

SCREENING IN FOOTBALL PLAYERS

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WHAT IS SCREENING?

Screening is a process used in a population to identify unrecognised disease in individuals without signs or symptoms. The World Health Organization published guidelines for assessing a screening programme in 1968, now called the Wilson-Jungner criteria¹.

The key criteria are as follows:

- The condition screened for should be an important health problem.
- It should be detectable at an early stage.
- There should be a treatment available for the condition that is of more benefit earlier than at a later stage.
- The test should be acceptable to the population.
- There should be an agreed policy on who to treat.
- The process should be cost effective.
- Screening tests should also be reliable, specific and sensitive.

WHY SCREEN FOOTBALL PLAYERS?

Screening in football players (or any other sporting population for that matter) usually

forms part of an annual health check, which has a wider purpose than the identification of individual occult disease.

The most important aspect of this health check is the identification of unknown medical conditions that might place an athlete at risk from participating in football. The obvious example of this is an underlying cardiac condition that may place a player at risk of sudden death during exercise. However, there are many other conditions that also warrant regular screening investigations. For example: lack of immunity to hepatitis B in a country with a high prevalence of carriers of this disease is a much more common, but less newsworthy, problem.

The annual health check also facilitates identification of unknown medical conditions that might affect performance, for example mild iron deficiency or exercise induced bronchospasm. Often players are not aware that their lack of performance may be attributable to a treatable illness.

A less common, but very important aspect of this annual check is a review

of known medical conditions - to ensure correct on-going management. This allows for optimal performance and ensures player safety, for example adequate control of diabetes mellitus.

Then there is also the review of recent injuries to ensure full recovery. For example:

- Review of a recent ankle inversion injury.
- Checking that there are no residual symptoms of pain, swelling or instability.
- Checking that full range of movement, power and functional stability have been restored.
- Checking that the player is complying with any on-going rehabilitation exercises or use of braces or taping.

This regular check-up also allows the opportunity to review current musculoskeletal symptoms that have affected performance but may not have been reported to team medical staff.

Finally, the screening examination can be used to check any current medications or supplements that are being taken and



educate or remind the player of their responsibilities under the World Anti-Doping Agency regulations and check that any Therapeutic Use Exemptions, which allows a player to use medications which would otherwise be forbidden during sport, are valid.

Screening assessments are traditionally done in the pre-season period and have been given a variety of titles such as pre-participation examination (PPE), periodic health examination (PHE) or pre-competition medical assessment (PCMA).

WHAT IS THE DIFFERENCE BETWEEN SCREENING AND MONITORING?

The annual screening examination is only a snapshot of a player at one point in time. It is useful for identifying an 'at risk' player. However, there are many external risk factors which may develop during a season and which can predispose a player to injury. For example, a player may become more susceptible to injury or illness at times of increased 'stress', such as during periods of heavy training load or congested playing

schedule/following inter time zone travel or with the psychological stress of family problems. Other changes such as a change in training surface or footwear, may also increase the risk of injury. A periodic health examination should therefore be combined with on-going player monitoring during the season to attempt to identify players at increased risk of injury or illness.

A periodic health exam should be combined with on-going player monitoring to identify players at risk of injury

Unfortunately, there is no perfect mix of monitoring tools that can identify when a player will be injured. However, several methods, which are used to identify if a player is fatigued or more susceptible to injury, have been developed. Examples of these include Profile of Mood Scores (POMS), resting heart rate, heart rate variability or actigraphy (a movement sensor usually carried on the wrist like a watch). Various blood test measures of recovery such as creatine kinase, testosterone or cortisol can also be utilised. Exactly when to use these tools, how often and what weighting to place on each variable is a matter of conjecture. Although packages have been marketed by some companies who believe that they have discovered the correct formula, there are in fact a wide variety of monitoring programmes employed by different teams around the world.

WHICH SCREENING PROGRAMME SHOULD BE USED?

As with on-going player monitoring, there is no universally adopted screening

tool that suits all athletes. A comparison of the screening medical forms from FIFA, the IOC (International Olympic Committee) and AAFP (American Academy of Family Physicians) pre-participation health evaluation forms reveals that there are a wide variety of different screening questions and clinical examination tests between these forms.

What should be included in a screening evaluation will largely depend upon the sport, the available time and resources and also the population being screened. Clearly money, staff, equipment and expertise will be different for an elite professional team compared to community level teams and age group, gender or ethnic group may affect the conditions being screened for.

There are three main areas that are traditionally considered when designing a screening programme.

1) *Assessment for risk of sudden death (cardiac screening)*

The near death of Fabrice Muamba, who suffered a cardiac arrest while playing for Bolton Wanderers in a Premiership match early in 2012, was one of the latest in a series of cardiac arrests during exercise in high profile athletes. Such incidents are widely covered in the media and are often followed by calls for action to prevent future such occurrences. In fact, many sporting organisations, including FIFA, UEFA (Union of European Football Associations) and the FA (Football Association) require annual cardiology screening.

Aspetar – Qatar Orthopaedic and Sports Medicine Hospital started its cardiac screening programme in January 2009 and has screened over 5000 athletes with an electrocardiography included as standard in all athletes. This is the largest cohort of

Middle Eastern athletes to have undertaken cardiac screening.

There is, however, still no universal consensus regarding the value of all available tests and their inclusion in a screening programme. For example, FIFA and UEFA recommend echocardiography as a mandatory part of the Pre-Competition Medical Assessment before European or World Cup events, while others recommend further investigations such as ECG and ECHO only when abnormalities have been identified on medical history and examination. However, a comprehensive family history, personal history and clinical examination are considered minimum requirements by most organisations.

One of the challenges of using ECG as part of a screening programme is distinguishing the normal physiological changes associated with athletic training





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from changes associated with cardiac pathology. Most of the normative data are derived from ECGs of Caucasian athletes but it is known that ethnicity can affect the normal ECG pattern with Black African/American athletes having an increased incidence of T wave inversion, but as yet there are insufficient normative data from other ethnic groups. The data collected by Aspetar on Middle Eastern athletes will be invaluable in identifying any differences in this ethnic group.

Although, with experience, the number of false positive ECG's (those interpreted as being normal in athletes without cardiac conditions) has decreased, even in the most experienced hands about 5% of athletes will have false positive ECGs leading to further investigations with cost and anxiety implications. The commonest condition detected by cardiac screening, hypertrophic obstructive cardiomyopathy, has no definitive treatment and data are still lacking to confirm that by identifying this group and preventing them from playing sport will result in a significant reduction in mortality. Cardiac screening is also expensive. So at present, cardiac screening in athletes does not meet the Wilson-Jungner criteria, but with time might do so as more data are collected and false positive rates decrease.

2) Assessment for illness risk (general medical screening)

While there is a strong emphasis on cardiac screening due to the potentially devastating consequences of sudden cardiac arrest, the incidence of non-cardiac medical conditions in athletes is actually much higher. In fact, studies investigating athlete presentations at Olympic Games

regularly reported that non-injury related, non-cardiac conditions represented 50% or more of all consultations⁵. Some of the most common conditions include respiratory illness (including exercise-induced bronchospasm), iron deficiency, allergies, infections and skin disorders. A thorough pre-competition medical assessment would therefore include screening for these conditions. The general medical screening assessment also allows for monitoring of previously diagnosed conditions in the athlete and review of current medications. This is a good opportunity to assess the necessity for therapeutic use exemption applications (for those athletes who need to use prohibited medications).

3) Assessment for injury risk (musculoskeletal screening)

The most common injuries in football are hamstring tears, groin injuries, knee injuries (ligament, meniscal and chondral injuries) and ankle sprains^{6,7}. The rationale behind musculoskeletal screening is to identify risk factors for specific injuries in individual athletes and then to instigate a secondary prevention programme. However, there is still much debate about the significance of various risk factors and the success of targeted prevention programmes.

Ankle injuries

The most consistently reported risk factor that is predictive for a new ankle injury in male football is a previous history of ankle injury⁸. However, in their study of Norwegian professional footballers, Engebretsen et al found the positive predictive value (PPV) to be low, with only 6% of those with a previous history of any ankle injury sustaining an ankle injury

in following season. This rose to 10% if they had a history of multiple previous ankle injuries and 9% if they had an ankle injury in the past 10 months. Furthermore, Engebretsen et al also found that 26% of ankle sprains occurred in players with no history of ankle sprain⁹. Therefore when instigating a programme to prevent ankle injuries, if those with a previous history of ankle sprains are the only ones targeted, a significant proportion of future injuries will be missed.

Other risk factors that have been suggested are clinical instability and poor single leg balance^{10,11}. However, not all authors agree. And one reason for this might be that the tests for ankle instability are not very reliable (poor inter-tester or inter-attempt reliability) or sensitive enough. Engebretsen et al found that 97.4% of their subjects scored normal or supranormal for one of their measures of ankle instability⁹.

Several studies have shown that, looking at a variety of sporting populations, that the rate of ankle sprains can be reduced either by neuromuscular training or with the use of orthotics or bracing, particularly in previously injured players¹². The benefit of bracing or orthotics seems to be more consistently effective but may not be popular in football players as they may not easily fit in to the modern tightly fitting, low cut football boot and therefore may be perceived to negatively affect performance.

Knee injuries

As with ankle injuries, a previous history of knee injury is the most reported risk factor for future knee injuries in male football players, particularly when knee injury rehabilitation has been inadequate¹³. Other risk factors, such as quadriceps

hamstring muscle imbalance, slow reaction time and joint laxity have been suggested, but have not been shown to be consistently predictive in adult male football players.

Gender is also an important factor – studies have shown that the ACL injury rate in female football players to be more than double than that of males (and even higher in girls compared with boys), the rate of meniscal and collateral ligament injuries to be also significantly higher in females and that ACL injuries tend to occur at a younger age in females (average 19 years) than in males (average 23 years).

Intervention studies have shown that neuromuscular training may prevent knee injuries, but this has not been shown in senior male football players¹⁴. It would therefore seem advisable to ensure that all players with a previous history of knee injury have successfully completed their rehabilitation programme.

Hamstring injuries

The most significant risk factor for hamstring injuries is (once again) a history of prior hamstring injury, with Arnason reporting an odds ratio of 7.42¹³. Other risk factors include older age, low hamstring strength and low hamstrings to quadriceps strength.

Eccentric hamstring strengthening, using 'Nordic hamstring' exercises, has been shown to reduce hamstring injury rates. Arnason¹⁵ showed a 65% reduction in injuries in a non-randomised study. Petersen¹⁶ showed a 71% reduction in hamstring injury risk, with numbers needed to treat (NNT) being 13 players only. More impressively, for players with a history of a previous hamstring strain, they showed an 86% reduction in recurrent injuries and calculated that to prevent one hamstring injury in this group you only need to get three players to undertake the Nordic hamstring strengthening programme.

In order for a Nordic strengthening programme to be effective, exercises should be introduced slowly with a gradual progression over several weeks to avoid soreness. Players need to be supervised to ensure correct technique as well as on-going compliance with the programme. Although older players with a previous history of

hamstring injury are those at highest risk of future injury, it may be worth the whole team undergoing a Nordic hamstring strengthening programme since hamstring injuries do occur in those without previous history of injury.

Groin injuries

As with the previously mentioned injury types, the most consistently reported risk factor for new groin injury is a previous history of injury to that body part^{13,17}. Strength imbalances around the pelvis have also been proposed as a risk factor for groin injuries. Engebretsen reported an increased risk of groin injury in those with weak adductor muscles on clinical examination¹⁸.

Although Hölmich et al¹⁹ showed that an active adductor strengthening programme was effective in treating those with chronic groin pain, it remains to be proven whether this is effective at injury prevention in a randomised controlled trial²⁰.

THE FIFA PRE-COMPETITION MEDICAL ASSESSMENT

According to the FIFA regulations, all football teams involved in FIFA competitions are encouraged to complete the Pre-Competition Medical Assessment, including echocardiography. This is also the screening assessment used for all

football players who present for screening at Aspetar. This assessment includes comprehensive cardiac, general medical and musculoskeletal components and is ideally repeated annually.

WHAT IS THE FUTURE OF SCREENING?

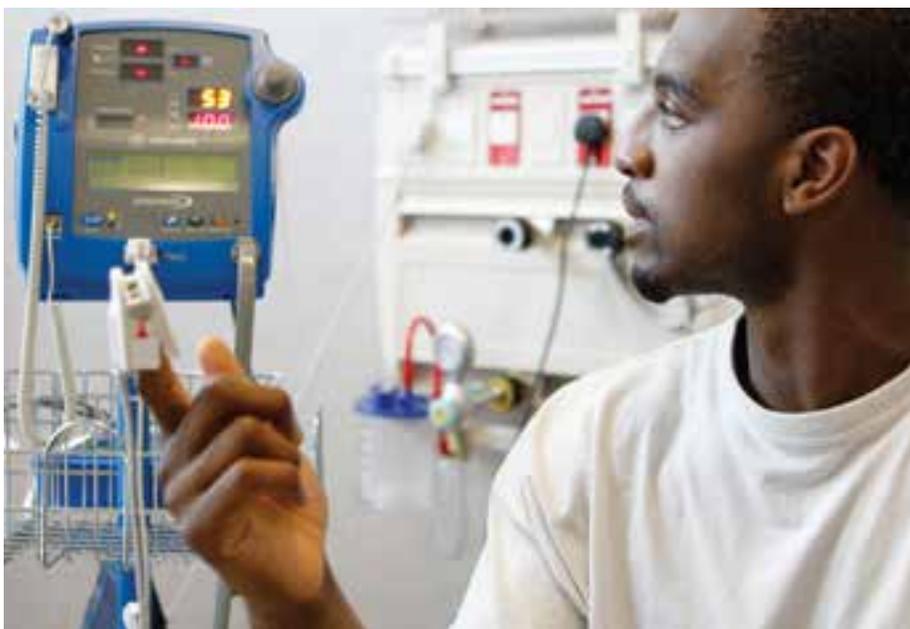
Some controversy about screening remains and no single screening tool can be considered to be perfect. There is also no value in collecting information if the information does not lead to either direct intervention for that player or is part of a bigger data collection process. When undertaking research, the information should be of excellent quality and therefore more tightly controlled than may currently be the case in screening clinics. It may not be possible to extrapolate and compare data collected in this way between genders, age groups and levels of participation in different sports.

In summary, although our current screening tools do not meet the Wilson-Jungner criteria for a screening programme they do provide an excellent opportunity to perform an annual general medical and musculoskeletal health check. There is still much scope for improvement, particularly with detecting risk factors for injury. Further good quality research is needed, and will no doubt influence advice in future.

What should be included in a screening evaluation will largely depend upon the sport, available time and resources and the population being screened

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