International Science And Football Association

Edition 3 - 2019

ISAFA Newsletter Magazine

Edition 3 – 2019

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PREFACE

BY: MONÈM JEMNI

CHAIR ISAFA

The International Science And Football Association: Where we going?

The ISAFA board and fellows are continuing their efforts to be establish the association as a global leader in sharing, promoting and delivering science knowledge and best practices that back-up football training.

It is a fact that we do not do much and so far, we organise only one event per year however, what we delivered has impacted people, communities, academics and future football fitness and mental coaches not only in one country but in few.

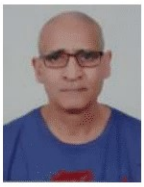
We are currently working on the 2019 call for bids following the unfortunate deception of the ISAFA in Russia 2018. This latter had to be cancelled for logistics and security reasons imposed by the organisers. We would welcome any institution to step forward and to request to host the next editions before the call to save time.

I would like to take this opportunity to thank all the active members of the ISAFA and the volunteers. Without their efforts, their commitment and dedication we would not made it so far. I would also encourage all members to engage their students in our activities from promotion, development to submitting short manuscripts related to some of their academic projects and research.

Monèm Jemni

Chair ISAFA

The Isolated lateral ankle sprain "Tips for physiotherapists"



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Introduction: Lateral ankle sprains are very common affecting both the active and general population with a high recurrence rate leading to increased time loss from sporting activities and decreased quality of life (Gribble et al., 2016). In the UK alone there are approximately 302,000 ankle sprains per year(Ferran & Maffulli, 2006), and these comprise about 11% of all injuries. Lateral ankle sprains comprise about 85% of all ankle sprains in the general public and 77% in professional footballers(Woods, Hawkins, Hulse, & Hodson, 2003). In a survey of Swedish football players, ankle sprains were 17-21% of all injuries(Ekstrand & Tropp, 1990). By any measure, ankle sprains are an important injury for recreational and professional athletes alike.

Our approach to treating ankle sprains is based on two main lines of evidence. First is recognizing that the primary risk factors for lateral ankle sprains (first time and/or recurrent) are: history of a previous ankle sprain, deficit in Dorsiflexion (DF) Range Of Motion (ROM), slower peroneal muscle reaction time, and deficit of proprioception and neuromuscular control (Miklovic, Donovan, Protzuk, Kang, & Feger, 2018). Secondly, evidence shows that functional training after injury leads to a better recovery with less time loss than classic (passive, modalities based) treatment (Gribble, Hertel, & Plisky, 2012). We emphasise functional strengthening and suggest management of the lateral ankle sprain should include analytic strengthening, and that closed kinetic chain exercising should be preferred to open kinetic chain. With this philosophy in mind, this paper will share some tips we use in our clinical practice which we believe should benefit in the management and return to play criteria after a lateral ankle sprain.

The Lateral ankle sprain usually affects the three main lateral ligaments of the ankle: The anterior Talo-Fibular Ligament (ATFL), The Calcaneo-Fibular Ligament (CFL) and The Posterior Talo-Fibular Ligament (PTFL). These ligaments play an important role in the lateral stability of the ankle complex. Failure to adequately address all deficits before return to sport may lead to recurrent injury (Chronic Ankle Instability) due to the ongoing insufficiencies and deficits such as reduced range of motion, muscle weakness, proprioception and neuromuscular deficiency(Hertel, 2002).

The ATFL: Its primary role is a passive restraint against ankle inversion and it tightens and becomes prone to injury while the ankle is in plantarflexion, internal rotation or even in slight dorsiflexion as well. As these functions can be performed by the remaining uninjured muscles of the foot and ankle, provided normal proprioception, strength, and range of motion are restored, good function can be expected in spite of any damage to the ligament.

The CFL: While the ATFL may be injured alone, the CFL is a stronger ligament and usually is injured in combination with the ATFL. It works as a passive restraint against rear foot tilting and tightens in with increased DF making of it the main stabilizer of the subtalar joint.

The PTFL: The strongest ligament of the lateral compartment and it is very rarely injured and never in isolation.

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Management:

Effusion: The primary point to take into consideration when dealing with an acute lateral ankle sprain is the difficulty to examine the ankle during the first 4 -5 days after injury. Usually the significant effusion surrounding the ankle and accompanying pain and fear makes the diagnosis difficult and inaccurate. Delaying the clinical examination in this case is recommended (Vuurberg et al., 2018). It is also agreed that unresolved initial effusion may inhibit the ligament healing and the normal recovery of proprioception, strength, and the range of motion (Hopkins & Palmieri, 2004). The important step to do immediately after injury is to reduce the effusion. In our daily clinical experience, we find that lymphatic massage drainage with slight to moderate pressure twice daily followed immediately by application of a large ice bag able to surround the whole ankle including its posterior aspect and slightly tightened to adhere to the skin, has an excellent effect on effusion, pain and fear reduction as well as in inhibiting the muscle guarding and so improving the active range of motion. At the same time moderate to deep massage of the plantar aspect of the foot plays a big role in activating the plantar sensor receptors and restoring the proprioception by improving the awareness of the foot placement during the early gait(Kaya, 2014; LeClaire & Wikstrom, 2012). Protection of the joint by a U shape taping is necessary for lateral ligament healing during the acute phase.

ROM: Once the player is able to load and walk without aid, we advise continuing to improve the ROM gradually in its pain-free limits(Delahunt et al., 2018; Konor, Morton, Eckerson & Grindstaff, 2012). Here we prefer to have the patient sitting on a chair, foot on the floor sliding the foot actively forward- backward then inward-outward as tolerated. A small towel or a piece of tissue can make the sliding process easier and more comfortable for the patient. Eventually, when the patient is able to one leg heel raise pain free, ROM can be improved by stretching into DF using the knee to wall technique. Similarly, to improve Plantarflexion (PF) by keeping the foot adhered to the floor and pulling the lower leg backward as tolerated pain free. Recently we have documented that weight-bearing PF ROM is often reduced even at return to play.

Strength: One of the easiest and safest exercises to start strengthening of the whole foot and ankle muscle including intrinsic, evertors, invertors, dorsi-flexors and calves is when the patient is standing having a circular light theraband surrounding both forefeet. He alternatively dorsi-flex bilaterally and spreads his forefeet then heelraises bilaterally and spreads the heels continuously as far as tolerated then uses to same progression technique in a controlled eccentric manner to return to the initial position.

Another strength progression exercise to activate ankle and foot muscles is to let the patient squat on the injured leg for about 10 consecutive repetitions while the end of a tightened elastic band is inserted anteriorly under the hallux (to activate calf, FHL, and intrinsic muscles) or laterally under the 5th metatarsal (to activate the Tibialis Posterior) or medially under the head of the 1st metatarsal (to activate the peroneal and especially the peroneal longus).

Since the calf muscles can be strengthened in the next step by heel raises exercises including gastrocnemius and soleus, the other group of muscles (invertors, evertors and dorsiflexors) can be strengthened using a roller where the patient is lying in a bridging position using his elbows (prone, and sides) having the foot to be exercised on the roller and mobilizes the roller proximally and distally using the targeted ankle muscle.

Proprioception and feedforward learning: As it is necessary to restore the feedback mechanism based improving the stretch reflex of the lateral ligaments as well as improving the muscle reaction time of the peroneal by strength, it also inevitable to improve the feed forward learning by teaching the central nervous system about the ankle position to react even before any stretch phenomena may happen (Hertel, 2002). Step forward- backward is a good exercise for foot placement as the patient should step forward and then backward reproducing the same distance heel-toe between the loading foot and the moving one. Progressing to exercise bilaterally is indicated.

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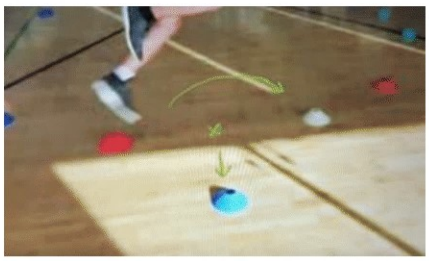
Landing on a spot with the injured foot will be the next progression exercise, where the player is standing only on the uninjured leg close to a spot drawn on the floor, the then athlete he tries to land on the spot as precisely as possible making simple weight shift from a leg to the other. The distance to the spot will be increased gradually in forward, side and backward direction. Once the patient has learned to land correctly on the spot, the vision control is excluded and he should start landing without the assistance of vision, and purely relying on proprioception.

Postural control: While the previous described exercises improve the strength as well the body awareness, the neuromuscular response and the postural control, the star excursion exercise will be the next progression exercise for all these parameters (Hertel, Braham, Hale, & Olmsted-Kramer, 2006). Since football and most other sports are played on a regular stable surface and not on an unstable "crazy bus" surface, we don't see the necessity to work postural control on discs, bosu, etc... It's important to recall that in football, as in most sports the player's body moves in all directions over a fixed foot on the floor, not the opposite. Allowing the body to be flexible as long as the posture is controlled is not be a deficit of stabilization but probably a positive for the player's ability to control their posture during the most difficult tasks while playing. In our clinical experience we allow the player to do the star excursion in a different manner to increase the difficulty in postural control. Once the player is one leg standing performing the star excursion balance test, objects are spread around him on the floor and he is asked collect each one of them manually and return to starting position each time, then the he will be asked to spread them again randomly on the star as far away from his standing foot as possible.

RTP Criteria:

One of the most important aspects of return to sports criteria is patient confidence. Assessing and improving the patient's confidence is a continuous effort that physiotherapists should provide from the start of rehabilitation. Coupled with this are the many specific functional exercises for testing performance and ability to RTP. These include sports specific tasks like sprinting, cutting, jumping and shooting(Clanton, Matheny, Jarvis, & Jeronimus, 2012; Richie & Izadi, 2015). One of the functional exercises we use in late phase of rehabilitation is the big 8 in/out one leg jump. The player is asked to jump on his injured leg from a cone to another placing his foot medial to the cone then lateral to the next one. At each landing no foot correction (reorientation of the foot) is allowed in preparation for the next jump. Cones are placed in a figure of eight (5m for each circle diameter), distance between cones is about initially 50 cm, then two cones are randomly removed after each trial from the track to increase distance between cones until the player is no longer able to reach two consecutive cones. Number of remaining cones and the largest distance are recorded. This is a task where the player should show his readiness to return to play including neuromuscular abilities, strength, stability, coordination and agility.



Conclusion: We propose that neuromuscular as well as functional training can be started early after injury and that these play a role in pain reduction, restoring full ROM, enhancing strength and are crucial to ensuring full recovery and a quick return to play.

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Link to Exercises:

https://youtu.be/MggDVaQoXAM

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Governance of the sport sector in Marocco: Actors and organizational structure

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Keywords : Sport, Public policies, Governance, Human development.

Introduction: Through its presence in speeches and royal actions, sport in Morocco remained linked to the private sphere of the King. Any government initiative in the field of sport cannot come out of the royal speech's context, either at the opening of the parliamentary session, the holiday of the throne or the message addressed to a symposium on sport. For its part, the parliament has become a second-class institution in the same way as political parties that no longer play the role that falls to them in the political framework and contribution to public policies.

The influence of the royal institution on the development of a sport policy in Morocco: The mechanisms applied by the political actor to dominate or even monopolize, by its omnipresence certain vital sectors to ensure its legitimacy, are the same used in the sports sector but with different means and stakes. Indeed, it is the king who is the main actor of the roadmap of the national sport through his letters addressed to the two national meetings on the sport which took place respectively in Marrakech in 1965 and in 2008 in Skhirat. It is also his responsibility to decorate athletes who have achieved major sports performances and to grant financial support in response to a crisis of results, such was the case with the Commission of high level athletes by reserving a budget envelope of 330,000,000 dirhams to prepare for the London 2012 Olympic Games; or the 250,000,000 dirhams put at the disposal of the football federation in order to prepare the national teams in terms of prospects. On the other hand, although the sport has not followed the evolution of the state apparatus throughout the past centuries, the latter gradually managed to reach it at the end of the protectorate and the aftermath of independence. And if the dominance of this state apparatus is embodied by the compilation of all powers, the sports sector is also affected. Indeed, this assignment of sport is translated in the field through several aspects, starting with the sports federations which all bear the name of the "Royal Federations", the designation of youth and sports ministers, the appointment of presidents of the National Olympic Committee, the designation of national team coaches in accordance with the Royal Institution's own perception. It is therefore concluded that the sport would fall within the remit of the Royal Cabinet, which also decides on the date of the Football Throne Cup, and decided on the creation of a football academy[1] and the financing of certain measures urgency[2]. While the protocol would like the royal institution to simply receive delegations participating in international competitions, the decoration of Moroccan and foreign athletes by royal Wisam.

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In the same order of ideas, any sporting performance is similar to a victory of the royal institution. According to tradition, the king receives sports delegations after their crowned return. According to Maghreb Arabe Presse, the king personally intervened to broadcast the 2006 African Cup of Nations Cup in Egypt, which was monopolized by the Arab Radio and Television (ART) Company. The King retains his central place in the Moroccan political system.

The articulation of sport policy with human development strategies.: The sports sector has remained since independence far from the priorities of the state. Since 1983, the share of the budget of the Ministry of Youth and Sports has only exceeded once the 1% mark in the general state budget. In addition, it is difficult to argue that sport is part of the priorities of the state since it is rather a site opened by the king since his enthronement. The time charged by the Royal Institution to intervene in the sports field does not signify its indifference, but it is due to the existence of other major priorities which require special attention from the high authority of the country. (Unemployment, housing, the Sahara). Nevertheless, in the last four years the sporting sector has experienced some flourishing embodied by financial support, an overhaul of the existing legal framework and the adoption of other sports laws, the reshuffle at the level of the ministry and federations and the adoption of new strategies (2016, 2020) for the development of sport with a view to transforming it into a vital sector that can contribute to integrated development.

Which strategies, especially the one adopted at the National Conference on Sport on October 24, 2008 represents a major opportunity that has been presented internally to revive the sport sector and make it a tool for socio-economic development.

Moreover, this is the reason why state institutions have relied on sport to carry out their development project as the case of the NIHD[3]. The same is true of international, public and private institutions, such as the United Nations and the International Olympic Committee, which have made sport a tool for socio-economic development and a means of promoting peace.

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1—Inauguration by the King in 2009 of the Mohammed VI Academy of Football located at the new Salé.

2—The allocation of 330 million dirhams to the program of the Commission of high level athletes for the preparation of athletes at the London 2012 Olympics after the unprecedented failure of the national sport at the Beijing 2008 Olympic Games. In addition to 250 million dirhams for the football federation for the preparation of the national teams in the deadlines in perspective.

3—NIHD: National Initiative for Human Development (INDH in french). This initiative is launched by King Mohammed VI in 2005.

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Effects of soccer position and physical exercise intensity on the ability to recognize opponents' effort facial expressions

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Keywords: Expertise, Motor resonance, Physical effort, Face recognition, information processing speed.

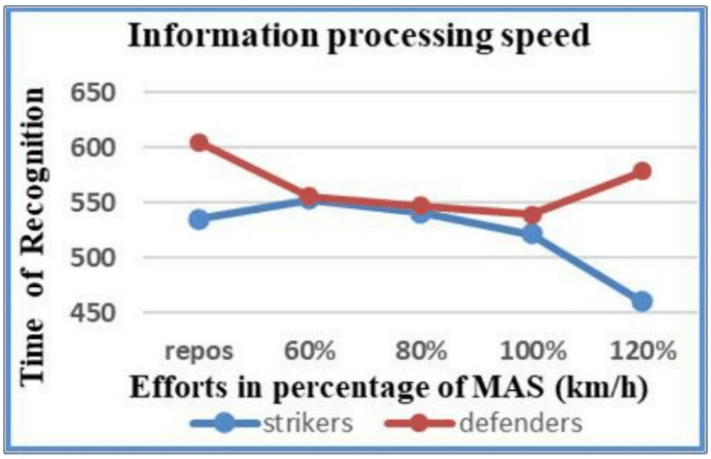
Introduction: By activating the Mirror neuron system (MNS) Motor-resonance allows us to embody another individual's intentions, state of mind, and feeling which can permit subsequent interactions with the observed agent (Abreu, 2014; Bishop, Wright, Jackson, & Abernethy, 2013; Gallese, 2007). In football Motor-resonance can inform us about the level of fatigue that can a soccer player decode from the face of his rival. Knowing the opponent's level of tiredness can be used to efficiently manage the effort and to perfectly choose the next move. The aim of this study was to evaluate the short term (physical effort) and long-term effects (soccer position expertise) of soccer practice on the ability to recognize the facial expressions associated with different levels of physical effort of a potential opponent.

Method: Eighteen soccer players participated in this study (9 defenders and 9 strikers, age, 21.9 ± 2.6 years, weight 75.6 ± 5.2 kg; height 1.80 ± 0.03 m). The determination of the maximal oxygen uptake (VO2max) and maximal aerobic speed (MAS) have been established in the laboratory. While running on a treadmill at different levels of his MAS (60%-80%-100%-120%) participant's had to indicate, by pressing one of the two mouse buttons whether the images of faces displayed on the screen express moderate or intensive physical effort. Stimuli presentation and response collection were controlled by the software Inquisit4®.Stimuli were 40 color images depicting males' faces expressing different facial expressions associated with different intensity of physical effort.

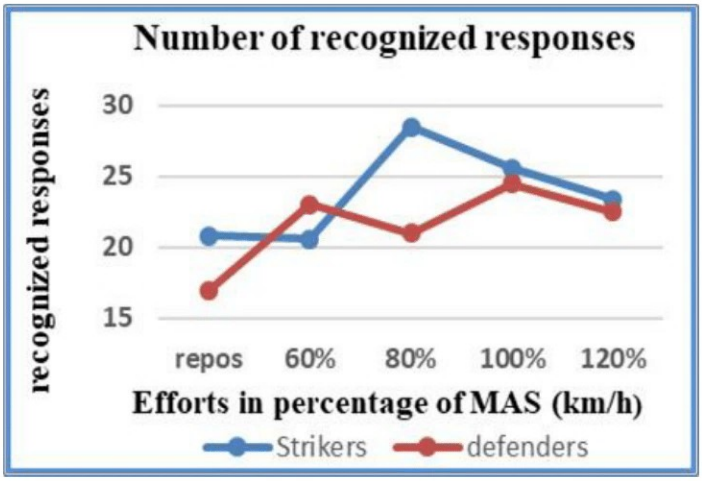
Results: Results showed that strikers had a faster information processing speed (IPS) to recognize facial expressions of fatigue then defenders at rest (540±20,57ms and 600,08±15,67ms respectively with p< 0,01) and at 120% of MAS (440±32,77ms & 567,27±17.28ms respectively with p< 0,001, fig1).

Figure1. The Evolution of the IPS in the function of the position and the percentage of MAS.

Figure2. The Evolution of the number of recognized responses n



function of the position and the percentage of MAS.



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Moreover Strikers presented a better number of recognized responses at rest and at 80% of MAS then the defenders (20.8±52 & 28,48±42; 17.07±32 & 21,02±12 respectively with p< 0,001, fig2).

Conclusion: These results may have two main implications. The first one is theoretical. The plastic modification of the ability to decode facial expressions as a function of the long-term practice on striker position is probably sustained by a cerebral plasticity (Abreu, 2014, Jouini, Mkaouer, & Chamari, 2017a; Jouini, Mkaouer, & Chamari, 2017b). The second is practical. Training methods in soccer rarely insist on developing athlete's ability to decode facial expressions. This study suggests that such ability could be an important determinant of success for defender. Inviting athletes to pay more attention to facial expression decoding may positively contribute to the improvement of their performance.

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Hamstring strain (HSI) and anterior cruciate ligament (ACL) injuries in football: taking fatigue into account to identify risk factors and prevent injuries

Dr. Anne Delextrat

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Introduction: Strength and conditioning coaches employ various strategies to prevent injuries in different team sports, this note will hopefully give an insight of the current sport and exercise science literature on this topic. But before going into prevention, something crucial is to know how to test for the risk factors associated with these injuries. One of the main risk factors for the two injuries in question is the ratio of maximal eccentric knee flexion strength to maximal concentric knee extension strength (Hecc:Qcon), with values below 0.7 indicating an increased risk of injury.

In my opinion, the main error that people make, probably because of time constraints, is to test players in a rested state. However, it is well-established that players get injured more frequently when they are tired , in particular towards the end of a match. Our research team greater decreases in the eccentric torque of the hamstrings at 10º, compared to other angles and a greater drop in Hecc:Qcon at 10º compared to other angles. Both of these results indicate a decreased capacity of the hamstrings to protect the knee joint close to extension in a fatigued state.compared hamstring strength and Hecc:Qcon before and after a simulated football match, for example, and showed that both are decreased, in the dominant leg only in male football players, while both legs were affected in female football players. (Delextrat et al., 2010; 2013). Decreases in Hecc:Qcon were also observed after a 45-min simulated football exercise (Matthews et al., 2017). Therefore, a player who is not considered at risk in a rested state could not be targeted for injury prevention, but could be at great risk of injury towards the end of a match.

More recently, scientists have highlighted that maximal strength values might not be the most relevant to predict the risk of HSI , but also the angle at which peak torque is produced (APT) may also be relevant to HSI risk, as hamstring eccentric peak torque occurs at knee angles greater than 30° of flexion, while strains HIS are reported to occur at the knee extension closer top extension (angles of 0-30°). In addition, angle-specific torques are also being studied more and more (Cohen et al.,. 2015; Delextrat et al., 2018). Our results showed that a 90-min simulated football exercise significantly changed the hamstrings eccentric APT of male football players towards shorter muscle lengths. Furthermore, the same simulated football exercise affected angle-specific hamstrings eccentric torque and Hecc:Qcon. Since fatigue has been shown to increase the risk factors for both HSI and ACL injuries, it is essential to take this element into account in the design of injury prevention programmes. However, there is a surprisingly small amount of studies in this area. HSI risk reduction protocols in the literature have typically used intensity, volume and rest periods employed to emphasize the development of maximum strength rather than fatigue

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The success of maximal strength development, that may positively transfer to several aspects of team-based intermittent exercise performance, such as sprint and agility times and jump height (Silva et al., 2015), support the value of this approach. However, it could be speculated that the of the maximal strength of the hamstrings may not prevent the decrease in strength reported across a match that has been associated to greater occurrence of injuries. To increase muscle resistance to fatigue, resistance training with low loads and high repetitions is usually recommended (Campos et al., 2002; Mitchell et al., 2012). For example, Campos et al. (2002) showed that an 8-week strengthening programme based on high repetitions (20-28 repetitions maximum (RM)) with a low load resulted in a greater number of repetitions at 60% of the one RM (1-RM), compared to a low repetition (3-5 RM) group. This could translate into a greater capacity to maintain a level of strength during prolonged intermittent exercise, however further studies are needed to confirm this hypothesis. More recently, Small et al. (2009) compared the effects of 8-week training programmes based on 6-12 repetitions of the NH performed either in the warm-up (WU group) or cool-down (CD group) of practice sessions on strength characteristics at the start (t0), middle (t45) and end (t105) of a football-simulated exercise. The CD group showed significant improvements in hamstrings eccentric strength and Hecc:Qcon at t45 and t105 (but not at t0), while the WU group only showed improvements at t0. This suggests that training in a fatigued state may promote improvements in the ability to maintain maximal hamstrings strength across the duration of a football match, of potential benefit from a HIS and ACLI risk reduction perspective. Finally our first recent study (Delextrat et al., 2018) used a training intervention based on the hamstrings curl and stiff-leg dead lift exercises for 7 weeks, and we showed that it prevented the effects of fatigue due to a 90-min soccer exercise on the hamstrings eccentric peak torque and Hecc:Qcon in female football players when it was performed with low load/high repetition, while no effect on fatigue resistance was seen on the same variables with similar exercises performed with low load/high repetition. Our other study showed that a training intervention based on the Nordic hamstrings for 4 weeks increased angle-specific hamstrings eccentric torque at angles ranging from 10-70º, and prevented the effects of fatigue due to a 45-min soccer exercise on the hamstrings eccentric peak torque in male football players whether it is performed with an emphasis on maximal strength (high load/low repetition) or muscular endurance (low load/high repetition).

In conclusion, it is essential to take into account the effects of fatigue by testing players when they are tired and implementing injury prevention programmes based on muscle endurance.

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Control of the training load in football
"A guiding perspective on training organization"

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Introduction: In the last decades, coaches and researchers of the field of the sports training have been committed to establish concrete guidelines for the process of physical preparation of athletes in football. Among several themes, the organization of the training load and procedures for its control have been highlighted in the discussions (Gomes, 2010).

The classical literature proposes that the training load itself does not exist, due to the fact that motor action is a muscular function characteristic of the training and competition process. Understanding this phenomenon with the actual conditioning state of the athlete and the organized training load, as well as the demand for the game, is the central challenge of theory and practice for coaches and physical trainers of the sport (Gomes , 2010).

Therefore, the understanding of the factors and variables related to the control of the training load depends on objectively interpreting the results of the effects on the body relative to the training and / or game tasks. In part, these variables unfortunately still occur in an isolated and incomplete way, failing to understand the concrete results, making them partly incompatible and contradictory to the stress of the exercise. It is fundamental to understand the factors and variables that contextualize the training load and characteristics of the contents proposed for the preparation process, corresponding to the training phase and its objectives.

The basic objective of the training is to increase the abilities of athletes in the various manifestations of game demand, and the training programs should designed to improve the functional limits of the athletes (Reilly, 2007).

A usual strategy in the application of these is the alternation of periods of high and low training loads in the search for improvement of physical and sports performance. However, this increase in training loads can not only generate positive adaptations to athletes and improve performance, but can also cause losses when training exceeds individual regeneration capacity, causing stagnation or drop in performance, leading to the "overtraining syndrome" or overtraining. (Nederhof et al., 2007).

This leads us to understand that the load is a functional stimulus capable of causing disturbance in the state of equilibrium of the organism, known as homeostasis (dynamic equilibrium), leading to physical and / or psychological adaptations; and requiring an individual recovery period compatible with the characteristics of the loads applied.

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ASTSPEC DETERMINING THE CONTROL OF THE TRAINING LOAD: The content of the training load is related to what will be trained and can be analysed from the point of view of the specificity and the potential of the training to be performed. It is characterized as: Insufficient, recovery, maintenance, development and excessive. In this case, the official game is considered a developmental burden, since excessive loads occur when the athlete is submitted to an effort that leads to exhaustion at the end of the training (Gomes, 2002).

Therefore, the discussion between the researchers is centered on the different forms of control and analysis of the effect of the training in the organism of the athlete. In this case, we highlight some parameters, such as the health status of the athlete and the adjustments and physiological adaptations that occur in the training process, indicating the level of performance, but also must be monitored to seek a better control of conditioning and prognosis of the level of performance in a game or training period.

Such parameters are: VO2max, strength, speed, flexibility, precision, muscle power and others. As well, the pedagogical scope of the technical, tactical and psychological performance of the athlete and the team can be evaluated. In this case, recent technologies have helped to more accurately identify situational game or training actions, making them a benchmark for establishing fitness and readjustments of the training load in the season.

For Godik (1986), the parameters most evaluated in the course and after the football match are:

Health aspect: General health, muscle and joint damage, trauma, peripheral vision, respiratory system, allergies, cardiac function, metabolic functions, concussion, etc.

Physiological aspect: Heart rate dynamics in the game, lactate concentration, energy expenditure, body temperature, net loss, among others.

Technical aspect: amounts of motor actions performed by the athlete, such as (right and wrong passes, goal kick, header, stolen ball, dribbles, fouls, kicks, goals, field location, etc.).

Physical aspect: Total number of kilometers (km) in the game, number of km with speed variation - low, moderate and high speed, number of meters walked, number of accelerations and decelerations performed, speed index , distance from accelerations and decelerations, forms of acceleration and deceleration, speed index reached, pauses between the most intense efforts, amount of vertical jumps, number of times the athlete had contact with the ball during the game, etc.

Biomechanical aspect: Level of muscular deformation, loss of muscle power, disturbance of pass and kick precision, disturbance of balance, etc.

Psychological aspect: Concentration, focus, anxiety, mobilization for the game, emotional behavior before and during the game, decision making, among others.

FINAL CONSIDERATIONS

This study has succinctly sought to address the issue of training load and control guidelines with the aim of indicating guidelines and facilitating the coach's understanding to improve the identification of the dynamics of training loads and competition, as well as their effects on the body of the athlete, assisting in the best training strategy. In this way, it allows lessening the error in the preparation of your athletes and team. Determine the training volumes, their characteristics as well as their intensities; is not a simple task in a modality like soccer, because it requires different efforts at each moment of the game, making it complex in organizing a training system. But without a doubt, the trainer must constantly cross the information of different areas presented, so that he can structure a more specialized methodology in all aspects, selecting means and methods of training that can improve the performance of the athlete and / or team based in the competitive model. This relationship must be considered constant to meet the goals established as a result of the competition calendar that the team will participate, influencing the dynamics of the variety and content of training. The experience of the group and its competitive level indicate differences in the organization and attribution of contents in the training process.

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Football physiotherapist role and prerogative

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Introduction: More sports related injuries, logically follow the ever-increasing trends towards concerns regarding fitness as well as tremendous sports participation in organized and recreational sporting activities at all ages [1–3]

The ultimate goal of every sports medicine setting is to foster a "healthy, capable and resilient athletes, while attaining widespread, inclusive sustainable and enjoyable participation and success for all levels of individual achievement" [4]. Players striving to reach higher level of performance, remaining healthy and injury free has a direct impact on their chance of success. Injuries related to sports activities are managed by sports physiotherapists.

Sports Physiotherapy is the specialized branch of physiotherapy which deals with Injuries and issues related to sports people. Sports injuries do differ to everyday injuries and are specific to each practiced sport e.g. individual sports or team sports such as Football. Players normally require high level performance and demand placed upon their body, which stresses their muscles, joints and bones to the limit. Sports physiotherapists assigned to football teams help players recover from games injuries and provide education and resources to prevent problems.

Each football physiotherapist usually has sport-specific knowledge that addresses prevalent acute [2], chronic and overuse injuries in different age category . Their services are generally available to sports men and women of all ages engaged in sports at any level of competition and delivered in medical settings, during training and games.

Football physiotherapist shall have experience and knowledge of the latest evidence-based practice, skilled assessment and diagnosis of sports injuries, and use effective 'hands-on' management techniques and exercise protocols to assist recovery and prevent injury.

To manage their teams in-line to the highest standards of practice, football physiotherapist should be committed to continuous development plans and have access to the most recent advances in sports physiotherapy through seminars, workshops and original researches.

A football physiotherapist is an active member of a multidisciplinary team e.g. S&C, physiologist, coaches etc.. and at the center of a shared decision- making process that collectively decides return to sport [5] following mostly long-term injury which requires weeks of sports discontinuation.

Moreover, as communication between the head coach/ manager and the medical team is vital for maintaining players on the field [6], football physiotherapist is responsible to ensure a transparent, effective and prompt line of communication with the coaching staff and all other stakeholders. In the match day, the prerogatives of football physiotherapist, are structured as follows:

Pre-Match: Prior to kick-off, physiotherapists for every team will be monitoring their players' hydration levels. They are also directly involved in each player's individual warm-up, including joint mobilization, sports massage,

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In-Match

During a game each team will have a physiotherapist as a key member of the pitch-side support team. They must remain calm under immense pressure, with viewers across the globe watching them live, to treat injuries as required and decide whether it's appropriate for a player to continue. Football physiotherapist will carefully wait for the authorization from the referee to enter the pitch in case of need. They deliver pitch-side first aid when required and ensure coordinated management with onsite paramedics.

Post-Match

After the final whistle blows, physiotherapists continue to play a key role in supporting the team. Vital tasks range from monitoring players' weights and hydration levels to ensuring ice baths are taken and providing rub downs and static and dynamic stretches to promote recovery before the next game begins.

Conclusion

The scope of practice and prerogatives of football physiotherapist are ever expanding, as a member of multidisciplinary team not only in-charge of injury management but also as an active contributor to an enhanced performance of his players.

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Does blood-flow occlusion help footballers?

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Key words: blood-flow restriction, repeated-sprint ability, team sports, muscle oxygenation

Introduction: Soccer players typically repeat short-duration, high-intensity bouts of movement such as sprinting, interspersed with brief periods of low-intensity activity. Thus, repeated-sprint ability (RSA) is a critical determinant of performance in matches. Research has demonstrated that improving RSA through physical training has clear benefits for team-sport athletes (Billaut & Bishop, 2009; Girard, Mendez-Villanueva, & Bishop, 2011), with a likely advantageous transfer to the playing field. Methods that increase the contribution of the oxidative metabolism generally mitigate the influence of limiting metabolic factors, and enhance the ability to resist fatigue during repeated sprints. Physiological adaptations related to greater oxidative phosphorylation such as higher maximal oxygen consumption (VO2max) (Tomlin & Wenger, 2002), faster oxygen uptake kinetics (Rampinini et al., 2009), and faster muscle reoxygenation (Billaut & Buchheit, 2013) have been associated with greater RSA.

Relevance of ischemic preconditioning: Blood-flow restriction methods can enhance the contribution of the oxidative metabolism to exercise, and thereby, improve some key aspects of RSA. The recent meta-analysis by Salvador and colleagues (Salvador et al., 2016) demonstrated a practical impact on sports performances. When all types of performances were combined, ischemic preconditioning (IPC) yielded a "small" beneficial effect (effect size ES 0.43) with no chance of observing a negative impact (ES range 0.28-0.51). The most robust beneficial impact was reported for "aerobic" (>90 sec) performances with a "moderate" impact (ES 0.51), which is directly relevant to soccer since players can cover long distances during a 90-min match. Results for performances of shorter duration were not convincing. However, such studies were scarce at the time. In very recent years, our sport sciences laboratory has particularly explored the potential of these non-invasive methods on the physiological responses and performance during short intermittent efforts. Our first series of studies aimed at understanding the impact of IPC on leg blood flow and muscle oxygenation. We used an IPC protocol with three 5-min complete occlusions with a cuff placed on the upper thigh and inflated to 200 mmHg, followed by 5-min reperfusion, performed before the warm-up. This manoeuvre completely stops the arterial blood flow within the lower limb and induces transient but severe tissue hypoxia. This protocol successfully enhanced muscle blood flow and O2 extraction (Fig. 1) in strength-trained athletes during repeated, maximal leg extensions (Paradis-Deschênes, Joanisse, & Billaut, 2016). We also demonstrated a greater muscle tissue re-oxygenation between efforts conducive to increased muscle force (+12%, ES 0.47), as happens between repeated sprints (Billaut & Buchheit, 2013). Importantly, however, we also reported for the first time that female athletes may not benefit from IPC (Paradis-Deschênes, Joanisse, & Billaut, 2017), probably due to their relatively well-develop aerobic me-

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Overall, IPC is shown to promote vasodilatation of muscle blood vessels, increase blood flow, accelerate VO2 kinetics, and ultimately improve O2 delivery to render many organs, including skeletal muscles, more resistant to subsequent ischemic-hypoxic events, similar to those observed during high-intensity exercise (Berger, Macholz, Mairbäurl, & Bartsch, 2015; Tapuria et al., 2008). However, methodological considerations such as cuff pressure and the quantity of muscle mass occluded still need to be clarified, as IPC is not always ergogenic (Zinner, Born, & Sperlich, 2017).

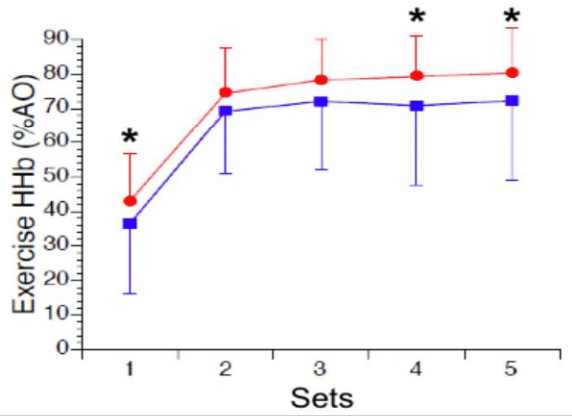

Fig. 1. Quadriceps muscle deoxygenation derived from near-infrared spectroscopy ([HHb]) during five maximal leg extensions lasting 10s after ischemic preconditioning (red) and placebo (blue). Paradis-Deschênes et al. 2016

Other uses of occlusion: Aside from physical training, a well-conducted warm-up also improves RSA. Since every athlete conducts some form of warm-up before training or competition, it is an important window of opportunity for the sport scientist. The majority of the warm-up ergogenic effects on performance are due to elevated muscle temperature, subsequently vasodilating blood vessels and increasing muscle blood flow, leading to greater skeletal muscle VO2 (mVO2) and faster VO2 kinetics (for review see (Bishop, 2003)). Therefore, one may argue that a warm-up specifically designed to enhance O2 delivery should provide an ergogenic potential.

Another compression method that allows manipulating blood flow to skeletal muscles is the so-called blood-flow restriction (BFR) technique (Loenneke et al., 2012; Scott, Loenneke, Slattery, & Dascombe, 2015). Contrary to IPC, BFR is employed during exercise and does not elicit complete ischemia. The pressure applied to the limbs impedes the venous outflow but maintains approximately 50-80% of the arterial inflow (Loenneke et al., 2012). BFR is known to induce acute adaptations of the endothelial and metabolic functions that mimic some of the mechanisms of a warm-up. Therefore, we taught to investigate the potency of adding BFR to a warm-up to increase RSA in team-sport athletes. The pressure was applied on the athletes' upper thighs using powerlifting elastic knee wraps (width: 7.5 cm; length: 200 cm) during a 15-min sport-specific warm-up (dynamic stretches, various activation exercises for the posterior chain and the ankle stabilizing muscles, and

Fig. 2. Time during 12 x 20-m run sprints after control warm-up (blue) with warm-up with BFR (red) in elite American footballers. Billaut & Fortin 2017.

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Both legs were wrapped at a perceived pressure of 7 and 3 out of 10 in BFR and placebo, respectively. Results demonstrated that elite American football players who used BFR had significantly more blood in their lower limbs during exercise (Billaut & Fortin, 2017). This greater blood flow further improved muscle oxygenation. Compared with players who received a placebo compression during the warm-up, the BFR group displayed a tendency for better performances (best average speed: BFR +1.1% vs placebo +0.2% ES 0.25; % decrement score: BFR -0.5% vs placebo -0.9% ES 0.39). Notably, this performance impact was greater in the last sprint repetitions of the test (Fig. 2), suggesting that this warm-up procedure could potentiate physiological responses that would enhance performances in longer activities.

Take-home message: Research has demonstrated that blood-flow occlusion techniques are safe when implemented appropriately (Loenneke et al., 2012; Nakajima, Morita, & Sato, 2011), and can enhance physiological determinants of repeated, high-intensity performance, as well as optimise the ergogenicity of a warm-up. In addition, both IPC and BFR have recognised advantages pertaining to recovery from injury and muscle hypertrophy (not discussed here) that are also directly relevant to performance in soccer (Loenneke et al., 2012). Therefore, we encourage soccer players and practitioners to take advantage of these innovative techniques.

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Injury Prevention and Performance Enhancement: Tournament Strategies for 055+ Masters Football Teams and Players

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Introduction: Increasing numbers of 055-065+ senior players are participating in masters football tournaments (e.g., 11v11, 5v5, futsal, 3v3, walking football) which involve a series of competitive matches interspersed over a full or multi-day event (Hubball et al, 2018). The vigorous physical/mental demands of masters football tournaments can increase the chances of injury (especially for ill-prepared or injury-prone players) and thus significantly hinder optimal tournament experiences for teams and individual players. Very little research has examined effective injury-prevention strategies for 055-065+ masters players participating in full or multi-day football tournaments. As part of preparation for the 055+ International Masters 5-a-side World Cup Football Tournament at the University of Bristol, England, 2018, case study methodology (Yin, 2017) was employed over a 6-month period in order to assess effective pre, during and post-tournament injury prevention strategies. Data collection and analyses focused on team development and individual preparation practices with a select 055 masters football team (three times international masters world cup tournament winners); a series of tournament-specific consultation and debrief sessions with a professional football physiotherapist, as well as team trainer; and, key insights from a representative sample of participating international tournament team leaders. This paper highlights key findings for effective pre, during and post-tournament injury-prevention strategies for 055+ players participating in a multi-day international masters football world cup tournament.

PRE-TOURNAMENT

Injury-prevention strategies prior to participating in a multi-day 055+ masters football tournament.

- In the months prior, teams should gradually increase the quantity of strategic fixtures/practice games against similar age and ability teams (as tournament opposition) in order to closely simulate the game format, as well as related physical and mental fitness demands for an upcoming (full or multi-day) masters football tournament. Cross-training aerobic activities such as the use of an elliptical machine, stair-climber, rowing machine, upright stationary bike, brisk hiking, or swimming reduces excess impact and stress on the muscles, bones, joints and tissues. Furthermore, increase strength training of major muscle groups is critical for conditioning against the rigours of a demanding masters football tournament. For example, key range of motion losses (crucial to football) experienced with aging include: hip extension and thoracic rotation. Specific recommended exercises include progressive back-leg raises that simulate football shooting, lateral trunk and upper body twists.

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Furthermore, common football injuries experienced with aging include calf and hamstring muscle strains. Specific recommended exercises include side-lying and progressive lower back rotation stretching, and single leg glute bridge exercises respectively (Thorborg et al, 2017). Adopt an effective football-specific warm-up and cool-down routine prior to and on completion of training/ games in order to get one's body feeling better for the start of a match (and for the next day!) and help prevent non-contact injuries that occur due to poor training/game preparation.

- In the weeks prior to participating in a multi-day 055+ masters football tournament, reduce/taper-off from your usual physical training quantity and/ or high impact activities i.e., don't overdo pre-tournament games/training and increase risk of injury and non-participation! For example, increase tournament-specific mental skills preparation (e.g., visualize the series of games from start to finish), reduce distance-speed running or competitive football training/games, and ensure rest-day recovery periods. If you do go for a run in this pre-tournament phase, avoid road-running and use softer terrain such as a turf field or nature trails. Include 'fartlek' sessions or short intervals (e.g., 2-3 mins of moderate to high intensity followed by 2-3 mins of light intensity or mini-rest periods for 4-6 repetitions) in order to help prepare for changes in running intensity during vigorous tournament conditions.

DURING TOURNAMENT

Injury-prevention strategies during a multi-day 055+ masters football tournament.

- Nutrition and fluid intake - Eat a meal with complex carbohydrate and lean protein at least 3 hours prior to the first tournament game. Have a small snack 30-60 mins prior to kick-off (e.g., granola bar)
- Warm-up - Despite tournament excitement and/or nerves when teams gather prior to kick off (i.e., interactions with team mates and/or other masters players), ensure deliberate and adequate warm-up prior to each game for optimal (physical and mental) performance state
- SAFETY: Tournament Rule number 1! - Absolutely no dangerous challenges (e.g. tackles from behind, slide tackles). It is imperative to play with safety in mind toward others and self (including compulsory shin pads). The collegial atmosphere among participating masters players, teams and referees is critical and thus safety must be strictly enforced by all!
- On completion of each individual tournament game - Add clothing to maintain full body warmth, and ensure immediate refuelling and re-hydration (e.g., water, pasta, bread, nuts & raisins, granola bar, electrolyte/ minerals) especially in warmer weather, and when appetite is often surpressed from vigorous activity. Try to mentally relax while maintaining very light mobility exerises, massage, and short walks to prevent body seizing-up.

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Furthermore, avoid exposure to the sun and temptation to stand still or lie down unless significant game-break periods enable deliberate and adequate post-game cool down (e.g., to dissipate lactic acid in muscles), as well as pre-game warm-ups for optimal performance state. During this phase, team leaders should provide psychological support and check-ins to see "how each player is feeling" to further encourage and assist optimal performance states. If appropriate, administer light massage for cramped muscles and/or instant ice-pack treatment for bruising or light impact injuries.

POST-TOURNAMENT

Injury-prevention strategies following an 055+ masters football tournament

On completion of Day 1 tournament games - If possible, use a stationary bike for 15 minutes at a light – moderate intensity in order to assist circulation and decrease leg soreness for the following day. Hot/cold contrast baths following the first tournament day can help to increase circulation and decrease soreness in the legs for the following day.

Resist temptation for excess alcohol and sedentary activity since both impair (physical and mental) performance state for the start of Day 2. Prior to beginning Day 2 tournament games, a hot bath for 5 mins followed by a short walk and light jog with gentle stretching can help to ease body soreness and muscle tightness. Recycle above "During Tournament" strategies for Day 2!

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- On completion of a full or multi-day tournament - address any injuries as soon as possible in order to decrease injury duration and prevent recurring injuries in future. Resume light daily aerobic activities such as walking, cycling, and/or swimming, however, allow adequate time/weeks before resuming vigorous bouts of exercise (including competitive football and high impact activities) in order for your body to fully heal and recover from a full or multi-day masters football tournament.

Conclusion: Injury prevention is key for 055+ teams and players participating in demanding full or multi-day football tournaments. Our research with 055+ players preparing for a 2-day international masters football tournament suggests that individualized pre- (e.g., taper-off, increase cross-training, core conditioning, mental skills preparation), during (e.g., light mobility exercises, refuel and hydration loading in-between game periods) and post-tournament (e.g., attend to injuries, light recovery activities) injury-prevention strategies enhance optimal tournament experiences and performance. Insights from this research will assist masters football tournament organizers, coaches and players.

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Fitness Preparation Challenges in Portuguese Professional Football

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INTRODUCTION: Football is one of the most popular sports in the world and Portugal does not escape this rule. In March 2017, the Portuguese Football Federation registtred 143,893 practitioners (FPF, 2017). With the increase of practitioners, the challenge for all the Football Professionals was increased. This paper aimed to address the challenges that football professionals encounter.

Congested Calendar: At professional level, an elite team of Portuguese Football, participates in 4 or 5 official competitions: Liga NOS, Portuguese Cup (PC), League Cup (LC), UEFA Champions League (UCL) and Portuguese Supercup. In this regard, and if we consider a possible qualification for the UCL K.O. stage and a qualifying for the PC and LC finals, an elite team will hold 55 official matches in the same season. The distribution of these games will lead to the existence of so-called congested calendars, which as a consequence a decrease of performance and an increase of injuries risk (Ekstrand et al., 2004; Carling et. al, 2015a). Such constraints arise from the existence of only 2-3 days interval between each game. Although the 72 hours between games may be enough to restore performance levels and most of the blood biochemical parameters will return to steady state levels close to those before the games, other variables of physiological stress remain high, especially when compared to non-congested cycles (Lundberg & Weckström, 2017). Therefore, during these congested periods, we should focus on recovery processes. However, when Carling et al. (2015b) analyzed the effective exposure to these periods, they found that a relatively low number of players appeared to be affected. Although the veracity of these conclusions, the existence of at least one player in these conditions already by itself, can raise several constraints, namely in the management of the training/recovery loads between the team. They can be different and/or temporarily unsynchronized with the other teammates (player “x” could be in recovery period, while the player “y” should be in load period). Accordingly and respecting to training modalities (especially: individualization of training), it becomes imperative to customize the training processus that should be prescribed. However, while in a "physical/physiological point of view” this separation may be possible, with regard to what is the essence of the game – collective –, this separation becomes counterproductive, since the tactical behaviors that we intend to see in the game, only are trainable together, leading us to a planning that does not fully meet the needs of all the involved players. Other constraints should be taking into consideration during planning such the group of the “selected” players that do not play, or the players that play little time. While the group of the “not selected” players can train in the day of the game - even if it is not exactly the same demand, the physical/physiological demand can be similar to the players who play (Russell et al., 2011) – the players who do

However, logistical issues (like match away and return travel), psychological stress due to the result of the game, contestation of the fans, among others, could make this training unfeasible. In this point of view, this group will always be at a disadvantage compared to the players who usually play, challenging us to overcome these constraintments.

Competitive Context: Associated with the aforementioned, the competitive variability in Portugal is huge, and during the same week a team can play against a theoretical "lower performance" team and after 3 days, against a Top-5 Team of world football, returning, after 3 days, to play against a team from a lower division, for example. This variability of competitive requirement puts many obstacles and insight in the management of workloads, because sometimes we try to manage the fatigue of some players, making them rest in some games – theoretically more accessible – but, not infrequently, there is a considerable loss of performance, as a result of the exchange of players and consequently loss of routines, as well as the increase of motivational levels of theoretically inferior opponents. Furthermore, the influence of the level of readiness and competitive requirement has on the appearance of sports injuries seems to be a reality. As such, the "disconnection" of alert levels, so common in games of (theoretical) lower requirement, can lead to the appearance of injuries (Hagglund et al. 2009) that, in other contexts could not occur, putting the fitness coach in a delicate situation.

Playing Surfaces: The injury risk associated with the type of playing surface has already been studied, especially with the comparison between artificial and natural grass surfaces (Williams, et al. 2013). However, the comparison of the injury risk and performance decrease in high-quality and poor quality natural turfgrass fields is unknown.

Although, in Portugal there are natural grass fields in excellent condition (figure 1), other fields are in poor condition (figure 2), which may lead to a performance decrease, on the one hand, and an increased injury risk, in the other hand.

In addition, experience has told us that playing in these fields imposes higher doses of fatigue and DOMS than the other pitches. This creates a further constraint on the planning of training/recovery loads, depending on the field of play.

National Teams: Another fact that puts innumerable difficulties, is the calls to the national teams. FIFA sets known dates (Fifa days) for official and/or friendly matches in which clubs have to release their players to their national teams. With this release, it is evident the loss of control of the whole process of physical and physiological development of the player (Training load) and, although the information sharing between National Team and Club can be a reality, the different methodologies used and the dynamics of work and requirements that may arise, may compromise all the planned work. It is not uncommon, as a result of these oscillations of methodology and/or competitive requirement, the injury appearance, in a phenomenon known by the media, as "FIFA Virus".

Personal Trainers

Another factor that can condition the activity of physical coaches in the club, is the presence of personal trainers external to the club that many players employed. Although individual development is absolutely necessary and essential for the optimization of its capabilities, the fact that, it's often done in secrecy and in default of the club, unfeasible the link between the work prescribed by the technical teams and the individual work. With this, fitness coaches

lost the control of the management of workloads and also his characteristics.

Figure 1. SL Benfica – FC Porto, Estádio do Sport Lisboa e Benfica (07.10.2018)

CONCLUSIONS

In conclusion, most of the constraints of the Portuguese Professional Football are related to external issues, that are not controlled by fitness coaches. Therefore, each fitness coach, must be able to understand it and adapt his ideas and methodology based on the knowledge that it possesses of these variables and constraints.

Figure 2. CF Belenenses – CD Tondela, Estádio Nacional – Jamor (19.01.2019)

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The effect of small sided games on youth players

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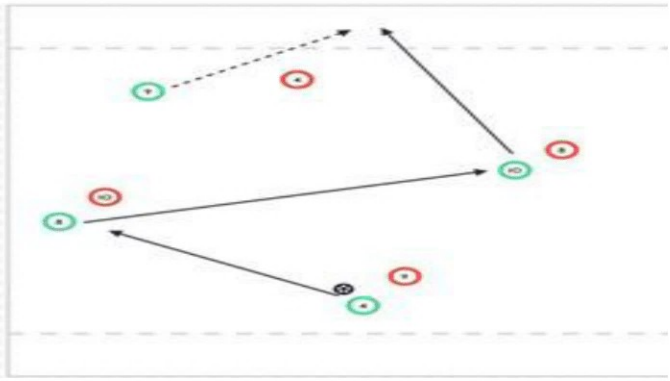
Introduction: Football is an open skilled game. An open skill is where "the environment is constantly changing, and so movements must be continually adapted. Skills are predominantly perceptual and externally paced, for example, a pass in football." The Open and Closed Continuum (Galligan 2000) is concerned with the effects of the environment on skills (Knapp 1967). It is often taught to youth players with practices that are totally unrelated to the demands of the game at grassroots and elite level. Often players are put into ques with a cone used as a defender, a pattern of play that involves zero peripheral skills and therefore requires zero decision making to take place which, in turn is disconnected to the true environment of football.



When we look at the environment of a game of football, it is effected by where the ball is, movements from the player's team mate or direct opponent. Therefore, we must consider based on this, what is the best method of developing youth football players and why?

Why not 11 v 11?

Often players as young as 10 are put straight into the 11v11 having the ability to dribble in a 1 v 1, connect or combine in a 2v2, 3v3 or a 4v4. The complexity of playing 11v11 at such a young age can result in having too many decisions to make. When we look at the lines of interaction (maximum number of passing options between players in a game) in a 3v3 (30) or a 4v4 (56), if a 10-year-old hasn't mastered this then how do we expect them to jump straight into an 11v11 with much more (462) lines of interaction? The tactical complexity is too high as the players don't have the mental capacity to deal with this at such a young age. To maximize the development of youth players the process needs to be progressive.

What effect do small sided games have on youth players?

If we look at a variety of commonly used parameters when developing youth players, we end up considering the following.

- The session topic placed by the coach which will in turn effect the size, shape and equipment used on the pitch.
- The principles of attacking and defending and the transitions between both noting the success within each category
- The technical and or tactical outcomes of the session set by the coach
- The 4-corner long term player development model

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The Advantages of using Small sided games

- Players get more touches of the ball which increases the technical demands.
- There is an opportunity to reproduce game realistic scenarios on a much high scale therefore allowing players to continuously make decisions and offers opportunities to learn from mistakes and challenge the players thinking.
- Small-sided games (SSG's) are very beneficial for the participants. Studies have been conducted to show, and observations confirm, that children get more enjoyment and learn more from playing in small-sided games with adapted rules. They get more touches of the ball, learn more quickly and have to make more decisions during the match (greater concentration is required because the ball is never far away).
- "SSG's are very beneficial for players, particularly during learning stages of grassroots and youth football players" Castellano (2011)
- Also they are a useful tool allowing the identification of talent in youth soccer players Williams and Franks (1998)
- SSG training in addition to the training of the technical and tactical aspects, maintains cardiorespiratory fitness and promotes a high level of enjoyment in youth elite soccer players. Los Arcos (2015)
- "The physiological benefits of participating in small-sided games are a valuable physiological training tool for all players, also allowing the improvement of technical, tactical and psychological/social skill development at the same time." Grant Small (2006)

Summary

"The best way to encourage players to develop their football is by training them in such a way that the whole brain is involved and that all parts of the brain are stimulated. It is a mistake to think that analysis of all aspects of the game is the basis of all training. It is mainly the technical part of the football game that requires analysis. This relies mainly on functions initiated by the left hemisphere. Training should in fact be focused on elements initiated by the right side of the brain - such as visual perception and movement – and the frontal lobes which are responsible for decision-making. The most effective training, therefore, is by playing small-sided games. Every player has to be involved, has a large number of touches, and has to make a lot of decisions about movement off and on the ball and about which skills to use. In this way, we stimulate the right as well as the left side of the brain at the highest brain level (cortex)." Micheal Critchell (2011)

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Hypoxic Training: What works?

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Introduction: The metabolic demand of top-world class football players during a match averages around ~70% of maximal oxygen uptake. Elite players typically cover 10±0.9 km per match with an intensity spectrum ranging from very low-intensity (55% of the total playing time or distance), low-intensity (16%), moderate-intensity (17%), high-intensity (7%), to very high-intensity (5%)[1]. The aerobic capacity plays a major role in sustaining high-intensity bouts during a match and in improving the rate of recovery. In fact, there is a significant correlation between maximal oxygen uptake – with values ranging from 55 to 68 ml·min-1·kg-1 for international football players – and distance covered during a match[2, 3]. It should not come as a surprise that performance decays in a match played at altitude[4]. Although exercising under hypoxic exposure affects aerobic performance, training at altitude or under hypobaric / normobaric hypoxia alleviates symptoms associated with altitude ascent in addition to potentially increasing the aerobic capacity of players. The underlying mechanisms behind the effects of hypoxic exposure are still unclear but factors such as central (ventilatory, hemodynamic or neural acclimation) and peripheral (muscle buffer capacity or enzyme activity) certainly contribute to the observed performance enhancement. The following sections aim at shedding some light on the potential impact of hypoxic exposures on improving physical performance of football players at altitude and at sea-level.

Hypoxic exposure paradigm: More and more athletes choose to purchase artificial altitude devices instead of making costly frequent trips to mountains in search of altitude effects. The scientific literature has frequently reported the effect of hypobaric or normobaric hypoxic exposure (simulated altitude) on all functional systems. Hypoxic exposure elicits physiological responses, comparable to a real altitude sojourn, such as increased circulating erythropoietin (EPO) and red cell mass that, in turn, increase O2 transport and tissue oxygenation [5] (see Figure 1). However, a growing body of literature on this topic raises questions about hypoxic exposure efficiency on aerobic and anaerobic performances. Some authors observed marked effects of hypobaric hypoxic exposure on polycythaemia, angiogenesis, and myoglobin content[6-10], others did not find significant change in maximal oxygen uptake and/or on other performance parameters[11-16].

Prior to discussing the effects of hypoxic exposure on whole-body physiological responses and physical performance, one must discriminate between different models of hypoxic exposure. Several years of scientific research have failed to establish conclusive affects of hypoxic exposure on endurance performance mainly because the types of hypoxic exposure intervention used in the literature differ from one study to another. They mainly differ in duration (from few minutes to a lifetime), level of altitude (from 1500 m to the top of the Everest) and physical activity (from anaerobic to aerobic activities).

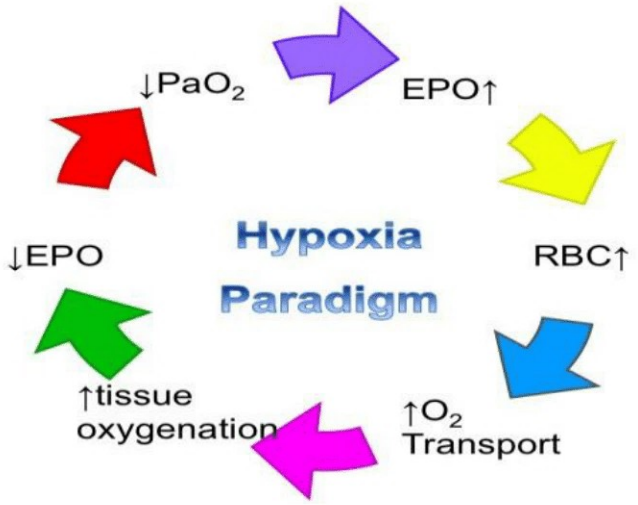

Figure 1. Hypoxia paradigm and its positive physiological responses.

Recently, Hoppeler et al.[17] proposed a nomenclature that differentiates between acute and chronic organism responses to hypoxic exposure. The metabolic profile varies widely between native, permanent and long-term highlanders, and lowlanders with physiological responses from microvasculature to cardiovascular and pulmonary systems adjusting accordingly. As a matter of fact, the environmental conditions preceding treatment / intervention as well as the physical fitness and training background of the athlete impact the magnitude of the physiological acclimations[18].

Potential physiological effects: Notwithstanding standardization problems such as absolute versus relative exercise intensities, and such factors as timing, length and degree of hypoxic exposure (see Figure 2); a general consensus on the effects of hypobaric or normobaric hypoxic exposure is emerging. Indeed, hypoxic exposure produces physiological acclimations similar to, but not identical with, the exercise-induced hypoxemia in normoxia [19]. The overwhelming numbe of investigations examining the effect of exercise on whole-body and muscle metabolism was conducted in comfortable ambient conditions. Many research findings show that endurance training in normoxia can positively affect muscle metabolic profile by increasing oxidative enzyme activity by about 30% to 40%. For instance, citrate synthase activity, a marker of the intact mitochondrial density, can be doubled in the muscle of a competitive endurance athlete[20]. Lipid metabolism increases as exhibited by higher lipoprotein lipase, carnitine palmitoyl transferase, and β-hydroxyacyl-CoA dehydrogenase activities [21].

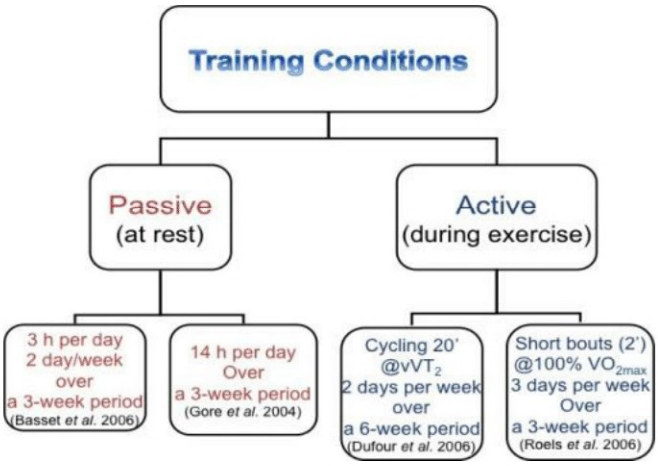

Figure 2. The types of hypoxic exposure described in literature.

High-intensity interval training also leads to an increase in muscle oxidative capacity, an improved lipid metabolism [22] and a greater capillarization[23]. Although environmental conditions are major practical issues, one must consider when examining acclimatory responses to exercise, certain authors hypothesized that short-term hypoxic exposures might be of sufficient amplitude to initiate acclimatory responses[24] (see Figure 3). In fact, relatively brief periods of hypoxic exposure through a hypobaric hypoxic chamber or inhalation of a normobaric hypoxic gas mixture stimulate erythropoietin release[25] and, thus augment reticulocyte count, haemoglobin and haematocrit.

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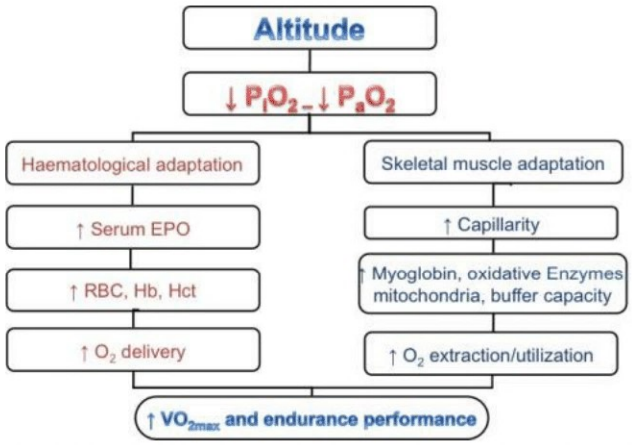

Figure 3. The hypothetical mechanisms of hypoxic exposure acclimation.

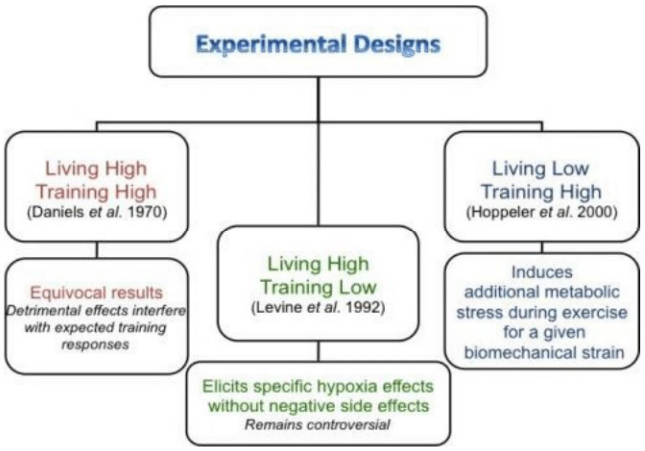

Figure 4. Most experimental designs used in literature.

It seems then, reasonable to infer an increased circulatory oxygen transport. Hypoxic exposure affects muscle metabolism[26] as shown by a significant increase in citrate synthase, succinate dehydrogenase and phosphofructokinase activity compared to normoxic condition[5]. These muscle enzyme activity modifications positively impact maximal oxygen uptake as previously shown[27]. Hypoxic exposure further increases muscle buffer capacity, an outcome associated with better cycling efficiency[14]. Prolonged high altitude sojourns result in a general loss of Krebs cycle enzyme activity; however, at moderate altitude or levels of hypoxic exposure, somewhere above an atmospheric PO2 of 80-100 Torr, aerobic metabolism is magnified, particularly when coupled with exercise[24]. Additionally, hypoxic exposure induces global systemic physiological changes. The aforementioned studies support the potential benefits of hypoxic training on cardio-respiratory responses and muscle metabolism while avoiding negative effects of prolonged high altitude.

Hypoxic modalities: Three main hypoxic modalities exist to alter oxygen provision (Figure 4). All aim at triggering beneficial physiological responses for sake of increased anaerobic and/or aerobic performance. Each of the three modalities triggers different acute and chronic systemic physiological responses. The "Training High – Living High" approach was the first training protocol used to induce improvement in endurance performance. Still, the negative side effects resulting from prolonged periods of hypoxic exposure impaired physical performance at altitude and upon the return to sea-level. This protocol is yet useful for athletes who wish to acclimate to hypoxic stress prior to a major event at altitude. The "Training Low – Living High" was developed because short-term hypoxic exposures interspaced with normoxic recovery periods can be of sufficient amplitude to initiate acclimatory responses while avoiding the detrimental effects of altitude. Alternate living at altitude, with training sessions at sea-level, permit specific metabolic and biomechanical adjustments through high-intensity training bouts.

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That said, the efficacy of this model is nevertheless questioned in the scientific literature and has, recently, lost popularity in the sporting world. The "Training High – Living Low" was designed for enhancing sport performance, acclimatizing to high altitude, and treating various clinical conditions. Its advantages reside in easily manipulating the repetition rate, the duration, and the intensity of both exercise and hypoxic stimuli. Growing scientific evidence suggests that short intermittent bouts of hypoxic exposure might be potentially beneficial for specific physiological acclimations[28]. For instance, short running or cycling bouts under hypoxic gas mixtures provoke additional metabolic stresses for a given biomechanical strain.

Conclusion: First, scientific research has shown the benefit of spending 1-2 weeks at or very near the competition venue for preparing for matches at moderate / high altitude in order to alleviate the symptoms associated with altitude ascent. In addition, some studies have reported that intermittent hypoxic training increases circulating erythropoietin and red cell mass, aerobic capacity, buffer capacity, and exercise performance while avoiding unfavorable hypoxic effects such as hypoxic ventilatory response, systemic hypertension, and left and right ventricular hypertrophy. Finally, the periodization of training must take into account the duration and dose of hypoxic exposure as well as the exercise content in order to optimize the hypoxic treatment and the time to peak performance of the football team.

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Effects of congested match play period on physical fitness, physiological and psychological parameters in elite soccer players

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Introduction: In contemporary professional soccer, teams are confronted with a large number of matches throughout the season, including league, cup, and international matches (Carling et al. 2015). These tight time tables frequently demand that teams play consecutive matches with less than three to four days of recovery in-between. It has been recommended that the recovery period between matches should be at least 72 h to avoid injuries and overtraining (Ispirlidis et al. 2008). Previous studies examined the effects of such a "congested period" of match play on physical and physiological performances in elite soccer players (Dellal et al. 2015). These authors demonstrated that running activity was negatively affected during match congestion periods. Of note, a reduction in running activity/capacity during a match may also affect skill-related performance in soccer players (Arruda et al. 2015, Moreira et al. 2016). Therefore, more research is warranted to better examine the negative effects of different congested periods on physical fitness, technical and tactical performance in elite soccer players. Furthermore, little is known on how an intensified in-season soccer period affects different physiological markers such as hematological and hormonal parameters and how these parameters may affect and explain the impairment of physical performance tests during periods of match congestion in soccer players.

Hematological responses to soccer training: It is well known that most common hematological variables (e.g., plasma volume [PV], hemoglobin [Hb], hematocrit [Ht], and red blood cells count) are linked to the development of aerobic capacity (Bekris et al. 2015). Previous research suggests that physical stress may affect PV and hematological parameters, which have major influences on players' physical performance. PV variation (PVV) is considered a form of body fluid adaptation in response to different training loads and exercise intensity. For example, Hb values determine the oxygen transport and consumption, which is linked to physical performance through aerobic capacity. Ht levels are usually associated with the enhancement of the oxygen transport capacity. Thus, longitudinal monitoring of Hb, Ht and RBc covering 6 months has shown an increase in hematological parameters at the end of the pre-season period in professional football players (Bekris et al. 2015). According to Silva et al. (2008) Ht was significantly increased after 3 months of training while it was decreased during the more intense periods of training in Brazilian soccer players. Moreover, Heisterberg et al. (2013) have monitored these hematological parameters in players from the best Danish league, and found a decrease in Hb and Ht as the competitive season progressed. In addition, the highest value of Ht and the lowest value of Hb were obtained after a period characterized by frequent matches (Heisterberg et al. 2013). Blood parameter variations are related to the amount of aero-

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Hormonal responses to soccer training

Two very important hormones in the biochemical assessment of athletes are testosterone and cortisol. The measurements of the main hormones secreted by the hypothalamic-pituitary-adrenal (HPA) axis and hypothalamic- pituitary-gonadal (HPG) axis can be used as an indicator of physical stress and to evaluate the balance between the anabolic and catabolic activities (Urhausen, A et al.1995). Thus, Freitas et al. (2014) provided evidence that intensive periods of training may lead to an increase in salivary cortisol concentrations but not stress tolerance in elite youth soccer players. According to Silva et al. (2011), the serum concentration of cortisol increased the testosterone and the ration T/C decreased after 12-week training program. In addition, Moreira et al. (2016) have demonstrated an insignificant change for salivary cortisol and a decreased for salivary testosterone concentrations after the congested period of match play (7 matches played in 7 days). However, despite some controversy, distinct methodological approaches of the analysis of hormonal parameters of soccer players. Hence, hormonal variations are related to the training intensity and volume (Silva et al. 2011).

Biological and psychological approach to monitor training

Given the importance of these measurements for physical fitness, it is imperative to better understand the concurrent effects of a congested period of matches on hematological and hormonal parameters for a better management of training and competitive workloads. A clear understanding of the impact of training will help in the design and development of more effective strategies to accelerate recovery (Anderson et al. 2008). Moreover, little is known about the integrative analysis of hematological and hormonal parameters, psychological parameters and physical fitness of elite soccer players from the same team, before and after a congested period of match play.

Thus, we conduct a study (under consideration for publication), which is, to our knowledge, the first to examine the effects of match congestion period on PV, hematological parameters, hormonal responses, psychological and physical fitness in elite soccer players. The results showed that PV, and selected hematological parameters, hormonal parameters and physical fitness of the soccer players were significantly altered after a match-intense 6-week in-season period. However, the changes observed in hematological parameters were not related to a decline in physical fitness other than squat jump performance. In addition, the changes observed in hormonal parameters were not related to physical fitness performance decline, but the changes in psychological parameters were related to the decrease in physical fitness. This research may provide useful information for coaches and medical staff with regards to training load and physical fitness performances during an intensive period of congested match play to better manage the work strain and to avoid overreaching and overtraining, while reducing the risk of sustaining injuries.

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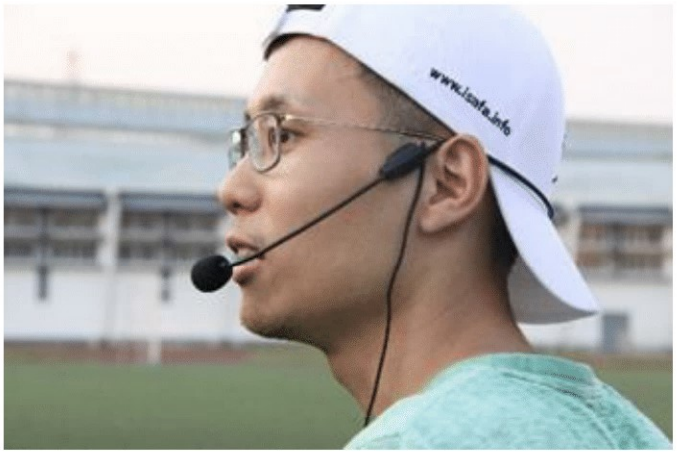

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Building a more equal world of football

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Introduction

With 270 million practitioners worldwide, football is a world's sport (FIFA, 2016). To some degree, this popularity involves a responsibility to serve as a role model for society. Nevertheless, football struggles with serious issues such as homophobia, racism and sexism (Thole & Pfaff, 2019). This short article on hand focuses on women's football. Football is one of the fastest growing sports for women. The FIFA has been counting more than 4,8 million females registered in 2006 and calculates more than 30 million non-registered players. Male superiority is not only the case when it comes to the number of active players but is also about the totals of coaches, referees and women in executive positions. Even though the females' involvement is increasing, there is still a long way to go (FIFA, 2016). This article aims to give a short view over today's situation of female players and the inequality of chances when it comes to stepping into and participating in a men-dominated sport. Drawing on results of a recent study within Europe, it tries to discuss methods of resolution to overcome this barrier and to promote female football.

In a comparative study of Scraton, Fasting, Pfister and Bunuel (2018), 40 top-level female football players from four countries (England, Norway, Germany, Spain) had been interviewed. The researchers' team was able to work out the way women step into the football world and the barriers and issues they are confronted with during their time being active. Moreover Scraton et al. (2018) investigated approaches to increase the number of female players and equalize the chances in comparison to men. In all four included countries, women started playing football at young age between four and eleven years. Their first football experiences took place in informal spaces such as streets and parks in the neighbourhood. Most of the interviewed players reported encouragement through the male parts of their family or their friends.

Women from England and Spain named barriers to participate such as limitations at school whereas those from Germany and Norway named a lack of girls' teams in clubs. This national difference can be explained by the different school systems concerning the integration of sports organisation. All the 40 top-level players reported a problematic impact of the feminine and masculine ideals on their self-perception. Together these results provide important insight into the situation of women in the footballing world. However, further research should be carried on to evaluate the current situation of football

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How could we help female football?

With the findings of Scraton et al. (2018) in mind, it becomes clear that there are various approaches to work out solutions. One starting point could be the creation of formal opportunities in schools, member associations and communities for females to facilitate the access to football. Furthermore, the male-dominated structures of football associations must open to women's participation, engagement and employment. The inclusion of women involves a qualification for jobs like coaches and referees and a more balanced allocation of public funds. It is, and it is going to be a huge task for the society to dispose of the stereotypes and change the binary image of the sexes. Working on increasing female participation in football could be an effective way to get other sports on board to lead the society towards a more equalized thinking not only regarding women but also the already mentioned issues such as homophobia and racism. Another key to remember is that the goal isn't the weakening of male football, but to provide equivalent opportunities for women. To make this work, it needs an all-embracing engagement.

Football is a team sport, what about the society?

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Small-sided soccer games for health in untrained people

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Introduction

Sedentary lifestyle is a public health problem of these last decades. It is associated with various types of diseases, including cardiovascular and metabolic diseases, obesity and stress. Most people do not participate in regular physical activities. This is linked to several factors, such as modern lifestyle, lack of spaces dedicated to sports, job or school calendar, and sometimes lack of motivation. For this reason, it is important to find motivational forms of physical activity that stimulate sedentary people to practice sport and, at the same time, elicit intensities that are high enough to have health benefits. It has been shown that football can offer an interesting form of training in comparison with other activities especially in terms of motivating sedentary subjects to engage in physical activity and increase their participation time.

Physiological responses to small-sided soccer games

Heart rate (HR) values recorded during SSSG in sedentary subjects can exceed 80% of HRmax values. For example, Bendiksen et al. (2014) found that out of nine physical activities in a physical education programme, a soccer-based session generated the highest HRmean values (156±18 bpm) in 8–9-year-old schoolchildren. It has also been reported that blood lactate levels and elapsed time at intensities greater than 90% HRpeak are significantly higher during SSSG sessions compared to running sessions (Krustrup et al., 2010). Another recent study has also shown that a session of SSSG (5v5, 1 hour) required very high exercise intensities (HRmean = 85±2% HRmax) associated with an energy expenditure of 634±92 kcal in sedentary adult subjects, who travelled a distance of 3412±381 m (Beato et al., 2016). In sedentary adolescents, Hammami et al. (2017) showed that RPE was significantly lower after SSSG session compared to repeated sprints.

Factors influencing the intensity of small-sided soccer games

The intensity of the exercise during SSSG can be modified by changing parameters such as pitch dimensions, number of players and game format. Aslan (2013) observed that HR values recorded during SSSG 5v5 were higher than those for 7v7 (164.3±11.9 and 161.2±12.9 bpm, respectively). In addition, Randers et al. (2014a) studied the effect of varying the number of players during SSSG. The results of this study showed that HR during 5v5 (pitch area 30x40 m) was higher than during 8v8 (pitch area 52.5x68 m). Another study by Randers et al. (2014b) showed that HRmean values were higher in 5v5 than in 8v8 (174±10 vs 168±12 bpm, respectively) in U10 players, but similar in 8v8 and 11v11 (170±10 vs 171±10 bpm, respectively) in U13 players. The other factor studied was the type of playing surface. It was reported that HR was significantly higher for SSSG played on a turf-type surface (87.8% HRpeak) compared with an asphalt type surface (82.4% of HRpeak). (Brito et al., 2012).

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Effects of SSSG on physical performance

Positive effects of SSSG training on aerobic performance, judged on endurance performance or maximal oxygen uptake (VO2max) were observed in healthy untrained subjects. Bangsbo et al. (2010) compared the effects of 16 weeks of SSSG training with running-based training in sedentary women aged 20-45. The results showed that VO2max increased by 15% in the SSSG group and by 10% in the running-based training group. It has furthermore been observed that the improvements in Yo-Yo intermittent endurance level 2 test (64%), 30-m sprint time (- 0.11s) and maximum hamstring strength (+ 11%) were greater after SSSG training compared to running-based training for 20-40-year old untrained men (Krustrup et al., 2010). More recently, similar gains in muscle strength and balance have been observed in 68-year-old subjects after 1 year of SSSG or strength training (Sundstrup et al., 2016). Specifically, 10 weeks of SSSG produced significant improvements in speed over 50 m (-0.9 s), jump performance (+ 7.6 cm) and muscular strength in sedentary children aged 9–10 years (Faude et al., 2010).

Effects of SSSG on body composition, including bone adaptations

A football-based training period has positive effects on body composition in healthy, sedentary subjects. A significant decrease in body fat (1.2 %) was observed after 16weeks of training in sedentary adult women (Connolly et al., 2014). Similar results have also been reported in sedentary adult men, with fat mass decreasing significantly (3%) and bone mass increasing (1.7 kg) after 12 weeks of SSSG (Krustrup et al., 2009). It is well known that good bone health and good postural balance are associated with a decrease in fall frequency and the risk of bone fractures (Karlsson, 2004). In fact, it was observed that trained women who regularly play football have higher total bone mineral densities (BMD) (13%) and higher leg BMD (24%) compared with untrained women (Jackman et al., 2013). Similarly, in men aged 68 years, an improvement in osteocalcin plasma concentrations (46%) and a significant increase in BMD (5.4%) were obtained after 12 months of SSSG training, with no variations in the strength training group (Helge et al., 2014). The positive effect on bone, muscle strength and postural balance reflects the intensity of the training stimulus, which requires intense movements in different directions, jumps, accelerations and decelerations that can produce a mechanical impact on the bones.

Effects of SSSG on blood pressure, metabolic and cardiac functions

Krustrup et al. (2010) demonstrated in premenopausal women that 12 weeks of SSSG induced significant decreases in systolic blood pressure (-7 mmHg) and diastolic blood pressure (-4 mmHg). Positive effects were also observed on the structural and functional aspects of the heart using echocardiography: increases in left ventricle volume and a decrease in isovolumetric relaxation time (Andersen et al., 2010). Schmidt et al. (2014) concluded that football training based on SSSG elicited superior cardiovascular effects compared with strength training in elderly untrained men.

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In fact, their results showed that, after 12 months of practice, left-ventricular internal diastolic diameter, end diastolic volume and mass index were higher in the football training group (8%, 21% and 18% respectively), with no changes in the strength training and control groups. A short-term, school-based SSSG intervention conducted by Krustrup et al. (2014) resulted in significant structural and functional cardiac adaptations in preadolescent children. Left-ventricular posterior wall diameter was increased in the football-training group compared with the control group, as was interventricular septum thickness. Global isovolumetric relaxation time increased more in the football group than in the control group, while the change in ventricular systolic ejection fraction tended to be higher.

Recommendations for using small-sided soccer games for health purposes

SSSG training elicits high exercise intensity, irrespective of age, fitness status and previous experience of football training, and has a large positive effect on health indices in sedentary healthy and unhealthy individuals. Clear evidence has been found that SSSG has positive effects on many health-related indices and variables, including VO2max, blood pressure, body composition, and metabolic and cardiac function irrespective of age or gender, suggesting that SSSG is potentially a highly motivational method for enhancing population health and engaging sedentary people in physical activity, since it has been demonstrated that recreational football training has the lowest rating of perceived exertion in comparison with other activities such as jogging, interval running and fitness training. This may be one reason why participants usually find the game enjoyable and maintain their interest in football training for longer periods, and why small football pitches have emerged in cities.

According to the American College of Sports Medicine, a single SSSG session is equivalent to 50% of the weekly recommended effort, so SSSG can be considered a health-promoting activity across the lifespan, especially if it is performed for 45 min or more two to three times a week and using different types of game format, starting with the easiest formats of 7v7, 8v8 or 9v9 on medium-sized pitches and progressing to 4v4 to 7v7 formats with an ideal pitch size of 80m2 per player. Participants should take into account that SSSG should be slowly introduced and should avoid forceful contacts to prevent fatigue, disinterest and minor or severe injuries.

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Injuries in professional Male Soccer player in United Arab Emirates

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Key words: Football, injury , incidence , trauma, soccer

Introduction

Football continues to increase in popularity at all levels of play, from recreational to professional and remains immensely popular sport worldwide. As in any sport, injuries occur, their incidence and characteristics (injury epidemiology) are well documented at all levels of practice: amateur, professional, international (Dvorak J et al., 2011, . Ekstrand J, 2007, Carling C, Orhant E, Legall F, 2010). Nevertheless, the field of injury epidemiology has a longer history. The first studies on soccer injury epidemiology date from the 1980s and were mainly conducted in the northern European countries, such as Ekstrand et al (1983) in Sweden and Sandelin J, et al. (1985). There have been a few reports evaluating soccer injuries in Asia (Sadat-Ali M, Sankaran-Kutty M, 1987). The first published study with a prospective design on senior male soccer injury epidemiology in Asia was performed in 2004 and analyzed the injuries that occurred during 50 senior and U-20 men's matches at national team level (Yoon YS, Chai M, Shin DW 20040. This latter showed injury incidence higher than those observed in European soccer, but with similar injury patterns. Specifically, the incidence of injuries during the first round was 42.4 per 1000 hours, which increased to 64.7 in the knockout stage. However, longitudinal data on the incidence, nature and consequences of injuries at the national football level in UAE do not exist in the current literature. Therefore, based on previously suggested injury definitions, this study gives some information on the incidence and nature of injuries in professional UAE team. We decided to assess the 12-months period and the lifetime prevalence of sports injuries among football player team according to type of injury and its seriousness.

A total of 22 professional team players from the first Emirati professional football leagues were observed during the entire season 2017-2018. All injuries and complaints as well as the game and training exposure were recorded. Team physician was required to report on all injuries after each match and training on the standardized F-MARC injury repot form defining the time of injury, location and type of injury, severity (a physician-based estimate of absence). These forms were collected by FIFA Medical Assessment and Research Centre.

The prevalence of football injuries during the season

53 injuries were recorded, 37 sustained during games (69.81%) and 16 during training sessions (30.19%). The difference in injury incidence between games and training was significant ($p < 0,001$).

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Injured body part, type of injury and diagnosis

All body parts were subject to injuries. Injury incidence of the lower limb was significantly higher compared to other body parts: head, lower back, ribs, thumb and shoulder. 46 injuries (87%) versus 7 injuries (13%) , p<0.001. Figure 1 shows the injuries diagnosis and their body parts.

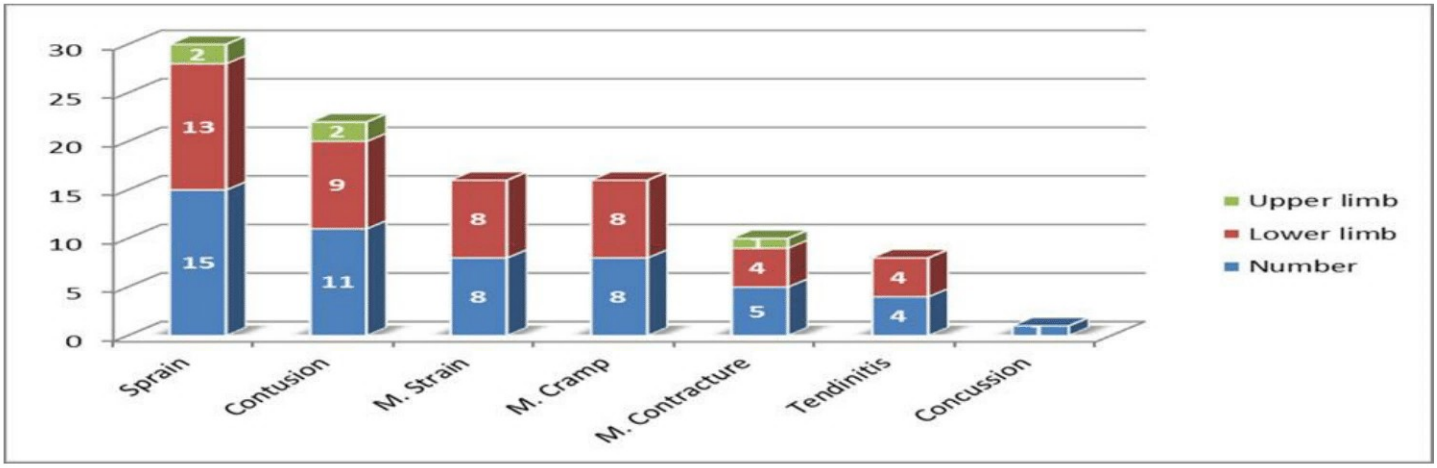

Figure 1: Injuries diagnosis and their body parts.

Injury causes were categorized as traumatic (44 recorded or 83% of total injuries) and overuse (9 or 17%) (Figure 2). The traumatic injuries were subdivided into trauma resulted after contact with opponent and trauma without contact, happened suddenly during games and/or training sessions. Contact traumatic injuries were 43% of traumatic injuries and 36% of total injuries, included all contusions and concussions (29.5% and 24.5%) and 6 sprains. Non-contact traumatic injuries were 57% traumatic injuries and 47% of total injuries. Incidence of injury in this study (8.92 / 1000 hours of football practice) was consistent with previous studies conducted in similar environment (Eirale C et al. 2012, Yoon YS et al. 2004, Marwan Y et al. 2010). However, there were other studies that reported significant lower or higher rates: significant lower incidence of injuries was noticed in the Tunisian professional league: 4.7 (Junge A et al. 2009), a team from the French professional league injury incidence per 1 000 h of exposure during matches and training was 4.7±5 (Dauty M, Collon S, 2011), 4 teams from the English premier league (Hawkins RD , Fuller CW, 1999) and in clubs participating in the European league (Ekstrand J, 2008, Ekstrand J et al. 2011).Most of the previous studies confirmed a significant higher incidence of injury during games (Eirale C et al. 2012, Yoon YS et al. 2004, Marwan Y et al. 2012 Junge A et al. 2009, Dauty M, Collon S, 2011).

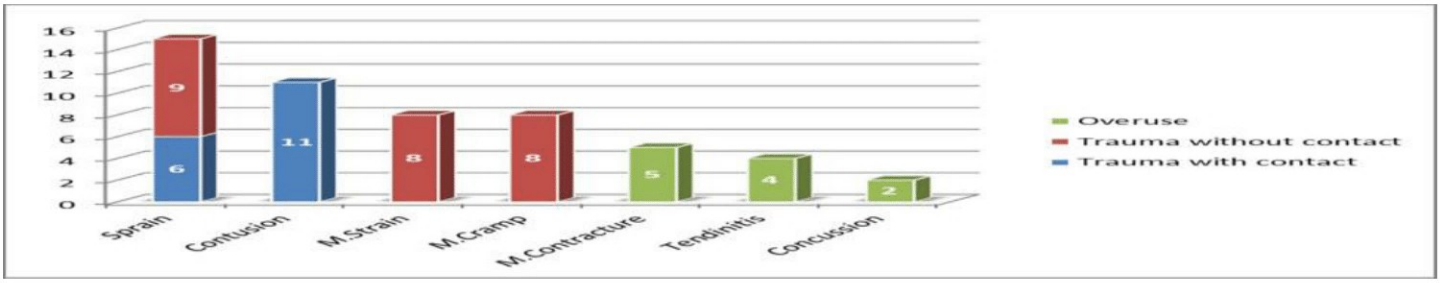

Fig. 2: Nature of injuries versus causes

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The same finding was confirmed in our study: 44.48 / 1000 game hours versus 3.12 / 1000 hours of training sessions. Obviously, intensity during games is greater than during training. In accordance with all previous researches, injury incidence of the lower limb was significantly higher than incidence of the other parts of the body. Lower limb is the part of the body that is the more involved in football practice, so it is mostly exposed to injuries, according to many previous studies (Eirale C et al. 2012, Yoon YS et al. 2004, Marwan Y et al. 2012, Junge A et al. 2009). We noticed that muscle injury was the most common with 43 % of total injuries. However, other studies demonstrated that the most common injury doesn't occur in the lower limb muscles. Azubuike 2009, and Yoon 2004, found that knee sprains ranked higher while (Carling 2010 and Wong 2005) concluded that the ankle was the body part with the highest injury incidence. In our study the injury cause was mostly traumatic with 83% of total injuries versus 17% for overuse injuries. The literature confirmed that the latter was more associated with training than with games (Azubuike SO, Okojie OH, 2009); furthermore, games injury rate was significantly higher than the ones registered during training sessions (Azubuike SO, Okojie OH. 2009, Eirale C et al. 2012, Yoon YS et al. 2004, Marwan Y et al. 2010, Ekstrand J, Hagglund M, 2011) 70% versus 30% in this study. During games, overuse injuries rate was low (6.5%) whereas traumatic injuries tend to dominate (94.5%). 66% of those were non-contact trauma, while 34% were contact-related trauma.

Take-home message: The ever-increasing number of active players naturally leads to an increasing frequency of injury, which implicated an increasing cost of treatment and loss of playing time. This figure would put forward the necessity of an injury prevention program that aims at improving the quality of training and adequate rehabilitation post injury in order to reduce the rate of injuries.

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