWEAT, WE DO SOME STATIC STRETCHING ... ISN'T THAT GOOD ENOUGH?

Coaching education has long taught that every aspect of training can and should be done using the ball. Thus, teams do a little easy skill work, maybe some small group play like 5v2, and then do a variety of static stretching exercises before getting to the 'real' training. Programmes like this don't address factors that are deficient in players and don't adequately prepare them for active training and competition.

Ask any coach what part of the warm-up prevents injury and they will probably say the stretching. What is interesting is that there is no high quality research evidence that provides objective, reliable and valid support for static stretching reducing any form of injury, much less muscle injury². In fact, there is good data to show that pre-exercise static stretching reduces speed and power output in activities that follow. Most coaches would prefer to not do anything that could impact a player's speed and power.

On the other hand, there is data to show that dynamic stretching does help reduce injury without the performance decrements seen after static stretching. It should seem obvious to swap out static stretching and insert dynamic stretching instead.

But the kind of stretching is not the only item to consider. After looking at how injuries occur, scientists have learned that players with the best strength, endurance, balance, agility, motor control and power output are injured the least. Ideally, each of these would be addressed during training, including the warm-up.



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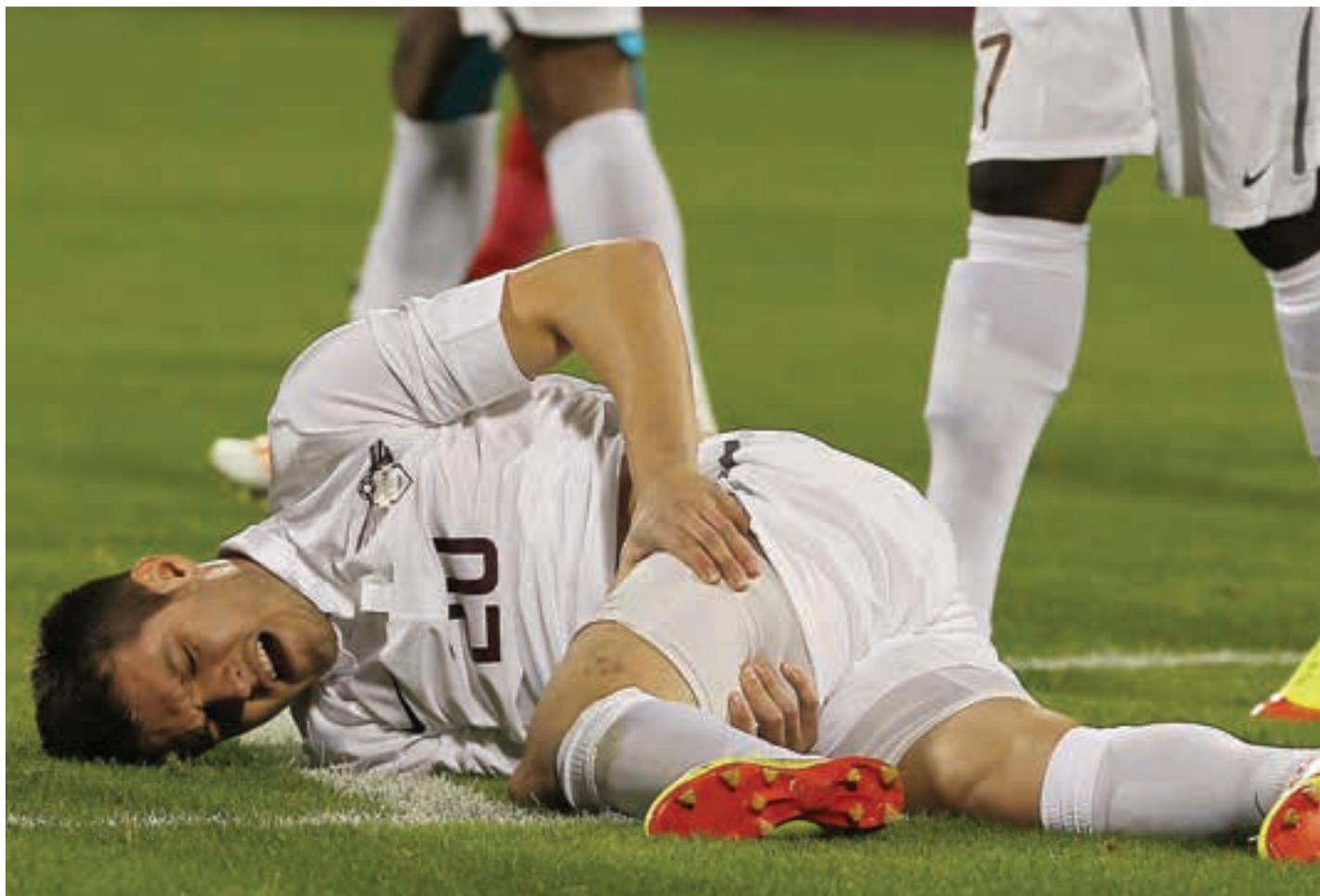


3. WHAT ARE THE COMPONENTS OF A GOOD GENERALISED AND PREVENTATIVE WARM-UP?

The basic purpose of a warm-up is to prepare the body for the coming training or competition. At rest, our bodies unique idle keeps everything running appropriately. During exercise, all systems are operating at a higher level to support the exercise: the increased breathing rate and depth to get more oxygen into the lungs, for example.

The increased output of the heart delivers more oxygen to the working muscles and removes waste products produced during the transfer of energy. The blood vessels open up to get oxygen, hormones, nutrients and more to those areas in need while also narrowing to restrict blood flow to areas of less importance. Blood vessels in the skin open to get warm blood to the skin so the extra heat produced can be eliminated. All of these and many more operate most efficiently at a temperature above that at rest and the best way to elevate the body temperature is through a gradual, progressive warm-up: start slow and work up to the harder work that precedes training or competition.

This can be accomplished simply by jogging, but that hardly prepares a footballer for the type of work, and potential injuries, that are ahead. So, when planning a warm-up, include light running exercises, dynamic flexibility, some agility work, motor control activities, strength of areas known to be a problem in footballers, some static and dynamic balance and plyometrics.



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Before you go thinking that accomplishing all that will take up all the training time, consider the next question.

4. HAVE ANY SUGGESTIONS FOR GENERALISED WARM-UP PROGRAMMES ALREADY PROVEN TO BE SUCCESSFUL AT PREPARING FOR TRAINING AND REDUCING INJURY?

The research into injury prevention programmes has been of keen interest over the past 10 to 15 years and a number of programmes have been shown to

reduce overall injuries by about one-third with much more dramatic reductions for specific injuries.

The 11+ is FIFA's generalised warm-up programme. Instructions, videos and printed materials are available at www.f-marc.com/11plus/ showing how to do this 15 to 20 minute warm-up programme. Close observation of the activities show that it includes all the exercise concepts outlined in the previous question. When applied over a large number of teams, the 11+ reduced all injuries by 32%, training injuries by 32%, match injuries by 28%, severe injuries by 45% and overuse injuries by 53%. As some of those injuries can lead to extended time lost to training and competition, as well as health care expenses, everyone involved should welcome reductions like these³.

This isn't the only proof that generalised warm-up effectively reduces injuries. From Canada comes a programme tested on girls and boys soccer that resulted in a 38% reduction in all injuries, a 43% reduction in acute injuries, 50% reduction in ankle injuries and 62% fewer knee injuries⁴.

Similar programmes have been reported to reduce injury in basketball, netball, team handball, Australian Rules Football and volleyball. One thing that is an underlying requirement vitally important to any programme's effectiveness is compliance. The programmes are effective if players perform the warm-up programme before at least 75% of the training sessions. When there is poor compliance with the programmes, little difference in injury rates is reported⁵.

5. MY TEAM GETS LOTS OF ANKLE SPRAINS EACH SEASON. WHAT CAN BE DONE TO PREVENT ANKLE SPRAINS?

As the ankle is the most injured joint in youth soccer, prevention of this common injury should have undergone research scrutiny.

It should seem obvious that if some mechanical restraint is applied to the ankle, joint injury should be reduced, and this is true. Taping is the most common intervention that unfortunately loses its restraint characteristics as the tape stretches over time. This limitation can

be overcome using a lace-up ankle brace, which can be repeatedly tightened as it loosens during use and effectively reduces the number of ankle sprains. Even more rigid supports further reduce ankle sprains.

Exercise programmes can also prevent ankle sprains, to a point. Exercise programmes progressively address strength and proprioception around the ankle and are effective, but only for athletes who have a history of ankle sprain. While no exercise programme has been shown to be effective at preventing the first ankle sprain, many exercise programmes are effective at preventing (or delaying) the next ankle sprain. Given the frequency of ankle sprains in football, it is probably safe to assume that most players on any team will have a history of ankle injury. Asking everyone to do prevention exercises will only address a minority with no ankle injury history⁶.

6. WHAT CAN BE DONE ABOUT KNEE INJURY?

The knee in general, and the anterior cruciate ligament specifically, is the subject of the bulk of sports injury prevention research, especially in football and even more specifically for female players where the rate of anterior cruciate ligament (ACL)

tear in women is two to three times the rate of their male counterparts. While recovery from an ankle sprain or a muscle strain might be measured in weeks, recovery from an ACL tear is measured in months and may require complex surgical reconstruction and a long period of rehabilitation. Tears of the meniscus or cartilage often accompany ACL tears. Once the cartilage is damaged, the knee begins the slow progression to early-onset osteoarthritis. Further, the younger the woman player is when she has her first tear puts her at risk for another ACL tear in either knee. Therefore, preventing the first tear is a very high priority in current and future health.

A number of knee-specific prevention programmes have been published. One programme is the PEP (Prevention Enhances Performance) Programme. Like the 11+, it too contains running, dynamic stretching, strengthening, plyometrics and agility exercises. This generalised programme was originally designed to prevent ACL injuries in adolescent females. Over 2 years, teams that complied with the programme had an impressive 88% and 74% fewer ACL injuries than teams not following the programme⁷. To view the programme, go to <http://smsmf.org/pep-program>.

Swedish researchers used a similar multifaceted warm-up programme and reported 77% fewer knee injuries in adolescent girl football players and a 90% reduction in non-contact knee injuries (the most common mechanism of knee injury in football)⁸.

But as stated earlier, compliance is required. These programmes are not occasional diversions from a coach's particular warm-up programme. These must be a regular part of every training session to be effective.

7. CAN MUSCLE STRAINS BE PREVENTED?

Injury surveillance studies have shown the increase in the incidence of muscle strain injury over the past 15 to 20 years as the game has become faster and more ballistic. The most commonly strained muscles in football players are the hamstrings and the groin. Most coaches would probably say that the best way to prevent strains is by stretching. Were that so, then lack of flexibility involving the muscles in question would be a significant risk factor. In reality, the main risk for a hamstring strain (other than a history of that injury) is reduced eccentric strength.

Professional football teams may experience six or more hamstring injuries per season. Depending on severity, a player can miss many weeks and upon returning becomes greatly at risk of a re-injury. A number of studies have attempted to apply eccentric training to prevent hamstring strains.

The most common exercise is the Nordic Hamstring (Figure 1). The player leans forward slowly, keeping their trunk and thighs in a straight line, until control of the descent is lost. Players get stronger by doing more repetitions, controlling the descent longer or both. When regularly applied (there is that compliance rule again), all hamstring strains can be reduced by as much as 79%, new strains are reduced by 59% and recurrent strains can be reduced by 86%⁹.

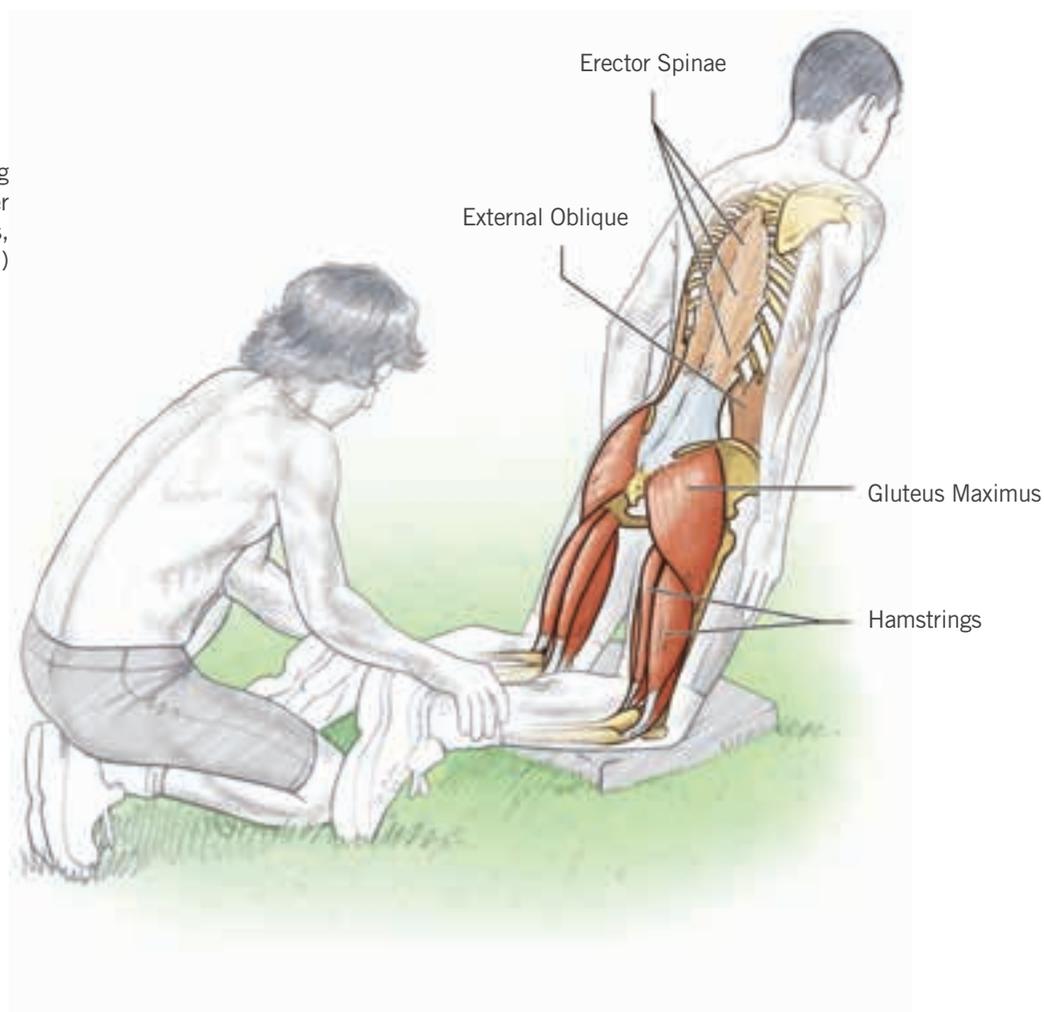
The other area of concern in the groin involves the adductors. These pesky injuries are a plague on many sports including ice hockey, basketball and football. A wide variety of prevention programmes have been attempted with limited success to



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Figure 1: The Nordic Hamstring
(From Kirkendall DT. Soccer
Anatomy. Human Kinetics,
Champaign, Illinois 2011)



prevent this injury that most commonly occurs in males. Newer programmes use a series of exercises to strengthen the core around the player’s hip, back and thigh. While a 31% reduction in groin injuries has been reported, these results are not statistically significant¹⁰. An interesting observation is the poor compliance rates by males. So, does this suggest that the lack of result was due to the intervention or poor compliance?

8. WHAT SPECIFICALLY DOES WARM-UP DO FOR THE BODY?

Our body is a wondrous machine and humans are at the top of the ladder when it comes to adaptability. Our body can adjust to almost anything. But one thing we cannot do is adjust immediately from rest to exercise. Instead, we need to gradually shift from rest to almost any level of physical work.

Going from rest to very hard work without a warm-up is hard on the heart. When a proper warm-up is applied (see questions 3 and 4 above), the subsequent exercise is more comfortable and the risk of injury is reduced. Warming up

gently raises the work demands on the cardiovascular system in terms of heart rate, stroke volume, cardiac output and blood pressure. At the same time, the body is diverting blood flow away from areas not directly involved in exercise (like the gastrointestinal system), to areas that really need the blood (like the working muscles and skin). The extra energy expended raises our body temperature and warmer blood gives up oxygen to the working muscles faster than resting body temperature blood. Muscle is not as dense as people think so when the body temperature rises, the muscle becomes more supple and compliant which helps with circulation and flexibility. The added blood flow and elevated temperature also helps increase the elasticity of tendons and ligaments, which gives more benefits with respect to flexibility. The elevated body temperature also helps nerve cells send signals faster. Combine all that together and it should be apparent that a well thought out warm-up has effects all over the body. In most cases, the body is pretty well warmed up when you break into a sweat.

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9. IT SEEMS LIKE THERE ARE A LOT OF INJURIES FROM FOULS. IS THAT REALLY WHAT OCCURS?

FIFA has been conducting an injury surveillance programme since the 1998 FIFA World Cup in France and they have a consistent database involving injuries at dozens of world championship events. One of the interesting findings was the fraction of injuries that occurred as a result of a foul. Over 40% of all injuries in men, and nearly 30% in women, were due to foul play¹¹. Significant efforts need to be implemented that support fair play. This should begin with the coach. Changing the interpretation of the laws is one method. Injury statistics led the International Football Association Board to authorise an immediate red card for tackles from behind when the player was closing in on the goal. This foul has since become extremely uncommon. Also in line for an immediate red card is the elbow to the head. Have you noticed that you don't see many of those anymore? Other injurious actions are (one or two-footed) slides from the front or sides with the studs exposed¹² which can also warrant a red card. Can you see what all those fouls have in common? Bad things happen when players leave their feet.

10. ENOUGH! JUST GIVE ME THE BOTTOM LINE.

Bottom line? Prevention works!

Most coaches are pretty good at planning a training session in order to improve skill and team tactics. Watch a normal training session for most youth teams and you will see poorly organised warm-ups. The typical warm-up is usually inadequate preparation for activity in general, much less injury prevention. As the warm-up is usually the least-organised aspect of training, one might think that coaches would embrace a package of activities known to adequately prepare footballers for training AND has been shown to reduce injuries. These programmes are brief (usually 15 minutes once the team learns the exercises) and do wonders for minimising injuries. Of course, reducing injuries is always a good thing because what is most important is that players keep playing and keep improving. When injured, they are doing neither. It is important to teach players to play fair and empower referees to exercise their authority with harsh penalties for players who play in a dangerous manner.



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