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THE BEST WA

IMPRESSUM

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Following the election of Michel Platini as president of UEFA, our institution is now moving closer to its origins: in other words, it is moving closer to the game of football. It is a fact that the complexities of today's administrative, legal and political connotations expose us to the risk of forgetting our basic product – the ball – and that the top items on all our agendas have to be football, football matches and the best ways of protecting the game.

Exactly the same principle applies to UEFA's Medical Committee. Sometimes people can be lured down such sidetracks as scientific congresses and fail to remember that our real responsibility is to address all the practical medical issues related directly to the game itself.

A quarter of a century ago, medical resources were directed almost exclusively to the treatment of injuries. Since then, we have come through a period which could be described as a real medical revolution. We have benefited from major advances in the domains of orthopaedia, physiology, psychology and pharmacology. We have seen substantial developments in our visions of prevention programmes, of progressive post-surgery rehabilitation, of sensible and sensitive medical protection afforded to young players – who should not be treated as 'miniature adults'.

At the same time, the explosive growth of women's football has demanded our attention in terms of establishing a specific approach to the special aspects derived from the relationship between women, girls and the game of football.

Other issues, such as hygiene, nutrition and hydration, underestimated for so many years in our sporting discipline, are nowadays rightly considered as factors which can decide the final result. I would also like to draw attention to the advances made in areas which are hidden slightly further away from the public eye, such as medical programmes

COVER

Alessandro Del Piero in front of Suni Olsen in the Faroe Islands v Italy EURO 2008 qualifier. Like the 2006 World Cup, EURO 2008 will be the subject of close medical attention.

Photo: Sabattini

EDITORIAL

By Dr Michel D'Hooghe
Chairman, UEFA Medical Committee

YS OF PROTECTING THE GAME

specifically devised for referees and for goalkeepers.

In the meantime, I think it is fair to say that every team doctor has been keeping track of developments in the field of doping methods and doping substances: blood transfusions, growth hormones, epopoietin and other substances which have taken the place of amphetamines. The products have changed, but our principles have not: we are still saying 'no' to doping and 'yes' to ethics, to the integrity of our competitions and to the welfare of our athletes. Happily, our sport can present some reassuring statistics which are substantially inferior to 1% in terms of positive results in doping controls (0.4% in 2004 and 0.3% in 2005), but we have to stay on our toes.

The globalisation of our sport has created some demanding situations on which we need to take a medical stance. We need to address issues that are becoming more frequent in professional football, such as jet-lag and the effects of playing at different altitudes or in extreme climatic conditions. We still need to establish and enforce certain minimal criteria in matches and tournaments. We still have a lot of work to do in the field of football-specific education aimed at developing the team doctors of the future. We also need to ensure that properly-educated people are responsible for medical infrastructure at stadiums – especially when it comes to reacting in a thoroughly professional way to emergency situations.

Sports medicine also exerts a direct influence on the Laws of the Game. Medical evidence has been the determining factor in decisions taken by the International Board on facets such as the tackle from behind or the use of the elbow. The constant evolution of the game obliges us, the people responsible for the medical care which surrounds it, to re-educate on a continual basis – and not in the lecture room of a university but on the field of play and in the areas which are directly related to our footballing organisations.

The team doctor of yesteryear, isolated and very much a solo performer, has progressively been replaced by an effective medical team which offers total medical backing to the players who takes the field. Everybody – including coaches and administrators – directly concerned about the results of football matches agrees in unison that the standard of the medical care offered to the players has a great influence on the standard of performance.

In other words, medical staff these days have more responsibility than ever before. The beautiful game is based on a blend of incredible simplicity and incredible complexity: the same applies to football medicine.

MAKING FRIENDS AND MEETING PEOPLE

In a year with no FIFA World Cup or UEFA European Football Championship, age-limit competitions move towards centre stage. And participants at final rounds played in recent months have been – perhaps unwittingly – witnesses to an important evolution in terms of UEFA's medical presence.

In the past, the UEFA Medical Committee was an entity which operated backstage. There is now much greater direct contact between UEFA's medical staff and the teams that play in UEFA competitions. UEFA's medical activities are important – and so are the corridors of dialogue with team physicians which have been opened up by greater and more visible presence at UEFA events. Apart from debating topical issues in Nyon, the medical team is now getting out into the field and meeting the performers.

This became evident at the final rounds of each and every age-limit competition. At the Under-17 finals in Belgium, the Under-21 finals in the Netherlands, the Under-19 finals in Austria and the Women's Under-19 finals in Iceland, anti-doping educational sessions were written into the programme. All players, coaches and medical staff attended hour-long sessions on a team-by-team basis. This meant that valuable contact was made and valuable messages were transmitted to 32 squads – almost 600 young internationals. Audiences were receptive, the sessions were much appreciated, and feedback has been extremely positive.

At the same time, the extension of UEFA's injury research project into the final rounds of age-limit competitions has also served to strengthen cooperation and relationships, as well as providing vital data to be correlated with findings from other tournaments. In the process, some interesting debating points have arisen. For instance, the Under-19 finals in Austria produced injuries to three goalkeepers – one of the anecdotes was that the goalkeeper of the Spanish champions was selected for UEFA's Team of the Tournament despite watching the final on crutches – and, given that 18-man squads are the norm at this level, three replacement goalkeepers had to be located and flown in. The Spaniards, as it happened, had only one replacement available, bearing in mind that the FIFA U-20 World Cup was running almost in parallel with the tournament in Austria.

It goes without saying that increased activity by UEFA requires an increase in the supporting cast. In human terms, seven candidates to join the 38-strong squad of Doping Control Officers attended the annual DCO Seminar in Nyon at the beginning of June. The newcomers will now gain their first experience on site alongside one of the more experienced DCOs before definitive recruitment into a squad which, in the near future, will need to expand its scope in order to cope with the newly introduced programme of blood-testing (approved by UEFA's Executive Committee to take effect in next year's EURO 2008 finals).

But the 'supporting cast' also features inanimate objects. Everybody who attended one of the sessions at an age-limit tournament, for example, received a copy of UEFA's leaflet outlining the 'step by step doping control procedure for football players'. At the start of the 2007/08 season, 27,000 copies of another leaflet were distributed to all national associations and clubs entering teams in UEFA competitions. The publication highlights – in a very straightforward and comprehensible manner – the most important doping issues that players should know about. The leaflet is available in English, French, German, Italian, Portuguese, Russian and Spanish.

Sportsfile

Informing participants about the dangers of doping during the European Under-19 Championship final round in Austria.

For the first time, there was an anti-doping flavour to the UEFA Champions League final – not just for the players, but for the public, too. In Athens, the 'Champions Festival' featured a UEFA anti-doping area, where the most popular element was the WADA quiz which educated and informed people about the dangers of doping. The quiz was available in 15 languages and everybody from children to grandparents enjoyed taking part – and going away with a UEFA gift.

Another important innovation has been built into the Training Ground area of uefa.com, which was officially launched at the UEFA Cup final in Glasgow on 12 May. It features an anti-doping e-learning platform addressed to all levels of players, coaches and medical staff – indeed anyone who is interested in football. Users are guided through the platform in a way that allows them to gain access to personalised information. In other words, a 12-year-old player will not see the same content as an adult team doctor. This will be developed further in the coming months.

But the most compelling message delivered by UEFA is undoubtedly the data related to doping controls during the 2006/07 season. In the UEFA Champions League, all 32 clubs underwent out-of-competition testing. A total of 51 visits were made (eight more than in the previous season); 506 players were tested (83 more than in 2005/06) and 431 samples were tested for EPO. The two finalists in Athens had been tested three times during the season. The UEFA Champions League testing yielded no positive cases.

This was not the case in doping controls carried out in all UEFA competitions. A total of 1,048 players were tested, including 471 analyses for EPO. Four positive cases were reported – three of which related to social drugs and the other to a high concentration of glucocorticosteroids. Four positives represent a minuscule percentage, but our attitude has to remain that four positives are four too many and that vigilance must not be allowed to fade.

For the record books, the 2006/07 season produced the first case of a player (FC Bayern München goalkeeper Oliver Kahn) receiving a one-match suspension from the UEFA Champions League as a result of improper conduct during a doping control. Well, maybe you can't make friends all the time…!


PA Wire/PA Photos

Doping controls were carried out during last season's UEFA Champions League, including the final between AC Milan and Liverpool.

MEDICAL CARE AT THE 2006 FIFA WORLD CUP IN GERMANY

By Prof. Wilfried Kindermann

A high degree of importance is attached to medical care at major international tournaments. At the World Cup, FIFA expects the local organising committee (LOC) to provide staff, equipment and facilities for comprehensive medical care for all tournament participants and accredited persons. These include the 32 teams (support for team doctors), officials, VIP guests and the FIFA and LOC staff. The German Red Cross (DRK) had prime responsibility for emergency medical care for spectators at the 12 stadiums and worked closely with the respective local medical officers (LOC MOs) at the match venues. Preparations began two years before the World Cup. The 2005 Confederations Cup, which was held in five cities, was a welcome dress rehearsal, even in terms of medical care.

ORGANISATIONAL STRUCTURE

The medical services organisational structure is shown in the diagram opposite. The chief medical officer of the local organising committee (LOC CMO) was responsible for all medical care and for the implementation of the FIFA guidelines. He cooperated closely with the chief medical officer of FIFA (FIFA CMO) and his deputy. For each match venue, the LOC CMO appointed a LOC MO, who in turn recruited a team of staff representing different medical disciplines. The LOC CMO coordinated the LOC MOs and was responsible for ensuring common standards at all the venues. The FIFA CMO also assigned a FIFA medical officer (FIFA MO) to each venue.

In the run-up to the World Cup (March 2006), a medical team workshop was held in Düsseldorf, involving team doctors from all the participating countries, the LOC MOs and the FIFA MOs. The medical services' organisational structure was presented and all medical aspects, including doping controls, were reviewed and discussed. Information was also provided concerning the compulsory medical examinations that were to be carried out before a World Cup tournament for the first time. The examination form drafted by the LOC CMO and FIFA CMO included sections on general, cardiological and orthopaedic health. No players had to be disqualified on medical grounds. All the examination forms were evaluated.

TEAM BASE CAMPS

The medical staff needed to be available from the moment the teams arrived at their team base camps (mostly between one and two weeks before the first match). Since some of the base camps were up to 200 km from the nearest match venue, for the teams staying in the most remote locations the LOC MO appointed doctors based nearby to support the team doctors when necessary – by making important diagnoses, for example. Providing medical care for the teams in their base camps was sometimes very demanding and, in many cases, time-consuming. In total, approximately 10% of all the players were given medical support at some stage. The most common procedure was an MRI scan.
A 24-hour telephone service was also provided before and during the tournament by the LOC MOs or their representatives. This emergency service was available to all FIFA-accredited persons. Surgeries were held at the FIFA headquarters in Berlin every morning and evening. A total of 144 consultations took place here with 77 patients, mostly FIFA staff. Two patients had to be admitted to hospital.

In addition, one or more hospitals were appointed in each host city (FIFA/LOC delegation clinics). They offered 24-hour outpatient and inpatient emergency care for players and all other team members, as well as other FIFA-accredited persons.

STADIUMS

Inside the stadiums, the necessary medical care was provided on match days in cooperation with the German Red Cross (DRK). The LOC MO was directly responsible for medical care in the pitch area, medical room area, VIP area and

Andersen/AFP/Getty Images

A competent medical service is the best way to avoid complications.

doping area. A pitch-side team comprising a pitch doctor and three stretcher-bearers was positioned next to the pitch, alongside the two team benches, ready to carry injured players from the field if waved on by the referee. As well as the medical room in the changing room area, another medical room was provided in the VIP area. The doping control rooms were set up in accordance with FIFA rules in all the stadiums. Doping controls were carried out by the FIFA MOs, each assisted by a German doping control doctor. The FIFA MOs were also responsible for distributing the FIFA injury study forms to the team doctors after each match.

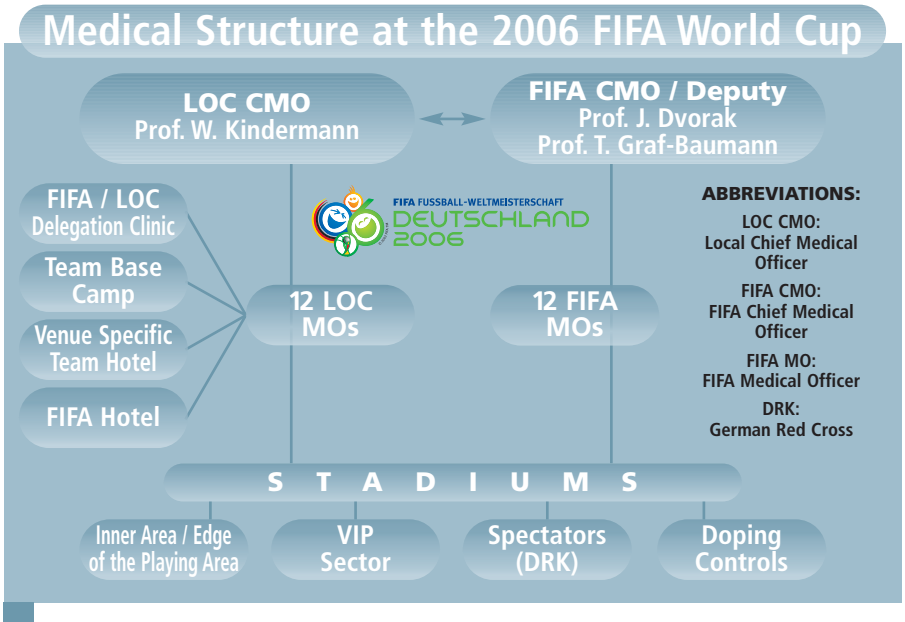
The DRK was primarily responsible for providing medical assistance to injured or ill spectators within the stadium area. Throughout each stadium, an average of 20 to 25 automated external defibrillators (AEDs) were installed, so that, where necessary, defibrillation by trained emergency medical staff could be provided within four minutes of an emergency being reported.

STATISTICS

Approximately 200 doctors worked on a voluntary basis to provide medical care for the teams, FIFA-accredited persons and VIPs in the stadiums. Medical assistance for spectators in the stadiums was offered by 132 DRK staff at each match. On average, medical aid was given 80 times per match, with five per cent of the incidents in the VIP area, where a particularly high level of medical care was available. Two-thirds of cases requiring the help of a doctor concerned internal or general health complaints, mostly heart or circulation problems. There were 11 suspected heart attacks. Just under 30% of cases involved suspected fractures, cuts, lacerations and fall injuries. During the whole World Cup, there were approximately ten consultations or cases of treatment being administered to players, other team members and accredited persons at each match venue. These are in addition to the aforementioned consultations at the FIFA headquarters in Berlin. Hospital treatment, mostly outpatient, was required between five and ten times at each match venue.

SUMMARY

The medical service functioned very well. Not even a doctors' strike which took place during the tournament was able to affect the medical care provided. As chief medical officer of the World Cup Organising Committee, I am not aware of any situation in which health problems resulted from poor medical treatment. With regard to future World Cups or European Championships, it should be pointed out that support for team doctors with the medical care of their players, starting as soon as they arrive, is very important and can be extremely time-consuming. I would like to emphasise the high level of commitment shown by all the voluntary doctors who carried out their duties in parallel to their normal professional activities in hospitals and surgeries.



CHILDREN AND YOUNG PEOPLE IN FOOTBALL

By Prof. Siegfried Israel
and Dr Hans-Jörg Eissmann

Football training for children and young people aims to produce a long-term specialised increase in performance, and is designed both to ensure a healthy lifestyle and to optimise growth and development.

Heimann/Bongarts/Getty Images

Every young player should concentrate on getting his or her technique right.

Speed and coordination of movement can be classified as 'early developments' in the context of heterochronic organ development. The top priority for any young footballer is technical training under increasingly difficult time conditions; before puberty, power and stamina are mostly built up naturally in football training sessions. Muscular imbalances which are already discernable during childhood need to be evened out using specific exercises, and coordination training must be permanently sensitive to changes in bodily dimensions dependent on growth rate. The ability to train is not gender-specific before puberty, but those who develop earlier are often more resilient than later developers. It is the collective responsibility of sports medicine and clubs and associations to make children and young people who play football aware of the problems related to personal hygiene and diet, as well as those pertinent to the prevention of illness and injury that are specific to their sport. Nevertheless, the following information is, in principle, valid for all sports.

THREE IMPORTANT ASPECTS

Sports medical care for children and young people in football should be provided taking into account the interaction of three aspects:

- Health
- Growth and development
- A long-term, sport-specific increase in performance.

The body's main organs grow at different rates after birth:

- The brain gets 3.7 times larger
- The heart gets 15 times larger
- The liver gets 18 times larger
- Muscles get between 30 and 40 times larger.

The following biological principle is worth considering in the context of heterochronic organ growth: In order for them to develop at their optimum rate, bodily structures must be stimulated during growth.

The central nervous system (CNS) develops early and matures quickly: by the age of three, the brain has reached 80% of its final weight. Thus the CNS needs to be stimulated early in the ontogenic process if optimal development is to occur.

COORDINATION

Of the motor abilities (power, stamina, speed of movement, coordination and agility), coordination (skill and dexterity) is controlled to an especially high degree by the CNS. On the basis of a quick development of central nervous functions, the biological prerequisites for the acquisition of coordination of movement, i.e. the ability to execute precisely a movement-related task, exist from an early age.

A very high level of trainability of neuromuscular coordination is already present in view of the advanced development of the CNS at pre-school and early school age. The young footballer needs to learn

Rose/Bongarts/Getty Images

Movement coordination greatly reduces the risk of injury.

to move in a specialised way (to gain skills and sports techniques): first simple and then more varied and complex skills need to be acquired, both in action (with and without the ball) and in reaction. Any factors that are neglected in this period of a young footballer's life can never fully be recovered. Based on our research, the conclusion of some classical teaching manuals – that the most important age for the development of motor nerves is between 8 and 12 – is not necessarily any longer valid!

The connection between development in neuromuscular coordination and an improvement in sensomotor regulation (feedback) follows a set pattern. The response thresholds of proprioceptors in muscles and joints stay low when coordinative qualities of muscle action are put under permanent stress early in life. The senses (especially sight) are sharpened and the prompt perception of the movement of the ball, of other players and of the player's own body is honed.

Neuromuscular coordination is also a factor in the prevention of injuries – uncoordinated movements are risky. A talent for football can be recognised early from an aptitude for motor-nerve learning (such as in the way a player uses the ball, his body control and his ability to read the game).

SPEED OF MOVEMENT

The movements of a childhood footballer must be exact (technically accurate) and fast. Amongst

Rose/Bongarts/Getty Images

Movement coordination and speed have to be practised from childhood.

other things, speed of movement is the result of precise inner coordination.

Motor-nerve creativity can be identified in skill under time pressure. Football practice with children is geared primarily towards learning quickly-coordinated, acyclical motor-nerve based actions and reactions. The laws of physical development state that teaching technique takes priority for the child footballer. Coordination and speed of movement are 'early abilities' and so justified developments in childhood years. A balanced level of fitness (power and stamina) is necessary to produce coordinated and quick movements both in training and competitive situations.

POWER

In football, power is indispensable to stabilise joints and to avoid injuries and fatigue. Before puberty, no additional weights should be introduced during general strength training; the control of a player's own body weight is sufficient for a football-specific increase in power. Power should develop fundamentally in all areas of the body. The use of specialised training material gives the appropriate priority to muscle strengthening in the knee and ankle joint areas.

STAMINA

Stamina is defined as the ability to resist tiredness and is necessary to tolerate higher demands on the body, as well as to reach goals set both in training and in competition. The stamina component in training helps, amongst other things, to improve the function and stability of the heart, the circulation, the respiratory system and the metabolism, as well as the nervous, hormone and immune systems. Good stamina is the cornerstone of stable health, durability and the ability to recover. These qualities are also important in sustainable motor-nerve learning (technique training) and in the avoidance of so-called tiredness mistakes.

Fitness training for children is based on the principle of intervals. Continuous running is as inappropriate for young footballers as it is for other children and can have a demoralising effect. Children and young people in football mostly increase their stamina using special training involving constantly-repeated specific movements.

AGILITY

It is the opinion of some teaching sources that muscular imbalances can be identified objectively in childhood. Football training requiring participants to be in relatively good condition leads to lasting delays in contractions in a number of muscles in the legs and torso. Participants should make sure they stretch properly both before training as part of the warm-up and afterwards as well. Because it releases growth hormones, the stretching of a muscle also stimulates a hypertrophy, producing the desired increase in power. Furthermore, tension-releasing stretches can help prevent injuries even in children.

PREPUBESCENT GROWTH SPURT

A growth spurt of between 8 and 12 cm is normal in the year before puberty; consequently the body's centre of gravity moves upwards and limbs quickly become much longer. During this phase of quickly-changing body

Rangers FC/PA Photos

Coordination exercises have to be performed regularly and adapted to a child's physical growth.

proportions, dexterity and especially football-specific techniques are temporarily visibly compromised. Special movements can be applied to this period of rapid growth by virtue of continuous exercises to help coordination – long legs are controlled differently from short ones! The coordination of movement must always be at the forefront of children's football training. Before puberty, this motor ability should be taught through constant firm correction during technical training.

PUBERTY

There is no difference in the physical resilience and the ability to train between girls and boys before puberty: boys have a slight genetic advantage, but girls mature faster, and these factors largely cancel each other out until the start of puberty. Puberty is neither a crisis for young people training for football, nor should the demands of training or competition be reduced, even if individual psychological characteristics dependent on puberty have an indirect effect on sports medicine.

BIOLOGICAL AGE

At the moment at which a child reaches puberty, there can be a difference of +/- 3 years between calendar age (how old they are) and biological age (their state of development). This is the source of the debate on the resilience of early and late developers. It has been proven that early developers are more resilient than their later-developing counterparts. It is advisable to proceed with greater care and patience during sports training sessions with children whose development is lagging behind.

TRAINING MOTIVATION

The pleasure of playing football is the central motivation to train. It is important to create situations that demand success, but it is of equal importance to avoid failure. The integration of psychological and physical factors should be considered constantly: optimal adaptive physiological reactions in movement occur when the emphasis in training is on enjoyment. Priority should be given to making the game fun, although discipline and the authority of the person in charge of the exercise are to be accepted. This person is also responsible for channelling a child's permanent desire to move.

The leader of the exercise is there to educate participants about health. It is his responsibility to make children and young people who play sport aware of the problems related to personal hygiene and diet for sport, as well as those pertinent to the prevention of illness and injury.

Sports medicine together with clubs and associations is called upon to furnish coaches and trainers with the necessary knowledge and teaching materials appropriate for young people for their basic and continued education.


UEFA

The enjoyment of playing is the key motivational factor.

EXERCISE TESTING OF REFEREES: FOR FITNESS AND HEALTH

By Prof. W. Stewart Hillis

The game of football has become more physically challenging for its participants, with increasing levels of fitness of players and changes in the Laws of the Game to reduce periods of relative inactivity by having the ball played more quickly from the goalkeeper and the rapid removal of players from the field of play for treatment.

There is an associated increase in fitness requirements for referees to maintain control of the game. Closer scrutiny of refereeing decisions by television re-runs and touchline observers has also increased both the physical and psychological stresses associated with the responsibility of implementing the rules of the game and ensuring that players abide by its regulations. The physical demands on referees will in part not be within their own control but will be determined by the pace and tactics of the teams and the competitive level of the players.

Awareness of the high demands on referees has promoted many studies to examine the physical requirements and resulting physiological demands. Methods of physical assessment have been applied to perform pre-activity screening of fitness to develop activity-specific training programmes and to not only assess overall fitness but also to examine and maintain the health of the individual. Although referees differ from players in that there is no contact with the ball or other participants, as in tackling, it is obvious that there are no periods of rest between activities, nor possibility of substitution, other than in the case of significant illness or injury.

FITNESS ASSESSMENTS AND PHYSICAL REQUIREMENTS

The gold standard measurement of fitness is the assessment of maximum VO_2 (maximal uptake of oxygen). This is applied in assessing athletic fitness, but low values are also a predictor of cardiovascular health and clinical events. The measurement of VO_2 is performed in a laboratory environment. Although portable equipment is available for testing, this remains cumbersome and is difficult to apply during free-ranging activity. Assessment of VO_2 in referees has confirmed a greater level of fitness compared with age-matched non-conditioned individuals and in referees has been shown to correlate well with the total distance covered during a match and also with the achieved exercise intensity. The measurement of VO_2 is expensive, requires specialised equipment and skilled technical super-

Referees have to pay attention to their physical preparation to perform well on the field.

Skarzynski/AFP/Getty Images

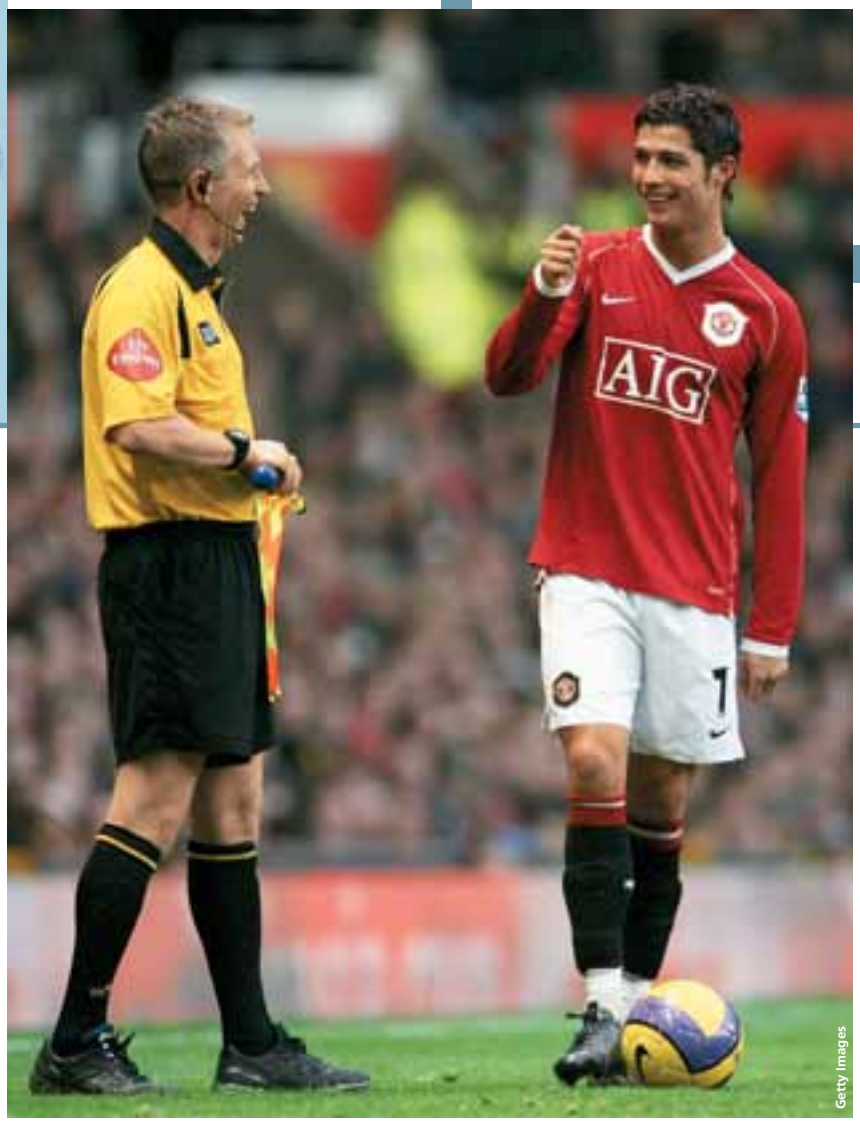
vision, and therefore has practical limitations in its application. Field tests have been developed to simulate the physical requirements during games which can be applied to the assessment of groups. They generally require little equipment and allow a large numbers of referees to be supervised simultaneously.

The distance covered during games has been studied over time in many countries with different playing styles and at different levels of the game. Distances covered have been as low as 7 kilometres in observations of English county games, up to levels of over 11 kilometres in the FA Premier League and up to 14 km in Serie A in Italy. Danish and Scottish observations have confirmed mean values of over 10 km, with assistant referees covering over 7,000 metres. The proportion of high-intensity activity is 1.67 kilometres, including running at speeds of greater than 25 kilometres an hour. There is a requirement of 150-200 sprints per match over up to 50 metres, with involvement of some 200 decisions per game and over 1,400 activity changes per match.

These activity levels are associated with a high heart rate – an average of 85% of the maximum heart rate achieved on maximum exercise testing reaching two thirds of the VO_2 max. as calculated in the laboratory. These physiological demands are similar to the activity of players, who have had mean values recorded of 85% of maximum with peak values of 98%. Serial investigations have confirmed that there is a higher demand at higher levels of competition, with international players having more high-intensity activity than other professionals. Distances covered by referees match those of the players and are equivalent to those with the highest demand, i.e, midfielders. Although decision-making as a referee may be influenced by the art of positioning and experience, it has been shown that there is a positive relationship between higher fitness test performance and match performance and that those with the highest levels of fitness testing performed more higher-intensity activity during matches.

ASSESSMENT OF FITNESS

In the past, national and international referee associations made recommendations regarding the assessment of the fitness of elite-level officials. Field tests were conducted using sprints of 50 and 200 metres respectively and a distance run over 12 minutes was performed. This latter test had shown a positive correlation with laboratory-measured VO_2. Over time, comparison of the field tests and on-field activity suggested



Getty Images

Competitive tension does not preclude lighter moments…

that the 12-minute run correlated only moderately with the total match distance covered and showed a poor correlation with high-intensity activity and maximum distances covered at speed, suggesting that these field tests were not specific to the activity profile required during games. Sprints were seldom further than 30 metres and the distance assessment was at a regular pace rather than the more challenging intermittent high-intensity activity of matches.

New regulations have been introduced by FIFA and UEFA consisting firstly of six repeated 40-metre sprints and secondly of an interval test composed of 15 150-metre high-tempo runs, each of which is considered a lap. Between each of these laps is 50 metres of active recovery walking. The time required for the sprints and time allowed for active recovery between the high-intensity shuttle runs depends on the sex of the official and the level of the game. The time to be allowed for the sprint tests varies between 6-6.8 seconds and the amount of time allowed for active recovery between the high-tempo runs varies between 35-45 seconds. These new tests are thought to simulate more naturally the running pattern of a referee during a match.

Campbell/AFP/Getty Images

A fit referee is always close to the action and able to judge how serious an injury is.

Women referees such as Bibiana Steinhaus need special training programmes to officiate in top-level football.

Further studies are required to confirm these initial observations and to apply this testing to the game at different competitive levels and with different playing patterns in different countries.

The scientific observation of laboratory-based assessments of fitness transferred and applied to field testing has given a very solid base for screening and ongoing assessment of individual referee fitness levels. We must look critically, however, at not only the fitness aspects of all officials but obviously their overall health profile. The average age of European standard referees is approximately 40 years and they are asked to undertake the same amount or even more activity than players who average 24 years. UEFA and national governing bodies are now requesting that players be screened for structural abnormalities of the cardiovascular system by the age of 21 for licensing purposes. There is no similar recommendation for referees. Are we putting any of our officials at undue risk? Coronary heart disease remains the most common cause of premature morbidity and mortality in participants partaking in sport. The highest risk is associated with very high levels of physical activity which require high heart rates generating high blood pressure and cardiac contractility – all of which put maximum demand on the heart and associated coronary artery blood flow.

These cardiovascular changes indicate responses in the blood, stimulating aggravation of platelet cells which can potently initiate thrombus formation in the coronary circulation. The values of stimulation which result in referees are much higher than in untrained, unconditioned couch potatoes who cannot achieve high exercise levels.

Should members of associations provide the same screening recommendations for pre-participation examination of all referees, as is now suggested for players, but with the extension of risk factor assessment, including the measurement of plasma cholesterol as well as routine clinical examination for structural abnormities such as hypertension and diabetes? Unfortunately, high levels of fitness do not always mean good health. Risk factor modifications through lifestyle changes, and even pharmacological treatment of individuals, would limit the small risk induced by high levels of exercise during the referee's most important 90 minutes of the week.

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