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DIVISION

# MEDICINE

## Matters





Dr Urs Vogel, Chairman of the UEFA Medical Committee.

## EDITORIAL

Regular readers of 'Medicine Matters' will possibly recall that we have, over the years, frequently commented on the ethical perimeters surrounding the club doctor. We have pointed out that a position somewhere between the board of directors, the head coach, the media, the player and his right to confidentiality is not always the most comfortable place to be. And we have also mentioned that the role of team doctor is often more a 'labour of love' than a 'career move'.

By DR URS VOGEL

There is no doubt that, these days, being a club doctor is, to all intents and purposes, a full-time job. But can we say the same when the debate turns to national associations? The question of how to offer optimal medical support is not always an easy one to answer. National-team work is, by definition, sporadic in nature. Yet it invariably entails travelling and, unlike club football, very often includes long-term events.

The colleagues who were on duty at the European Football Championship in Portugal last year will testify to the number of days it wiped off the calendar. But, of course, national-team football isn't just about the peak of the pyramid. An association has to cater for – at least – Under-21, Under-19 and Under-17 categories, most of which are valid for girls as well as boys. A majority of associations also have futsal competitions on their agenda. A glance at this year's UEFA diary reveals that, for example, Under-17 and Under-19 tournaments plus the European Women's Championship eat up 41 days in May, June and July. How many physicians can contemplate such prolonged absences? Can doctors be expected to use up their vacations in order to be on national-team duty?

"The other problem is," one national association's General Secretary recently remarked, "that doctors don't come cheap." Some physicians might immediately respond that the financial recompense offered in exchange for spending two or three weeks away from a practice, a clinic or a hospital is often unattractive, no matter how much you love football. The line of thought inevitably leads to a basic question: how best to rec-

oncile logistics and financial resources with the need to offer the best possible medical support to the players.

One of the valid answers is to build a strong squad of medical staff in order to share out the workload. Some major associations have recruited a pool of eight or nine doctors who are ready, willing and able to combine occasional duties with their professional lives. This not only requires planning and administration but also clear policies and guidelines. To have eight or nine doctors singing "I'll Do It My Way" when they report to the training camp is enough to drive coaches and players to distraction. The team needs to be coached; there has to be teamwork; there must a clear indication of what the physician is expected to contribute – and what he is not expected to contribute. And, on the other side of the coin, the coaches need to be fully briefed about the physician's role and responsibility so that, no matter which member of the medical squad reports for duty, there is continuity and a similar modus operandi is adopted. And, ideally, the medical squad should be assembled for briefings and debriefings at the start and end of each campaign.

Bearing in mind the variables among UEFA's 52 member associations, it is clear that nobody is in possession of the absolute truth. But, as we try to juggle timetables, professional obligations and financial resources, the prime objective must always be that of guaranteeing the quality of the medical support offered to the players.

### COVER

Heading the ball may be spectacular, but it also raises medical questions.

PHOTO: A. LINGRIA



# WOMEN'S EURO 2005

The European Women's Championship kicks off in England on Sunday, 5 June. The eight contestants will be fighting for a place in the final, and so players will need to stay fit, healthy and injury free. We asked the England team doctor, Dr Pippa Bennett, some questions about the medical preparations designed for the home team at this prestigious event.

## MEDICAL PREPARATION

### 1. Describe your role as the England national team doctor.

I coordinate medical care for all our squads together with our physiotherapist and exercise scientist. This involves liaising with clubs and organising further referrals for players where necessary. We cover seniors, U21s, U19s, U17s and U15s. I also oversee the medical provision for our squad at the Player Development Centre at Loughborough University. I then travel with squads whenever there is a fixture or training camp. This year my focus is obviously the seniors and I enlist other medical colleagues to travel with the junior squads.

### 2. How many other medical staff members are appointed for the England team?

We have a full-time physiotherapist, Louise Fawcett, and exercise scientist, Dawn Scott. We have been working together for the past four years.

### 3. What are the challenges for the national football team doctor as compared to a 'normal' medical practitioner?

A 'normal' medical practitioner sees sick patients and the worried well. Our players can of course fall into these categories but more often our work is preventing illness and injury and in so doing keeping them fit and healthy and performing at the highest level.

### 4. What are the most common injuries in female football players?

The most significant injury that occurs more commonly in women is the anterior cruciate ligament (ACL) tear. This occurs 2–5 times more commonly in women, and a great deal of research has gone into investigating the risk factors and prevention strategies. Our players follow training programmes

that incorporate strength, plyometrics, proprioception, speed, agility and endurance drills. In so doing, we hope to minimise some of the risk of ACL injury. From my masters work in the area, I believe the focus should be on our young pre-pubescent players and in particular assessing and retraining their neuromuscular pathways, especially in cutting, turning and landing movements.

### 5. Are the English female players regularly monitored to assess their fitness levels? If so, how often are these tests done?

Fitness tests (e.g. speed, agility, aerobic endurance) are conducted for all our squads. Results are fed back to the players and coaches and targets set. This is done at least three or four times per year, depending on the squad involved. All senior players have undergone some blood screening. All players over 17 are cardiac screened with ECG and echocardiogram.

### 6. From a medical point of view, do you think 90 minutes is an appropriate duration for women's football matches? Would it be advisable to play less (e.g. in tennis, women play three sets, whereas men play five)?

No, research has shown that a female player can cover 9,500 metres in one game of football, which is comparable to the men's game. Injury rates are mainly lower in the women's game. Giza et al recently reported that the injury incidence in the Women's United Soccer Association (WUSA) was lower than the 6.2 injuries per 1,000 player hours in the corresponding male professional league.

### 7. Are the nutrition needs of a female player different to those of a male player?

The demands of the game are the same. It is important that players are aware that their energy demands are high and that they consume enough to avoid a negative energy balance. There are differences due to menstruation as female players can be prone to anaemia. Foods rich in iron, calcium, B vitamins and essential fats are encouraged to promote good hormonal balance.

### 8. Do the players follow a particular diet?

When we are away our players have a high carbohydrate, low-fat diet with lean-meat protein. We encourage this when they are back home and have assessed individual needs through food diaries and nutritional questionnaires.

### 9. Are the players informed about doping risks?

Yes, we regularly update our players on WADA, UEFA and FA regulations. Players are randomly tested at club and international level. They fill in medical pro formas at each fixture, which alerts us to any new medications.

### 10. Are there any medical recommendations you would make for the benefit of football in general?

Any player, whether male or female, needs to focus on strength, fitness, core stability, muscle balance and proprioception and must have good nutrition and hydration. We need to continue and expand the research in sports medicine in football and invest in the medical care of all our players.



# STRESS AND PERFORMANCE

BY JACQUES CREVOISIER

## The concept of stress.

Different authors interpret the term 'stress' in very different ways.

It is something connected to physiology or psychology. However, there is always evidence of a psychoaffective disorder.

### Pressure

Can pressure be measured objectively?

Certainly not. No two players will react to the same situation in the same way, proving that the relationship between the subject and the situation is the crucial factor and that it may be possible to work at this relationship.

### Good and bad stress

Authors seem to differentiate between good stress (catecholamine, adrenaline), which is necessary and prepares the individual for activity, and bad stress (cortisol), which holds them back.

Blood tests can be carried out just after an individual has woken up in order to establish their predisposition.

### Stage fright

We often hear about stage fright experienced by actors before they go on stage.

This stage fright is undoubtedly necessary for them to be able to give their best performance, and obviously affects experienced actors too.

It is the same for players:

- pre-match anxiety is a positive factor as long as it remains at a certain level;
- among more experienced players, this anxiety subsides as soon as the game starts.

### Symptoms of stress

They can be numerous. Below are several examples of symptoms which

could be evident in an individual suffering from high levels of stress.

### Physiological

- increased heart rate
- increased breathing rate
- muscle tension
- high blood pressure
- enlarged pupils
- reduced levels of coordination
- reduced powers of observation.

### Psychological

- restlessness
- anxiety
- frustration
- limited concentration span
- increased fatigue
- weariness
- aggression
- nervousness.

### Defensive reactions

- aggression
- rejection
- negativity
- introversion
- urge to escape
- isolation
- rationalisation
- intellectualisation
- burying one's head in the sand
- regression.

### How to reduce anxiety

There are some simple self-help methods to reduce anxiety:

- practise controlled breathing;
- be aware of the physical effects of anxiety;

- try to relax tense muscles;
- focus on the task in hand;
- have a positive self-image;
- turn fear into excitement;
- turn anxiety into energy.

### The fear of losing... or winning

What exactly are people afraid of? The fear of winning seems somewhat paradoxical for the uninitiated, yet there are many examples of defeat being snatched from the jaws of victory.

Becoming trapped in a defeatist state of mind must be avoided at all costs.

Some examples:

- The player who is playing well but tells himself it can not and will not last. The fatal error committed is inevitable because it was expected.
- Another phrase: "I knew it wouldn't work".

This is another example of someone anticipating failure.

Concentrating on the task in hand and ignoring the consequences of the imminent success or failure remains the best solution.

It is also important to learn to accept and therefore rise above short-lived failures.

### Rituals

Pre-match routines are rituals that must be respected.

Studies have shown that Europeans have more individual rituals, while Africans are more likely to perform rituals as a group.

Different types of superstition fall under this heading and their importance for many players is acknowledged.



Young players are not immune to stress either.

### Negative effects of stress

These can occur in different ways:

- a poor start to a match that sets an unbreakable trend for the remainder of the game;
- a stressful situation, particularly after a defeat: a one-on-one against the goalkeeper, or taking a decisive penalty (in the last minute or in a penalty shoot-out when qualification is at stake).

The effects also arise in specific circumstances:

- in the period before a decisive match (knock-out game, cup final);
- inability to cope with the continual demands of a series of crunch matches.

## HOW CAN STRESS BE COMBATED?

### 1st problem: how the situation is perceived

A child playing a minor district championship game with his friends can experience extremely high levels of stress because their chances of being picked again depend on their performance in the match (or at least that is their impression).

#### Solutions:

Change how the situation is perceived: put the real importance of the match into perspective and focus on the enjoyment aspect and the fact that players are entitled to make mistakes;

the key is always to give your best and focus on the game and not on what is at stake.

### 2nd problem: role of the environment

A young player can 'choke' in a game because of the enormous pressure

they are under from their parents or because their coach is criticising their every mistake.

Fear breeds fear, and stress breeds stress.

Players of all levels need an environment (particularly a coach) that promotes command and control. Unfortunately, this is not always the case and constant efforts need to be made in this area.

#### Solutions:

Manage the environment (parents, coach) by asking these people to control themselves and consider the knock-on effects of their behaviour; distance players from their environment, or even better, draw additional motivation from negative situations (this requires experience).

### 3rd problem: decisive actions

Thinking about the consequences of a missed penalty leads the player to focus on the consequences of an action, rather than on the action itself; any player trapped in this cycle will be completely thrown.

#### Solutions:

Focus solely on the task ahead; try and forget the external environment as far as possible; clear the head; block out negative thoughts; desire success.

### 4th problem: the fear of playing a match

Sometimes, players (particularly the youngest ones) feel the urge to escape, and are more or less consciously afraid of competing in a match, despite the fact they are sufficiently prepared for it.

#### Solutions:

Having worked very hard in training, players should not look to find fault with themselves: if they are as well-prepared as possible, they will be in a position to tackle the situation and stress levels will be lower. The opposite is also true as stress is often borne out of a lack of preparation (we are afraid of sitting an exam because we have not revised or done enough work).

Players should focus on their specific job within the team.

### 5th problem: the role of anxiety

It is a mistaken belief that anxiety always inhibits.

People are afraid of previous failures, but at the same time they definitely do not want to experience the same frustrations.

As long as it does not exceed a certain level, anxiety can also be a motivating factor that inspires caution to avoid defeat and its trail of disappointments.

The specific pressure of a situation (e.g. fans' attitude to defeat) encourages greater effort on the part of the player.

Conversely, a lukewarm or flat atmosphere, or a quiet, unwelcoming or distant audience does not create the type of anxiety that stirs people into action.

We can therefore suppose that "controlled fear" causes players to perform better.

Pre-match nerves are quite normal, not to say desirable, and let the individual know their stress, awareness and concentration levels. Everyone knows that, as soon as the match starts, the stress often quickly fades away, apart from



Body language is very important.

FLASH PRESS

in exceptional cases which need to be addressed. There are also players who show no signs of excessive pre-match nerves. If this self-confidence is genuine and not feigned, it is the sign of an individual with high confidence in their own ability. It is reasonable to expect a good performance from them.

#### **Solutions:**

By motivating his players, adopting a positive, stimulating and energising attitude and overcoming his own nerves, the coach also has an important role to play in controlling pre-match anxiety. Body language is particularly important.

However, in the same way that internal thought processes are reflected in external actions, adopting a positive and focused external attitude affects one's internal state of mind.

The way the coach views the match and its preparation has a much greater influence than he imagines over his players and their motivation levels.

It is appropriate to distinguish between anxiety as a personality trait and anxiety as a temporary state.

Some players show permanent signs of anxiety (trait anxiety), while for others anxiety is created by a particular situation (state anxiety).

The second case is obviously much easier to treat, although, as a general rule, it is well worth learning how to manage stressful situations.

#### **Learning to manage stress**

There are several well-known techniques within certain sporting circles and each addresses a specific problem.

How should we proceed?

Below are a few examples:

#### **Changing the situation**

This technique involves controlling the aspects of the situation causing and intensifying the anxiety. For example, to reduce uncertainty, players should be told whether they will be starting the match or on the bench at the right time.

#### **Somatic stress management techniques**

These so-called "physical mediation" techniques can bring on either an active (Jacobsen or Eutonie de Gerda Alexander relaxation techniques) or passive state of relaxation (Schultz's autogenic training or Kretschmer's graded hypnosis).

To minimise internal tension, or to improve powers of self-control, biofeedback can prove appropriate (equipment that can amplify and detect changes in the electromyographic potential that causes changes in muscle tension or the skin temperature increases that occur when muscles are relaxed).

What is significant about biofeedback is that it works on the principle of being able to control optimal levels of activation at will.

#### **Cognitive stress management technique**

This technique focuses on reducing or eliminating the negative images and thoughts that trigger high levels of physiological activation and generate stress.

#### **Mental imagery**

The principle is as follows: as the extent to which a player's environment can be changed is limited, attempts can be made to alter the way this environment is perceived.

"Mental preparation" sessions are therefore symbolic rehearsals for the physical activity (e.g. skiers who visualise their descent before the race).

Conjuring up clear images has positive effects, which are further enhanced when performed in conjunction with physical activity.

#### **Stress inoculation**

This technique follows exactly the same principle as vaccination. The subject is asked to imagine stressful situations, then to block the negative thoughts and replace them with positive ones.

This enables players to halt negative thought processes: saying "stop" to themselves when they imagine themselves in a difficult situation, e.g. a goalkeeper making a misjudgement when coming off his goal-line.

It is based on the idea of trying to develop rational thoughts and helping people to identify their irrational ones.

For example, by asking the coach a series of suitable questions, he



Missing a penalty can have serious psychological consequences.

GETTY IMAGES

is shown that his anger towards a player is linked to him failing to carry out his wishes or desires. There is no real value in being angry at mediocre performances: it is much more effective to make training more progressive so that players can improve.

With the use of these varied techniques, each addressing a specific problem, players' pre-match thoughts and mental images can be changed in the same way that their behaviour on the pitch can be altered.

#### **Break free from excessive affectivity levels**

Players are well advised to try to free themselves from excessive affectivity and to relax so they can play to the best of their ability. Experience shows us that this is far from always the case.

Many professional players admit that they have been handicapped by stress throughout their career, before and sometimes during matches.

When the desire to win is coupled with excessive levels of stress, performance usually suffers. Emotional detachment – i.e. the ability to control stress levels and relax – allows the player to rediscover the clear-headedness required during the game.

Depending on the individual, this can be useful either in the days leading up to a game, on the day itself, or even during the match or the final stages of preparation.

By introducing measures to recreate match conditions and demands as realistically as possible during training (or friendly matches), it is possible to develop the active control process which is likely to prove effective in the trickiest of situations.

The anxiety that precedes a match is therefore sublimated to become a positive factor, capable of reinforcing the quality of the performance.

Good self-understanding enables players to identify the most efficient strategy for ensuring optimal conditions in the run-up to games.

## **CONCLUSION**

#### **Firstly, underline the key role played by the environment**

- coach
- parents (for the youngest)

#### **Play to the best of your ability**

- only then can results be achieved.

#### **Pursue self-development**

- understand yourself;
- seek to identify your emotions, recognise them, understand how they work, and then try to manage them;
- define a personal strategy (control, active relaxation, external control, etc.).

#### **Prepare as well as possible**

- being well-prepared inspires self-confidence.

#### **Focus on yourself and not on others**

- do not become fixated by an opponent (nemesis);
- focus primarily on your own game, and not on that of others;
- play to your strengths rather than weaknesses.

#### **Try to improve over time**

- desire to improve over time;
- above all, play with passion;
- enjoy the game;
- avoid "playing under suffrage";
- do not become a slave to results;
- accept defeats (inevitable part of the learning process).

A good player is one who thrives when playing football, who knows that he is playing to the best of his ability most of the time and who is aware that whatever the result may be, it is only a momentary indicator of their success or failure.

But in every case, it is necessary to take account of general psychological factors, particularly stress.

This is why we ourselves have developed a personality and motivational test for footballers to analyse, amongst other things, resistance to stress.

This test has helped us enormously to solve problems similar to those identified throughout this article.

# ARTIFICIAL TURF OR NATURAL GRASS: IS THERE A DIFFERENCE IN INJURY RISK?

## PRELIMINARY REPORT FROM THE ARTIFICIAL TURF PANEL

By PROFESSOR JAN EKSTRAND

### AIM

To compare the injury risk when playing football on artificial turf to the risk when playing on natural grass.

### MATERIAL

Fourteen teams (10 male and 4 female teams) playing at elite level on facilities with the third generation of artificial turf were included in the study. These teams were Austria Salzburg FC (Austria), Heracles Almelo (Netherlands), Dunfermline Athletic FC (Scotland), Helsinki JK (Finland), TUIL Tromsdalen Fotball (Norway), GIF Sundsvall, Gefle IF, IF Elfsborg, Västra Frölunda IF, Örebro SK, AIK, Hammarby IF DFF, KIF Örebro and Umeå IK (Sweden).

This report is based on data collected from February 2003 to March 2005. A total of 630 injuries (379 sustained on artificial turf, 216 on grass and 35 on other surfaces) have so far been reported from 71,300 hours of football (45,600 hours on artificial turf, 18,300 hours on grass, and 7,400 hours on other surfaces).

### METHOD

Each team doctor was provided with attendance record forms and was responsible for completing these forms with data about the players' attendance at training sessions and matches. The attendance records included all training sessions and matches. Only coach-directed sessions that included physical activity were recorded.

A recordable injury was defined as an injury that occurred during a scheduled match or training session and caused the player to miss the next match or training session.

All injuries were recorded on a special card. The injury card consisted of a single page on which all injuries were listed in tabular form.

### RESULTS

The injury data for the individual teams is shown in Table 1.

The total injury risk was lower when playing on artificial turf as compared to playing on grass (8.3 injuries/1,000 hours of exposure when playing on artificial turf compared to 11.8 injuries/1,000 hours when playing on natural grass,  $p<0.001$ ). To decrease the influences from environmental factors (different training content, etc.), we also made an analysis where we restricted the data set to first-team matches and excluded training sessions and appearances with the

second teams or national teams. This analysis showed no difference in injury risk between surfaces (28.0 injuries/1,000 hours on artificial turf and 32.0 injuries/1,000 hours on natural grass).

There was a large variation in incidence rates between the teams. The total injury risk varied between 2 and 17 injuries/1,000 hours of exposure, and the risk during match play varied between 8 and 49 injuries/1,000 match hours.

The incidence of **traumatic injuries** was lower on artificial turf compared to natural grass (4.1 vs. 8.1 injuries/1,000 hours,  $p<0.001$ ), whereas there was no statistically significant difference between surfaces for **overuse injuries** (3.7 injuries/1,000 hours on both surfaces).

Team	GRASS			ARTIFICIAL TURF		
	Exposure (hours)	Injuries (no.)	Incidence (injuries/1,000 hours)	Exposure (hours)	Injuries (no.)	Incidence (injuries/1,000 hours)
1	4,297	65	15.1	6,007	99	16.5
2	2,569	23	9.0	7,939	48	6.0
3	1,601	3	1.9	1,618	3	1.9
4	3,215	57	17.7	7,129	61	8.6
5	1,015	4	3.9	6,195	17	2.7
6	2,326	37	15.9	3,182	30	9.4
7	650	11	16.9	2,601	45	17.3
8	976	6	6.1	3,431	20	5.8
9	179	3	16.8	1,989	12	6.0
10	1,122	6	5.3	2,105	13	6.2
11	332	1	3.0	1,547	14	9.0
12	5	0	0	1,036	9	8.7
13	25	0	0	481	1	2.1
14	4	0	0	363	7	19.3
<b>Sum</b>	<b>18,316</b>	<b>216</b>		<b>45,623</b>	<b>379</b>	
<b>Incidence</b>				<b>11.8</b>		<b>8.3</b>

Table 1. Exposure hours, number of injuries and injury incidence on grass and artificial turf for the 14 teams included.



East End Park, home of Dunfermline Athletic.

The incidence of **major injuries** (causing absence > 4 weeks) was 0.79/1,000 hours on artificial turf and 1.26/1,000 hours on grass (no statistical difference).

There was no significant difference between artificial turf and grass for the incidence of **ligament injury** (1.6 injuries/1,000 hours of exposure on both surfaces).

The overall risk of **muscle-tendon injury** was lower when playing on artificial turf as compared to playing on grass (1.1 vs. 2.7 injuries/1000 hours of exposure,  $p<0.001$ ). The risk was lower for both thigh strain injuries (0.7 vs. 1.4 injuries/1000 hours,  $p<0.05$ ) and calf strain injuries (0.1 vs. 0.5 injuries/1000 hours,  $p<0.05$ ).

Seven of the teams have a **shock-absorbing elastic pad** under the artificial turf, whereas 6 teams have no elastic pad. Comparison of injury rates between the two groups showed that the teams playing with an elastic pad had a lower overall injury risk compared to the teams playing without an elastic pad (8.0 vs. 11.2 injuries/1000 hours,  $p<0.001$ ). This was due to a lower rate of overuse injury for the teams with an elastic pad (2.7 vs. 5.5 injuries/1000 hours,  $p<0.001$ ), whereas there was no difference in the incidence of traumatic injuries (5.2 vs. 5.7 injuries/1000 hours).

## DISCUSSION

This explorative study did not show any evidence of an increased injury risk when playing football on artificial turf as compared to playing on natural grass.

The study was based on a comprehensive data set from 14 (out of a total of 21) teams playing at elite

level on facilities having introduced the third generation of artificial turf.

The study is, however, limited by the fact that it was performed during the time when third-generation artificial turf was allowed and progressively introduced for competitive matches at elite level. A number of different types (brands) of artificial surfaces were included in the study, which explains the heterogeneous results obtained. Furthermore, not all of the brands met the quality criteria drawn up by UEFA later on. Given this limitation, at this stage we did not find any indication that competitive play on third-generation artificial turf increases the risk of injury. Rather, the results of the preliminary analysis suggest that playing on artificial turf decreases the risk of traumatic injuries, while no difference could be found with respect to overuse injuries.

Finally, due to the limited data set, it must be emphasised that these results are to be regarded only as tendencies. For instance, the large variation in the observed injury risk between the different teams is one reason for using the results with care in decision-making. The variation can be explained by both differences between the facilities with regard to the environmental conditions and the limited time period for the data collection. For more conclusive advice, we would need to follow the teams for several additional months and also add some new teams to the study group.

This is a medical study and did not consider the effects of artificial turf on playing styles or the quality of football produced on this type of surface.



This match between Heracles Almelo and Excelsior was played on artificial turf.

## CONCLUSION

- This study did not show any evidence of increased injury risk when playing football on artificial turf as compared to playing on natural grass.
- There was a large variation in injury risk between the teams included in the study.
- The results are to be considered as tendencies only due to the limited data set.
- If the teams were followed over a longer period of time and more teams were added to the group, we would be able to provide more meaningful conclusions. With a larger data set, we may be able to evaluate the difference in injury risk between different brands of pitches and possibly also whether injury risk increases with the ageing and deterioration in quality of artificial surfaces.

# CONSIDERATIONS IN FOOTBALL BOOT SELECTION

BY MIKE HEALY

In a full career a footballer may cover over 300,000 km in game and training activities. During a single game a player may travel up to 12 km, make over 500 ground/foot contacts per kilometre, spend over 50% of the game running, and have as many as 300 contacts with a ball. To maximise their participation in match (and training) activity, and achieve optimal performance, players must ensure they have selected the most appropriate footwear to suit their needs.

The football boot is the vital link in the chain of locomotion at the interface between the player's foot and the playing surface. Yet, football boots appear to change with a predictable frequency that has more to do with aesthetics than functional needs of a player. What then are the major considerations when choosing a football boot?

## Fit and Comfort

All our feet are different; even our own left and right feet are different. The foot posture is broadly classified in three ways – pes planus (flat foot), pes cavus (high-arched foot) and neutral. Width variations, wide, narrow and standard are

another added dimension. It is therefore important that the boot be suited to the player's foot type, length and width. Typically, most players wear boots a size smaller than their 'true' foot size in order to enhance ball control and 'feel'. However, a gap of between 5-10 mm between the tip of the longest toe and the tip of the shoe is considered to be the ideal. The foot must not slide around inside the boot; it will impair stopping, starting, and foot stability. The boot must fit cosily at the heel and instep, have a well-padded tongue, not have a high heel 'tab' (which may intrude onto the Achilles tendon) and, with laces tied of appropriate tension, the

foot should feel supported and comfortable. The 'toe box' should be also deep enough to accommodate the forefoot and to prevent abrasion to the dorsal (top) aspect of the foot or toes (which may cause blisters or bunions). In young players the boot must allow sufficient room for growth; any areas of redness or hardening of skin on the dorsal (top) surface of the foot may indicate a need to replace the footwear. Leather uppers, which are breathable, are considered the best option for football boots. However, new materials are now being used which are considered to offer comparable qualities to the traditional leather option.

The different brands of boot generate a myriad of stud configurations in terms of number, design, position, length, material. In addition to being conscious of the type of stud, a player should be aware of the position of the stud on the sole of the football boot. Stud position dictates specific focal pressures on the plantar aspect (sole) of the foot. It can be useful to lift up the insole to check the position and quality of stud fixation. If insidious, chronic foot pain develops as a result of changing to an alternate brand of footwear, one should consider that stud position may be part of the aetiology. Selection of a comfortable, well-



How to choose the right boots...



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fitting boot is best performed at the end of the day when the foot will have become slightly swollen. The feet should always be measured before selecting a particular brand of boot (or training shoe). Two different brands of boots (designated to be the same size) may in reality be significantly different due to variations in manufacturers' sizing.

The optimal foot position, a position producing less stress on the joints, ligaments and tendons of the foot, is different for everyone. For many players the interior of the 'standard' boot (which is usually flat) cannot accommodate their foot type or allow this desired optimal position to be achieved. In those instances custom-made corrective orthoses (inserts) made of a variety of materials of varying degree of rigidity/density are used to obtain the position and, where desired, influence the biomechanics of foot motion. These inserts should be as thin as possible so that the foot remains adequately supported in the boot, and must not compromise the functional characteristics of the boot, as this will ultimately affect player performance.

### Support, Stability and Motion Control

When a player's foot strikes the ground, the foot must initially be a flexible 'mobile adaptor' to accommodate to the playing surface, and then with continued motion become a 'rigid lever' from which effective propulsion can be achieved.

Pronation (rolling of the foot) is necessary in contributing to adaptation of the surface and to shock absorption, although excessive movement is undesirable. Weight-bearing propulsion also requires a high degree of stability; a stable base of support is essential for rapid cutting and turning movements and economic movement.

The football boot must facilitate this changing role in the foot function by providing a secure base of mechanical support and stability for the rearfoot at heel strike and at the midfoot and forefoot as the foot is progressively loaded. The degree of control will be governed primarily by the composition of the sole of the boot and the fit of the boot. Unfortunately, most football boots tend to force the foot to act as a single unit, limiting

natural movement. 'Energy return' is a feature of some football boots which are made of materials that compress and conform during impact but then return to their original shape with out any detrimental loss of energy.

Good heel fit is essential in controlling rearfoot movement and imparting stability on the foot during ground contact and ultimately the 'push off'. This is particularly relevant to the player with a hyper-mobile, flexible foot. Poor heel support may result in overpronation (excessive rolling of the foot) which causes torsion on the tibia and femur and with it an increased potential for injury. Good arch support and high lacing can enhance midfoot stabilisation and optimise foot function. Poor motion control in the forefoot, which may be due



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Football boots have changed enormously since the day when Danny Cripps took care of the Arsenal team's boots (1955).



Support your ankles!

ments, particularly when braking and changing direction, with the standing foot unable to escape from, or pivot in, the turf, subjects the player's body to lateral and rotational forces which impose shearing and torsional loads on the foot and joints of the lower limb; a suggested cause of metatarsal fracture. The abrupt halt to speedy forward motion can cause the foot to rotate over the leading edge of the boot resulting in serious ankle joint injuries and fractures to the foot and lower leg. The potential for lower limb injury and fracture is further compounded when the foot carrying the player's weight is unable to disengage from the turf and the body, leg or foot is impacted by a heavy tackle from another player.



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to too much room in the 'toe box', or the 'upper' material becoming overstretched, may result in increased lateral movement which can lead to excessive shear, compression, and instability of the forefoot, again resulting in injury.

**Cushioning (Shock Absorption)**  
At each strike of a player's heel with the ground during running, impact forces greater than three times body weight resonate through the body; these forces are elevated further when landing from a jump. An important characteristic of a football boot therefore is shock absorption (or cushioning), i.e., the ability to reduce peak impact force which occurs on initial ground contact. The boot should distribute the impact load, disperse pressure, prevent focal compression and dampen the impact forces between the ground, the boot, the foot and the rest of the skeleton. This is particularly relevant to the player with a 'rigid', inflexible foot type that is incapable of attenuating some of the impact force.

Unfortunately, most boots are usually flat, offer little shock absorption and clearly cannot accommodate each and every foot type. To embrace each and every difference in players' feet boot manufacturers would have to consider foot shape, the depth of the forefoot, instep height, heel width, forefoot width, heel to forefoot width ratio, forefoot swing, foot length and foot girth. Specific individual orthoses permit a player to 'modify'

the boot for their own needs. One should understand that if cushioned insoles are utilised they do lose their effectiveness very quickly and need replacing on a regular basis.

### Traction

A dynamic relationship exists at the frictional interface between the outsole of the football boot and the playing surface. Optimal compliance at this interface is critical if the players perform to their optimal level. The factors which influence the degree of friction at the interface, and which determine the amount of effective traction achieved from a particular brand of boot, are the composition and arrangement of the outsole and studs, the type and condition of the playing surface and the weight of the player wearing the boots.

The outsole, stud type and stud configuration must allow for good surface penetration ('grip'). Long studs (providing they penetrate the ground) ensure better grip due to increased friction between the boot and the playing surface. Good grip is essential if the player is to be able to stop, start, accelerate and decelerate, change direction rapidly, and strike the ball with the foot in contact with the ground remaining relatively fixed.

However, although good grip can facilitate improvements in performance, excessive grip and 'release failure' can increase the potential for injury. The extreme body move-



UEFA's Anti-Doping Panel.

**Front, left to right:**  
Hakan Nyberg,  
Caroline Thom,  
Dr Jacques Liénard,  
Dr Mogens Kreutzfeldt;  
**standing:**

Marc Vouillamoz,  
Philippe Verbiest,  
Dr Martial Saugy,  
Prof. Jean-Luc Veuthey;  
**absent:**

Dr Ian Beasley.

## DOPING MATTERS

The new UEFA Anti-Doping Unit began operations in January. It is headed by Marc Vouillamoz, assisted by Caroline Thom, a lawyer recruited from the World Anti-Doping Agency.

The Anti-Doping Panel comprises two members of the UEFA Medical Committee as well as legal, medical and laboratory experts. It is chaired by Dr Jacques Liénard (France).

The panel is responsible, among other things, for proposing an anti-doping programme and policy to the CEO. The panel has met twice since January and has defined the 2005 UEFA Anti-Doping Regulations as well as the testing programme for next season, which includes out-of-competition controls.

An education and prevention leaflet to warn players about the risks of doping and the mistakes which could result in a positive test or disciplinary sanction is currently in production and will be distributed to all players participating in a UEFA competition.

The first education session for players, medical staff and coaches will be organised at the European Under-19 Championship final round in Northern Ireland in July.

A Therapeutic Use Exemption (TUE) Committee has been created and will review all requests received from players participating in UEFA competitions.

### Injury Prevention and Protection

The football boot must afford protection to the dorsal (top) aspect of a player's foot from the direct trauma of repeated ball contact (kicking and receiving), or from the potential injurious challenge from an opponent. It is ironic that some boots are now constructed with thin, malleable 'uppers' to both lighten the boot and to improve the player's perception of 'ball feel', whilst potentially exposing the foot to an increased incidence of trauma. The plantar (sole) aspect must also be protected from the trauma it would be exposed to by different, changeable surfaces. It is acknowledged that the fewer the studs, the greater the potential risk of injury through deformation of the sole, particularly on hard surfaces. If the 'sole plate' of the boot (with a typical six-stud configuration) is too flexible and the studs do not penetrate the surface the mid foot can be subjected to bending and torsional forces which may cause insidious foot injury. In dry conditions moulded boots with a large number of studs (or training shoes if indicated) give better support over a wider area and reduce the risk of injury from these forces.

Players are ill advised to start a game having not previously worn the boots they are to play in; the sudden changes imposed on the foot may lead to unnecessary injury. They should first wear them in training for several, progressively increasing, short periods (approximately 30 minutes) before wearing

them in a match situation. It may pay to soak them in water prior to wearing them the first time, and use shoe-trees/stretchers/paper to 'mould' the boot. An increased injury risk and a reduction of performance may also result if the player does not select the most appropriate type of boot for the surfaces upon which they are training or playing (wet or dry, grass or artificial). To accommodate the variable surface conditions an array of football boots has been designed with a variety of outsole materials and a varied number, dimension, distribution and orientation of studs.

### Conclusion

It is impossible to describe the optimal boot characteristics for all players. The acknowledgement that all players' feet differ in size, shape, and functional characteristics means that the choice of the most appropriate football boot is a most individual one. Players should take into account their individual anatomical and biomechanical requirements, coupled with the required boot design factors and technologies which will allow them to perform at an optimal level. What should not be ignored is that ill-considered boot selection can predispose a player to unnecessary long-term injury. The most astute choice of football boot should not be based on design or brand (or sponsorship), but rather on the grounds of proper fit, performance enhancement and injury prevention. Looks are not everything!



# DOES HEADING THE BALL HARM YOU? – NOW OR LATER?

BY PROFESSOR MYLES GIBSON

**Football is almost certainly the most popular and most widely played game in the world. Soccer has always been a game different from others because of the skill and purposeful use of the head for controlling and projecting the ball. In some of these activities the head and neck are protected by the neck muscles, as impact with the ball is anticipated, but in others the impact is not anticipated and the head and neck are not protected.**

In recent years there has been increasing interest in the possibility that heading a football in the course of play, whether competitive games or training, could cause immediate or delayed long term consequences for brain function. Several studies over the years reporting late problems in the brain due to heading the ball after a football career are now recognised to be seriously flawed because the analysis has frequently not investigated the complete career profile of a footballer and made no attempt to identify and stratify the other means by which the head can be injured in the course of football activity. For example, there are a number of ways by which the head may be injured apart from heading and these include not only the ball striking the head forcibly but the head striking an opponent's head or knee, impact with goal post or other off-field objects and in recent years, as the game seems to have changed, use of the elbow has caused serious impact blows to the face and brain. There are no studies so far which detail the actual heading exposure of the player, for example in different playing positions on the field, although some six to seven headers on average have been quoted. Experienced professional footballers would probably regard that as a low figure.

Additionally, the number of headers conducted in training is not reliably known. Bowden noted that the mechanism of head injury in football was most frequently head-to-head contact, followed by head to ground, then head to other body parts. Gibson concluded from reviews in the English football leagues that head to head was the commonest cause of head injury but also pointed out the significant incidence of elbow-to-head and facial skeleton injury and highlighted that serious injuries to the head and brain appeared to be caused mainly by the use of the elbow. Ball-to-head heading was never accompanied by significant or serious head injury unless the player was unprepared and struck accidentally and with force by a kicked ball at short range.

Steps already taken to protect players and prevent injury include improved coaching with emphasis on heading techniques, size of ball regulation for young players, regulations on the weight of the ball and water resistance and size of playing pitch regulated by age.

It is also important to remember that footballs used prior to the 1970s were made of leather and

could absorb a lot of water when played in wet conditions. Since then several different types of ball have been used with water-resistant coatings but it was not until the late 1980s that the manufacture of the modern ball with synthetic materials made it resistant to water absorption and therefore avoided the heaviness and weight incurred with the water-laden leather ball. It also has to be remembered that the velocity of a kicked football will vary greatly according to the experience and skill of the player; hence the impact of the ball to the head is equally variable and difficult to assess.

Norwegian studies have been widely quoted as evidence that heading can result in impaired brain function in relation to cognitive features such as memory, concentration and decision-making. However, numerous other studies conducted since the early Norwegian studies have been unable to note any such deficits as a result of purposeful heading of a football and the earlier studies do not stand up to detailed scientific scrutiny.

In addition to concerns about the possible long-term effects of heading the ball in a football career, much attention and research have been focused on the management of the player injured in the course of a game and what best advice should be given as to return-to-play fitness.



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The head is useful but fragile.

Several attempts have been made in the last few years to define and understand the clinical features of concussion that can arise on the football field when a blow has occurred to the head by one mechanism or another. Until recently, the incidence and effects of concussion were not regarded as significant problems in football and this tends to suggest that concussion is not always recognised when it has occurred and also the aftermath or after-effects not always appreciated or treated. Perhaps the reason for this lies in the confusion between the terms "concussion" and "unconsciousness". Players, medics and referees all recognise unconsciousness when the player has been knocked out, but concussion and its subtle symptoms and features often go undetected. A player does not need to be rendered unconscious to have suffered concussion and perhaps the best definition of concussion is that reached by the concussion study group in Vienna 2001.

### CURRENT GOOD PRACTICE

There have been helpful new guidelines produced for field-side and track-side medical personnel helping them to recognise concussion, and protocols to standardise the assessments which should be made at that time. Different sports have different rules about returning to play following concussion events but soccer remains the most pragmatic and helpful both to players and coaches. Each player is different, each injury is different,

each brain reacts differently so each case is assessed on its merits. Copies of the guidelines are available.

### A GLIMPSE INTO THE FUTURE – AN IMPORTANT RESEARCH PROGRAMME

Looking ahead, it is necessary to try and establish as far as can be, with a prospective longitudinal study, what, if any, are the possible after-effects of a career as a footballer with respect to possible impairment of brain function or aggravation of underlying constitutional "brain conditions". The neurosciences group of the Leeds University Medical School, comprising a leading neurological surgeon, a neuroradiologist and two consultant neuropsychologists, have set out a longitudinal prospective research programme, funded by the Professional Footballers Association and The Football Association (England). A cohort of young professional footballers is undergoing detailed assessments in clinical neurology, neuroradiology and neuropsychology. These assessments are detailed and use the latest state-of-the-art scientific profiles. These studies will be assessed and reported in the medical journals in 2006 and are expected to be a signal contribution to scientific knowledge on these issues. They will help to establish the state of knowledge in this field. Guidelines will be produced which should enable medical staff in the professional football

leagues and non-medical staff in the amateur and lower leagues to afford a good standard of care to the footballer who may suffer a head injury or concussion while playing and advise on his early and late treatments.

### SUMMARY

It is hoped that this study will make a significant contribution to the well-being and safety of those engaged in playing football, and a reassurance to parents of young players involved in the sport. Helpful, simplified information should also be available to assist medical staff access a player's fitness and ability to return to play based on sound clinical and psychological information. Head-injury concerns are frequently a matter of request for urgent help and guidance by medical and coaching staff. The knowledge that this matter is taken seriously should give confidence to players that their best interests are being observed, not only during their playing career, but also in later years.

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