

Twenty years of the FIFA Medical Assessment and Research Centre: from 'Medicine for Football' to 'Football for Health'

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In 1994 Joseph S Blatter, President of the Fédération Internationale de Football Association (FIFA), asked: "What can medicine and science do to improve the game of football?" Although a simple question, it led to the founding of the FIFA Medical Assessment and Research Centre (F-MARC) during the 1994 FIFA World Cup USA. The objective of F-MARC was to reduce football injuries at all levels of play, and to promote football as a health enhancing leisure activity improving social behaviour.

MEDICINE FOR FOOTBALL—A BRIEF HISTORY

In 1994, epidemiological data on the incidence of injuries during major football competitions were scarce. Thus, F-MARC established an injury surveillance system at the 1998 FIFA World Cup France, and has routinely implemented it at all subsequent FIFA competitions.¹ This database now enables comparison of the incidence and characteristics of injury between competitions for different age, gender and skill-levels and over time. From the 2002 to the 2014 FIFA World Cup, the incidence of injuries decreased by 37%.² Reasons for the decrease might be the better preparation of the players for the competition, the strict application of the Laws of the Game by the referees, and also the improved approach of the players towards Fair-Play.

Since the large majority of the 300 million football players around the world are recreational players, F-MARC developed an injury prevention programme for these players based on scientific evidence and best practice. The 'FIFA 11+' programme was rigorously tested using randomised controlled studies jointly with the Oslo Sports Trauma Centre (Norway),³ and jointly with the NCAA

and the Santa Monica Medical Centre (USA).⁴ Bizzini and Dvorak⁵ summarise the scientific evidence of the effectiveness of 'FIFA 11+' in reducing injuries by up to 50% if performed regularly.

Since 2009, FIFA has disseminated the 'FIFA 11+' through the network of its 209 Member Associations (MAs) and implemented the programme on a large scale. The implementation is conducted either in close cooperation with MAs or via FIFA Coaching Instructor courses. The national Football Associations of Spain, Japan, Italy, Brazil and Germany integrated 'FIFA 11+' in their coaching curriculum or in their physical training/education curriculum. These national association initiatives and subsequent implementation of the prevention programme provides a role model, or 'bright spot'⁶ to reduce football-related injuries on a large scale. The New Zealand Accident Corporation Company (ACC) showed that implementing the 'FIFA 11+' can also reduce medical costs; the ACC calculated that each dollar invested would result in an \$8 saving in medical costs.

Football injuries can be prevented in recreational football by implementing the 'FIFA 11+' programme.⁷ However, can injuries be prevented at top level football? McCall *et al*⁸ interrogated the physicians from the 32 participating national teams at the 2014 FIFA World Cup Brazil, about injury prevention strategies. The authors report practice the need to improve and further develop evidence-based preventative strategies for top level. There is a need for a more coherent approach for clinicians to determine injury risk factors, choose appropriate tests and monitoring tools and finally, implement both exercise-based and psychology-based preventive strategies.

ANSWERS AND QUESTIONS FROM THE 2014 FIFA WORLD CUP BRAZIL

The 2014 FIFA World Cup Brazil was played in five different regions where the environmental conditions ranged from temperate to tropical. This provided an ideal setting to analyse the association of environmental heat stress with

performance during the 64 matches. The web-bulb globe temperature (WBGT) were obtained prior to, during and after matches while various physical and technical performance parameters were recorded. Nassis *et al*⁹ reported that top level players adapted their activity in hot and humid environments by trading off high-intensity activity with a larger volume of low-intensity activity. Thus, they still covered the same total running distance and maintained playing time in the more challenging conditions.

It is notable that the WBGT reached the critical level of 32° for just one match and therefore the FIFA Medical Officer ordered a cooling break. During the entire 2014 FIFA World Cup Brazil no player or official reported a heat-related adverse medical condition.

FIFA pioneered a new antidoping programme and biological monitoring before the 2014 FIFA World Cup Brazil.¹⁰ All players who were registered to compete were tested unannounced prior to the competition; testing included blood parameters as well steroid profiles in urine. Players' results were then compared with the samples they provided after each match during the World Cup competition. Over 1000 samples were collected and analysed at the WADA accredited laboratory of Lausanne. The steroid profile of the urine of the players was stable and consistent with literature in this field.¹¹ In this large population of players, we found no significant differences in haemoglobin value between precompetition and postmatch samples. The experience from Brazil documented the feasibility of implementing biological monitoring during a footballer's career. This important advance, the biological passport,¹² provides an important additional avenue to detect doping.¹³

The use of medication has been analysed since the 2002 FIFA World Cup.¹⁴ More than two-thirds of adult male players used medication(s) during the tournament, and more than half were using non-steroidal anti-inflammatory drugs (NSAIDs). Up to one-third of the players were using NSAIDs prior to every match. During the FIFA Women's World Cup, the prevalence of total medication use was 12% higher than in the men's event; NSAID use was similar to that of men. Prevalence of medication use was lower in Under-20 and Under-17 male competitions (60% of the players using some kind of medication and 43% of the players using NSAIDs during the tournaments). No decrease in the use of medication was observed despite of potential side effects especially of NSAIDs.

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Following the tragic death of Marc-Vivien Foé during the FIFA Confederations Cup 2003 in France, FIFA has been fully committed to a programme of standard research education and practical implementation to prevent and manage emergency cardiac arrest on the football field.¹⁵ In the meantime, this strategy has been routinely implemented with the aim of detecting football players with a medical risk during mandatory precompetition medical assessment and by implementing the international accepted guidelines for the interpretation of an athlete's ECG based on the Seattle criteria.¹⁶ A clear protocol has been developed and applied for field of play for the recognition response, resuscitation and the removal of a player under sudden cardiac arrest.¹⁵ FIFA have introduced and distributed the FIFA Medical Emergency bag including an automated electric defibrillator to all 209 FIFA Mas.¹⁷

The FIFA Sudden Death Registry has been established at the FIFA Medical Centre of Excellence of the University of Saarland to document and examine fatal events in football worldwide.¹⁸ Thus, anyone in the world can confidentially report cases of sudden death as well as successfully resuscitated sudden cardiac arrest of football players. The article by Scharhag *et al*¹⁸ should encourage the medical community to use this platform to better understand the causes of sudden death in football, and thus, mitigate risk and apply appropriate management when sudden cardiac arrest occurs.

FOOTBALL FOR HEALTH

The effect of recreational football for prevention and treatment of non-communicable diseases (NCDs) have been investigated under the leadership of Professor Jens Bangsbo and Professor Peter Krstrup at the Copenhagen Centre for Team Sport & Health.¹⁹ The effect of regular training in small-sided games (4 vs 4 to 7 vs 7) for 45–60 min up to three times a week were analysed in different groups of players—from children to mature women and ageing men. The results showed that regular training reduced blood pressure, lowered resting heart rate, enhanced cardiac structure and function, improved lipid profile, elevated muscle mass, reduced fat mass and ultimately boosted functional capacity.

The most recent nationwide implementation of the 'FIFA 11 for Health' programme is reported by Fuller *et al*.²⁰ The momentum of the 2014 FIFA World Cup Brazil was used to prepare the medical legacy of the World Cup in Brazil and the South American continent. The

programme was delivered to 128 elementary schools in 12 cities (official venues of the FIFA World Cup) in five regions of Brazil, jointly with the Confederação Brasileira de Futebol and the Brazilian government—the Ministry of Health, Sport and Education. The mean increase in health knowledge was 18.4%, and almost 91% of the children evaluated the programme positively. Thus, the 'FIFA 11 for Health' programme was delivered successfully across the five regions of Brazil and the knowledge gains were of the same magnitude as those previously obtained in sub-Saharan in Africa.^{21–23}

THE WAY FORWARD

FIFA and F-MARC will continue the research activities outlined above, develop new research areas, and redouble our efforts in prevention (of injuries and their long-term sequelae, sudden cardiac death and of doping).²⁴ Two major goals are (1) the world wide-implementation of 'FIFA 11 for Health', and (2) the dissemination of knowledge and the improvements of the standards of care for football players around the world.

'FIFA 11 FOR HEALTH'

The 'FIFA 11 for Health' programme has already been implemented in 20 countries including in Africa, Oceania, Central and South America. This global health initiative was unanimously supported by the FIFA Congress 2013 and 2014. It is an ambitious aim to introduce the 'FIFA 11 for Health' programme to children in up to 100 countries during the next 5 years. This objective can be only reached in partnership with the governments, the FIFA member associations and medical professionals in the different countries.²⁵

REDUCING LONG-TERM OSTEOARTHRITIS

The epidemiological data on long-term changes as well as the onset of degenerative diseases of joints in football players is far from complete.²⁶ However, articular cartilage injury appears to be increasing in frequency in football players. The management of articular cartilage injury in athletes aims to return players to competition and requires effective, durable joint surface restoration that resembles normal healing articular cartilage and can withstand the high joint stresses of football. Novel scientific concepts and treatment techniques that apply tissue engineering technologies, are promising in the treatment of this challenging injury. With the support of FIFA, a Cartilage Engineering and Regeneration professorship was

established at the Swiss Federal Institute in Zurich in 2013.

TRANSLATION OF RESEARCH INTO EDUCATION

Over the past 20 years, F-MARC together with other research institutions, groups and individual scientists have published over 300 peer-reviewed original research studies. This has provided the credible foundation for 'Football Medicine'. A future activity of F-MARC will be the translation of science and research into the daily life of medical personnel with football players, that is, sports physicians, general practitioners, physiotherapists, para-medical staff and others. The 42 accredited FIFA Medical Centres of Excellence will serve as educational hubs in the different regions of the world. Under the guidance of F-MARC, the Centres of Excellence have responsibility for disseminating state of the art diagnostic and therapeutic procedures for different football conditions. On 1 June 2015 F-MARC will launch an educational free e-learning Diploma in Football Medicine.

In summary, FIFA has demonstrated its commitment to health over more than 20 years by unconditional support of numerous F-MARC projects to improve (1) the health of football players ('Medicine for Football') and (2) of the health of the general population ('Football for Health').

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REFERENCES

- Junge A, Dvorak J. Injury Surveillance in World Football Tournaments 1998–2012. *Br J Sports Med* 2013;**47**:782–8.
- Junge A, Dvorak J. Football injuries during the 2014 FIFA World Cup. *Br J Sports Med* 2015;**49**:599–602.
- Soligard T, Myklebust G, Steffen K, et al. Comprehensive warm-up programme to prevent injuries in young female footballers: cluster randomised controlled trial. *BMJ* 2008;**337**:a2469.
- Silvers H, Mandelbaum BR, Adeniji O, et al. The efficacy of the FIFA 11+ program in the Collegiate Male Soccer Players (USA). *Am J Sports Med* 2015 In press.
- Bizzini M, Dvorak J. FIFA 11+: an effective programme to prevent football injuries in various player groups worldwide—a narrative review. *Br J Sports Med* 2015;**49**:577–9.
- Heath C, Heath D. Made to stick: why some ideas survive and others die. New York: Random House, 2008.
- Bizzini M, Junge A, Dvorak J. Implementation of the FIFA 11+ football warm up program: how to approach and convince the Football Associations to invest in prevention. *Br J Sports Med* 2013;**47**:803–6.
- McCall A, Davison M, Andersen TE, et al. Injury prevention strategies at the FIFA 2014 World Cup: perceptions and practices of the physicians from the 32 participating national teams. *Br J Sports Med* 2015;**49**:603–8.
- Nassis G, Brito J, Dvorak J, et al. The association of environmental heat stress with performance: analysis of the 2014 FIFA World Cup Brazil. *Br J Sports Med* 2015;**49**:609–13.
- Baume N, Jan N, Emery C, et al. Anti-doping programme and biological monitoring before and during the 2014 FIFA World Cup Brazil. *Br J Sports Med* 2015;**49**:614–22.
- Geyer H, Schanzer W, Thevis M. Anabolic agents: recent strategies for their detection and protection from inadvertent doping. *Br J Sports Med* 2014;**48**:820–6.
- Verne AR. The Athlete Biological Passport: an integral element of innovative strategies in antidoping. *Br J Sports Med* 2014;**48**:817–19.
- Dvorak J, Baume N, Botre F, et al. Time for change: a roadmap to guide the implementation of the World Anti-Doping Code 2015. *Br J Sports Med* 2014;**48**:801–6.
- Tscholl P, Vaso M, Weber A, et al. High prevalence of medication use in professional football tournaments between 2002 and 2014: a narrative review with a focus on NSAIDs. *Br J Sports Med* 2015;**49**:580–2.
- Kramer E, Dvorak J, Schmie C, et al. F-MARC: promoting the prevention and management of sudden cardiac arrest in football. *Br J Sports Med* 2015;**49**:597–8.
- Drezner JA, Ackerman MJ, Anderson J, et al. Electrocardiographic interpretation in athletes: the 'Seattle criteria'. *Br J Sports Med* 2013;**47**:122–4.
- Dvorak J, Kramer EB, Schmie CM, et al. The FIFA medical emergency bag and FIFA 11 steps to prevent sudden cardiac death: setting a global standard and promoting consistent football field emergency care. *Br J Sports Med* 2013;**47**:1199–202.
- Scharhag J, Bohm P, Dvorak J, et al. F-MARC: the FIFA Sudden Death Registry (FIFA-SDR). *Br J Sports Med* 2015;**49**:563–5.
- Bangsbo J, Hansen RP, Dvorak J, et al. Recreational football for disease prevention and treatment in untrained men: a narrative review examining cardiovascular health, lipid profile, body composition, muscle strength and functional capacity. *Br J Sports Med* 2015;**49**:568–76.
- Fuller C, Thiele E, Flores M, et al. A successful nationwide implementation of the 'FIFA 11 for Health' programme in Brazilian elementary schools. *Br J Sports Med* 2015;**49**:623–9.
- Fuller CW, Junge A, Amaning J, et al. 'FIFA 11 for Health': implementation in five countries in sub-Saharan Africa. *Health Education Journal* 2015;**74**:103–19.
- Fuller CW, Junge A, Dorasami R, et al. '11 for Health', a football-based health education programme for children: a two-cohort study in Mauritius and Zimbabwe. *Br J Sports Med* 2011;**45**:612–8.
- Fuller CW, Junge A, DeCelles J, et al. 'Football for Health' – a football-based health promotion programme for children in South Africa: a parallel cohort study. *Br J Sports Med* 2010;**44**:546–54.
- Fuller CW, Junge A, Dvorak J. Risk management: FIFA's approach for protecting the health of football players. *Br J Sports Med* 2012;**46**:11–17.
- Dvorak J, Fuller CW, Junge A. Planning and implementing a nationwide football-based health-education programme. *Br J Sports Med* 2012;**46**:6–10.
- Mithoefer K, Peterson L, Zenobi-Wong M, et al. Cartilage issues in football: today's problems and tomorrow solutions. *Br J Sports Med* 2015;**49**:590–6.