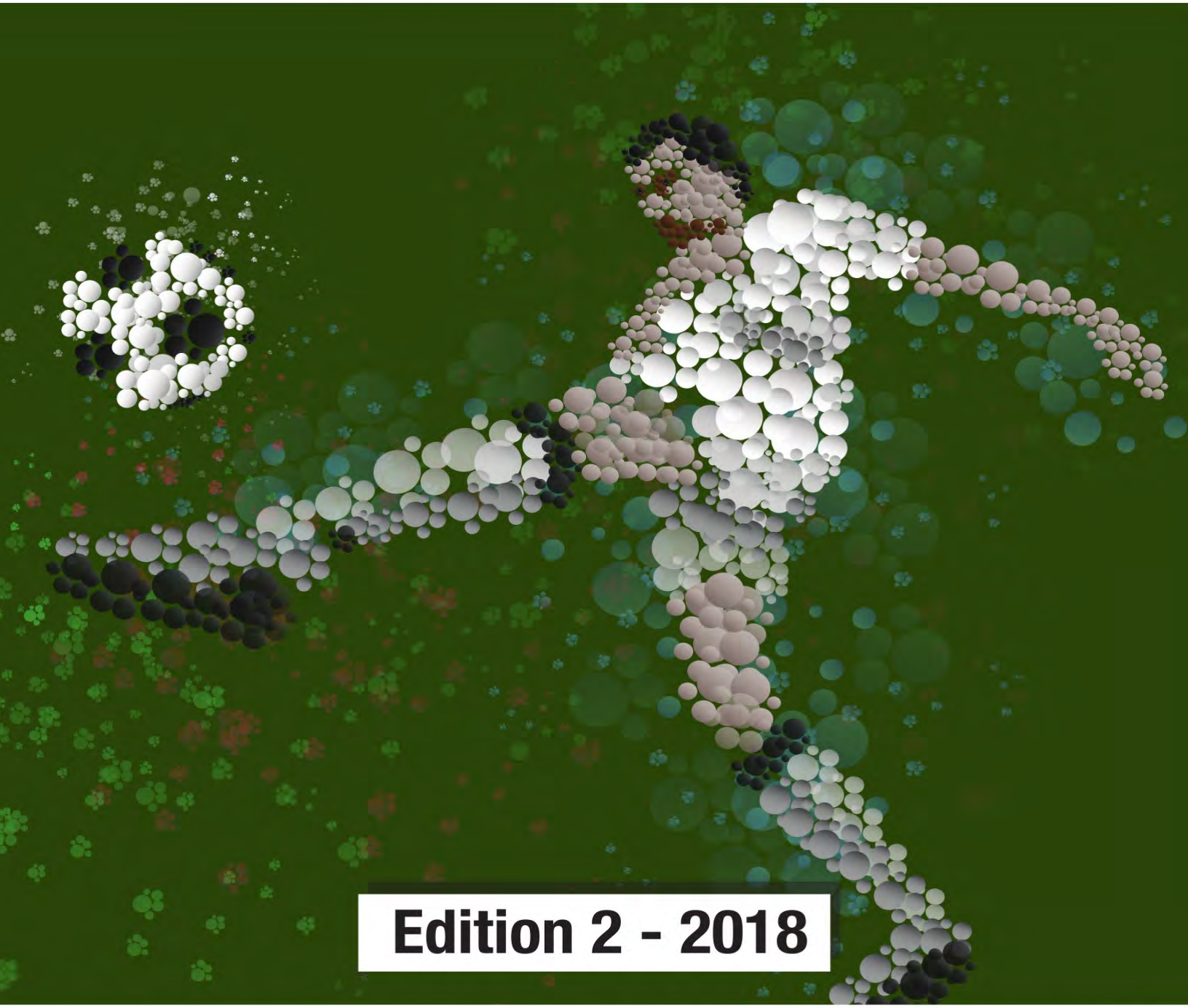
International Science And Football Association

Newsletter Magazine



Edition 2 - 2018

- Partner resisted exercise to improve strength and power
- Speed and Agility Training
- Sport managers' perception about FIFA World Cup 2022 in Qatar
- High intensity training and implications for fatigue
- Effectiveness of post-match recovery strategies
- Questioning proprioception training for football
- The integrated physical preparation approach
- Heart rate variability to monitor training load

ISAFA Newsletter Magazine

Edition 2 – 2018

Edited by Monèm Jemni & Hassane Zouhal

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Managing editor: Mohammad Shoaib Prince

Art work: Naeem Ahmed

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Preface

BY: MONÈM JEMNI AND HASSANE ZOUHAL

The International Science And Football Association's contribution to the global football sector

The International Science And Football Association (ISAFA) is at the edge of colossal development with events and enterprising in different parts of the globe. Our vision is to be a global leader in:

1) Organizing sustainable and regular innovative educational events worldwide

2) Training future football fitness coaches armed with the latest science-based knowledge

3) Provide professional development opportunities for individuals and communities

We aim to offering a global networking stage to interested individuals within professional football career who could take it at their levels and affect societies and other end users. We believe the above vision could only be achieved by promoting science knowledge that backs-up football. Hence, we are striving to create opportunities for scientists, academics, and professional football practitioners to interact and share knowledge and experiences.

2017 has seen the ISAFA entering the 1.7 billion people's market, China by organising its first event at Ningbo City, in partnership with Ningbo University www.isafachina.com. This first experience will be surely followed by other similar workshops and conferences in the near future and also at the longer term.

Our social network reached 28 countries so far and is growing up ever since we are established worldwide. We are anticipating a significant boom in reaching out more people and more countries following the above-mentioned events. In addition, our visibility is boosted via this Newsletter Magazine that has been launched on the 15th February 2017. The newsletter is published online and via our social network, hence more visibility.

The ISAFA is envisaging to launch a scholarship programme soon to encourage young researchers to develop their research whilst taking advantage of our international network and undertake short to long-term visits in different research centres amongst our partners' laboratories and collaborative institutions.

We will continue our calls for bids to hosting the coming editions; look out for it around March – April every year.

Strength training increases performance and reduces injuries on soccer players

By: Abderraouf Ben Abderrahmane[1], Sghaeir Zouita[2], Hassane Zouhal[3]

[1]Laboratory of Biomonitoring of the Environment (LR01/ES14), Faculty of science, Bizerte, University of Carthage. Tunisia [2]Tunisian Football Federation, Tunisia. [3]Movement, Sport, Health and Sciences laboratory (M2S). University of Rennes 2,

Soccer is one of the most popular games being played throughout the world. During latest years, it has been shown that playing soccer can induce considerable beneficial effects on cardiovascular risk and bone health from childhood to older ages (Krustrup et al. 2009). Several explosive movements, such as kicking, tackling, jumping, turning, sprinting, and varying speed and direction are performed by soccer players during a 90-min soccer game. It has been shown that short sprints are the most frequent actions that are performed during soccer games by using time-motion analysis (Haugen et al. 2014). These last authors assumed that "straight sprinting is the most frequent action, both for the scoring and assisting player" and in most cases, scoring goals were preceded by a straight sprint. It has been indicated that 90% of sprints performed by professional soccer players lasted less than 5 sec which are equivalent to sprints between zero and 20m (Andrzejewski et al. 2013). Therefore, increasing sprint performance and in particular the acceleration phase of the sprint is very important to score goals, thus could help players winning the game.

In contrast to the beneficial effects, playing soccer may also induce an inherent risk of injuries (Yard et al. 2008). In fact, soccer is a high-intensity sport with frequent changes in movement, velocity, and direction with high impacts and many situations of contacts between players. The substantial risk of injury has been estimated to be 1,000 times greater than other sports (Drawer & Fuller, 2002). The widely accepted consensus for epidemiological studies (Giannotti et al. 2011) shows that soccer injuries come in a wide variety, but most of them affect the lower extremities, including the upper leg, knee, and ankle (Ekstrand et al. 2011). Therefore, injury prevention is utmost importance, and it is necessary to implement preventive measures to reduce the risk of injury and, thus, to support the health benefits associated with playing soccer (Ekstrand et al. 2013).

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Because of the frequency of injury, the resulting costs, and not least the personal suffering of the injured players, several studies have focused on injury prevention measures in soccer to keep players on the pitch (Mohammadi, 2006). To prevent soccer injuries, several strategies have been developed by the teams. These strategies are ranged from protective equipment to warm-up and cool-down (van Beijsterveldt et al. 2013). Significant reductions of soccer injuries have been achieved by implementing intervention programmes focusing on intrinsic risk factors for specific injuries. Some studies demonstrated that eccentric strength reduced the risk of hamstring injury in different populations of soccer players (Askling et al. 2003). Other studies showed that neuromuscular training and exercises focusing on balance, strength, flexibility, and stability might also reduce the risk of injury (van Beijsterveldt et al. 2013). However, it is important to note that most of these studies were conducted in adult soccer players, and little data exist concerning the effects of preventing programmes on injury rate in elite adolescent soccer players.

Optimizing the physical potential of young soccer players is one of the main objectives of youth soccer academies. Indeed, elite soccer player must be prepared to perform and sustain high loads of training observed at elite level (Myer et al. 2013). The injury prevention aspects represent an important consideration for young elite soccer players and their academies. Strengthening muscles through resistance training will increase the forces they are capable of sustaining, making them more resistant to injury, whereas improved motor control and coordination will also improve balance and joint stability. For adolescent soccer players in particular, structural adaptations to resistance training may represent the key of injury prevention. These effects include strength enhancement of supporting connective tissues and passive joint stability, and also increased bone density and tensile strength, which are particularly useful in collision sports such as soccer (Faigenbaum et al. 2013).

Strength and conditioning coaches have been using strength training for many years. However, strength training is still not incorporate in the training programs of many professional soccer teams.

Literature studies indicate that regular participation in an appropriately designed exercise program inclusive of resistance training can enhance bone mineral density and improve skeletal health and likely reduce injury risk in young athletes (Valovich et al. 2011). The benefits have been identified and related to training in sport disciplines such as long-distance running, gymnastics, swimming (Bencke et al. 2002), and tennis (Kanehisa et al. 2006). However, the development of muscle strength and power through resistance and strength training in adolescent soccer players in relation with performance enhancement and injuries prevention is still overlooked.

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Our laboratory conducted a study focusing on the effect of strength training on performance and injury prevention (Zouita et al. 2016) in young elite soccer players. This study was the first to include a strength training intervention for young elite soccer players over one season. It showed that soccer training simultaneously with 12 weeks of combined plyometric and resistance training led to the enhancement of body composition, explosive strength, endurance performance and reduced the injury occurrence in young elite soccer players. Our results suggested that strength training program directly supervised by a strength and conditioning specialists over a period of 12 weeks led to a significant improvement compared with a control group of well-trained soccer players. In addition, resistance training has also been suggested to reduce the risk for musculoskeletal injuries or at least reduce the severity of such injury. The physiological adaptations seen consequent to resistance training on bone, connective tissue, and muscle do imply enhanced protection against injury for individuals who participate in such resistance training program.

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High intensity sport performance and muscle function: Implications for fatigue

By: Julien S Baker

Institute of Clinical Exercise and Health Science, School of Science and Sport, University of the West of Scotland

During brief, high intensity exercise, rapid changes in metabolism and muscle function occur. This may ultimately result in an inability to maintain performance, force or required exercise intensity. These processes collectively contribute to the phenomenon of fatigue (Hermanson, 1981). Wootton and Williams, (1983) investigated the influence of recovery duration on repeated maximal sprints. The exercise task was randomly assigned and consisted of five 6-sec maximal sprint bouts, with either 30 or 60-sec recovery periods between each sprint. The test protocol used was similar to that of the Wingate test (Bar-Or et al. 1981). Loadings were pre-determined to ensure that each subject would achieve the maximal power output attainable, while pedalling within the range of 150 to 160 rpm. The results showed that the capacity to perform repeated 6-sec bouts of maximal exercise on cycle ergometers was markedly influenced by the preceding number of sprints. The study also demonstrated that muscle contraction was dependent on the ability to recover muscle performance following brief maximal intensity exercise. Effects of recovery duration on performance and fatigue during multiple treadmill sprints was investigated by Holmyard et al. (1988). Ten rugby union backs volunteered to participate in the study.

A non-motorised treadmill was used for the sprint tests which allowed the subjects to run at unrestricted speeds. Fatigue was recorded as a decrease in running speed. The experimental protocol consisted of ten 6-sec maximal sprints, with either a 30-sec or 60-sec recovery period between each successive sprint. The results obtained showed that performance during brief duration, multiple treadmill sprinting was affected by both the recovery interval and by the preceding number of sprints. With 30-sec recovery only 5 sprints could be performed before fatigue influenced power outputs. Alternatively, 60-sec recovery duration enabled power outputs to be maintained throughout the duration of testing. The larger decrease in performance observed with the 30-sec recovery interval may be due to an incomplete resynthesis of PC and also a possible greater acidosis. This may have resulted from the limited time for translocation of H+ from the muscle to blood. It has been suggested that H+ causes fatigue by either inhibiting energy provision from anaerobic glycolysis through moderating the activity of phosphofructokinase (PFK) or by affecting the contractile mechanism itself (Hermanson, 1981).

The maximal rate of energy expenditure cannot exceed the activity of the ATP hydrolysing enzymes (ie muscle ATPase activity). Myofibrillar ATPase activity has been determined during maximal static contraction in skinned human muscle fibre to 0.10, 0.27 and 0.41 mmol.l-1s-1 in type I, IIA and IIB fibres respectively (Stienen et al. 1996). Assuming a Q10 of 2, 3.3l of H2O per kg-1 dry mass of muscle and 2.7 times higher energy turnover during maximal dynamic exercise than static contraction (Potma et al. 1996) it can be calculated that maximal ATP expenditure is 6.5, 17.6 and 26.6 mmol ATP kg -1 dry mass in type I, IIA and IIB fibres respectively. This value approximates to the value observed in mixed muscle during 10s of maximal cycling (15mmol ATP kg-1 dry mass ; Jones et al. 1985). It therefore seems plausible that the release of energy during short bursts of activity (< 5 s) is not limited by the rate of ATP supply but rather by limitation in ATP hydrolysis.

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The higher degree of PCr depletion (Hiroven et al. 1987) and plasma NH3 accumulation (Hageloch et al. 1990) during the initial phase of sprinting in sprint trained subjects support this contention. The amount of energy that can be produced from PCr is rather small and is limited by the intramuscular stores of PCr. Fast twitch fibres contain 15 - 20% more PCr than slow - twitch fibres (Soderlund et al. 1991) which is in accordance with the higher glycolytic capacity of this fibre type. With the maximal rate of PCr breakdown one would expect complete depletion of PCr within 10 s (Jones et al. 1985). However, PCr breakdown can contribute to ATP generation for more than 20 s because ATP is supplied from other energy sources and because energy expenditure decreases after a few seconds of contraction. Following 10 s of maximal exercise the power output decreases (Nevill et al. 1996 ; Hiroven et al. 1987).

These first signs of fatigue have been shown to correlate with substantial decreases in muscle PCr. On the basis of thermodynamic considerations the maximum rate of PCr breakdown and therefore ATP generation would fall when the PCr content decreases. Availability of PCr may therefore be a limiting factor for power output even before the muscle content of PCr is totally depleted. This may partly explain why the power output decreases after 5 s of maximal cycling despite the fact that a considerable portion of PCr remains in the working muscle (Sahlin et al. 1998). Maximal force is related to muscle PCr both during contraction and the recovery period. Similarly, after maximal cycling, peak power is restored with a similar time course as PCr (Nevill et al. 1996). Recent studies have demonstrated that the muscle store of total creatine (PCr + creatine) can increase by about 10 - 20% after oral creatine supplementation (Harris et al. 1992). Creatine supplementation was shown to increase performance during high intensity exercise in some studies (Balsom et al. 1993 ; Greenhaff et al. 1993 ; Earnest et al. 1995) but not in others (Barnett et al. 1996 ; Deutekom et al. 2000).

Post - exercise hypoxanthine (Balsom et al. 1993) and plasma NH3 (Greenhaff et al. 1993) were reduced following creatine supplementation despite the fact that there was an increase in work performed. These findings support the hypothesis that limitations to energy supply are a major cause of fatigue during high intensity exercise. Based on the in vitro experiments of Cooke et al. (1988) and the in vivo experiments of Wilson et al. (1988) it has been suggested that increases in Pi may contribute to fatigue. Concomitant with the decline in PCr there is almost a stoichiometric increase in Pi and the observed correlation between PCr and force during exercise and recovery may therefore be an effect of increased Pi and not energy deficiency per se (Sahlin et al. 1998). However, creatine supplementation increases pre - exercise PCr (Harris et al. 1992) and therefore one could expect augmented release of Pi and an earlier onset of fatigue. The finding that performance is improved following creatine supplementation cannot be reconciled with the hypothesis that increases in Pi is a major cause of fatigue (Woledge, 1998).

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Future Sport Managers' Perception About FIFA

By: Maryam Binali, Eman Alkhamiri

Sport Science Program, College of Arts and Science, Qatar University, Doha,

The objective of this short report is to give an insight on the local sport managers' perception about Qatar hosting the FIFA World Cup 2022. The report is based on interviews and statements gained from Qatari managers currently living in the country.

Football in Qatar became something tremendous due to the hosting of the FIFA World Cup 2022. It has influenced so many people to get involved in each related field to this sport such as management, fitness, nutrition and so on. Local people's belief towards football and sport events' managements is continuously changing seeing the up and downs the entire bidding process has gone through. According to Giulianotti and Robertson (2004) "The global game spans culturally diverse societies in all continents; an estimated 250 million people are direct participants, around 1.4 billion have an interest". In other words, Football is considered as worldwide sport language. Every nation speaks football in order to express their selves either it was a pro player, amateur or a fan.

According to our interview collections, Qatar hosting a major event such as the 2022 World Cup will have significant benefit in every sector whether socially, economically or politically. In addition to that, Qatar will gain the reputation of a small country that hosted huge event in the region and this will give a good reputation too. Ries and Trout (2000) stated, "Win the battle for hearts and minds", in our context football can be the battle where people from all around the world fight for their best team to win. It includes coaches (who put all of their effort to win), players (who apply all of their abilities and skills to win) and fans (who put all of their feelings such as anger, temper, excitement, happiness and sadness in order to support their team to win). A 90-minute full of drama that follows the heart path or from the other side a mind battle that corporates could benefit from by considering football as a brand that is spread globally. Our interviews showed that Qatar sport managers are very excited about the FIFA 2022 with a huge sense of pride and sensitivity about a small nation with great resources. We do believe that sport managers should put their feeling aside and let the logic talk. They should know what is best for their own country to succeed and proceed properly. For example, a good sport manager should acquire crucial characteristics such as great communication skills, respects to sports ethics and regulations, should also know when and how to make good decisions, etc… These characteristics will help and benefit them to manage and to lead the organization efficiently and effectively. Football is indeed something with a give and take. Hence, understanding football requirement and demands not only from the management prospective but also what the fans, players and the communities needs is crucial to ensure sustainable legacies after the FIFA 2022 event. These identifications, if highlighted and strategically pinned could help making Qatar a sport destination not only for football but also for other sports.

Our short investigation suggests that local sport managers' perception about Qatar hosting the FIFA World Cup 2022 is emotionally affected by the sense of pride rather than logic legacies. It is surely a great opportunity for Qatar to host such a major event but, we felt like managers are not ready yet to facing the follow-up conflicts that may occur post event.

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Speed and Movement Agility Training in Soccer

By: Antonio Carlos Gomes and Clovis Alberto Franciscon

Brazilian Society of Sports Coaches

Introduction

Team sports, such as soccer, are practiced at high speed. Therefore, when discussing this topic it is opportune to start with the concept of speed and its subcategories. Soccer requires 90 minutes of nonstop action, broken into two periods of 45 minutes each, so speed is considered a motor ability that determines in great part the player's success in both decision-making and physical motor skills. The game itself requires movements of high intensity over short distances (Silva Junior et al., 2011) and during a game's development, being faster is a determining factor for the final result (Rebelo & Oliveira, 2006). Brazilian scholars usually classify speed as reaction speed and sprint resistance. In soccer, reaction speed occurs when a visual signal triggers a response action (Gomes & Souza, 2008).

Soccer is a sport that requires the player to react quickly to different stimuli and situations and these can involve perception, anticipation of play and critical decision-making. According to Ruschel et al. (2011), it is important to have these components related to perception of complex patterns and different stimuli and, during the game, it is necessary to maintain this capacity for as long as possible. Another fundamental motor skill that is necessary for the modern soccer player to develop is sprint resistance because this conditioning enables the player to perform several maximum sprints throughout the game. According to Gomes and Souza (2008), a soccer player's sprinting requirement can be more than 80 successive sprints during a single game. Successful training of this motor capacity enables a player to improve the quantity and quality of these movements during a game, in addition to improving post sprint recovery times via improved anaerobic production and capacity.

Currently, some coaches propose the idea that football does not require speed in the pure sense of the word but rather in continuous cycles of 5 or 6 seconds. In game practice, there are fewer and fewer examples of these. The players perform various movements requiring the ability to react, accelerate, decelerate and stop. This demands a high ability of the players' neuromuscular system to manage effectively the numerous starts, stops and direction changes common during a game. All of this takes place in just fractions of seconds during game play.

Speed and agility Training

The training and development of speed and quickness of movements can be done with exercises with or without a ball and with and without changes of direction. The training exercises should include specific time spans of stimulus, rest periods between different stimuli, different number of sets and rest periods between the sets.

Various places can be utilized for the training with different materials but the ideal space to be used is the soccer field and, if possible, in the position the player is most capable. This space can also be an indoor soccer field, a synthetic turf field or any other location that works. The materials - small cones, ground stakes or even balls - can be adapted.

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The training content must conform to the type (subcategories) of the desired speed development. According to Gomes and Souza (2008), sprint resistance training should include an average of 3 to 7 sprints at a distance of 20 to 60 meters. Pauses between the exercises should be 15 to 30 seconds and between the sets of exercises 2 to 3 minutes. Oviously, these variables could change depending on the position of the player and the period of the season.

The training for faster reaction time should be supplied via signals and these can be optical, acoustic or tactile. Distances should vary from between 5 to 10 meters with a maximum of 10 repetitions per exercise and a rest period of approximately 2 minutes (Carravetta, 2001).

An example of a reaction speed exercise is: a player must react to a sound by quickly moving short distances of 5 to 8 meters that include a change of direction to the right or left, circles, zigzags, with jumps in the middle of a sprint and medicine ball throws, alternations of slow to fast movements or alternations of fast to slow movements.

Final considerations

It is necessary to practice the motor capacity speed and its subcategory, as we know that it is a complex requirement in football. A soccer player's ability to compete can be improved through more specialized training that requires the right metabolic energy system.

As a final point, it is important to note that the highest levels of reaction time and displacement speed can only be achieved after 8 to 10 years of specialized speed training.

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Effective 3-a-side game formats and team strategies for advanced-level 055-070+

BY: Harry Hubball[1], Ian Franks[1], Mike Sweeney[2], Risto Kauppinen[3]

[1]The University of British Columbia, [2]Canada; Cleveland Whitecaps, USA; [3]University of Bristol, UK

Introduction

Small-sided football for 055-070+ players (e.g., 5v5, futsal, walking football, training sessions) is not new in recreational, intermediate or advanced-level football settings around the world, however, 3-a-side football (3v3) is far less common and is vastly under-utilized. 3v3 football is a unique version of small-sided games that it is played without goalkeepers on a much smaller pitch with modified goals, and has great potential to enhance high quality competition, and strategic team and player development experiences for advanced-level 055-070+ players (Aguiar, Botelho, Lago, Maças, & Sampaio, 2012). As part of coaching preparation for the 2017 International Masters 5-a-side Football World Cup at Swansea University, Wales, action research methodology (Putman & Rock, 2017) was employed over an 8-month period with advanced-level 055-070+ players (two-time winners and three-time runners-up in five International Masters Football World Cup Tournaments). Drawing on analyses of a series of 3v3 coach-player game-planning and debrief sessions, individual player interviews, and team performance outcomes, this paper highlights key findings for effective 3v3 game formats and related 3v3 team strategies for these players.

3v3 football for advanced-level 055-070+ players

Advanced-level 055-070+ players are fit and skilled with high levels of commitment who typically participate in competitive leagues or who are selected for representative teams in competitive masters tournaments (Hubball, Reddy, Sweeney & Kaupinnen under review 2017; O'Flynn, 2007). As part of a broad range of football intitiatives, 3v3 game formats provide safe, high quality competition, strategic team and player development, and enjoyable ways to sustain the interests of advanced-level 055-070+ players. For example, 3v3 game structures maximize emphases on effective ball skills (e.g., close ball control, accurate one and two touch passing, accurate short-range shooting at ground-level), while minimizing emphasis on excess physical play (e.g., by limiting sprinting and endurance running, no slide tackling). Strategically, 3v3 football uses the smallest tactical unit able to apply the principle of depth and breadth for effective team offence and defence. Thus the repeated intensity of competitive 3v3 football increases the development of effective "game-sense" through continual team problem-solving, decision-making, dynamic intra-team mobility on-and-off the ball, and interpersonal team communication skills. The simplicity of 3v3 football can be implemented easily in either running or walking football formats as part of intra-squad warm-ups or team preparation for small-sided game tournaments for advanced-level 055-070 masters players.

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Effective 3v3 game formats for advanced-level 055-070+ players: Caution!

3v3 football demands few rules (e.g., no goalkeepers; regular corners, sideline and end-line plays apply with kick-ins; goals can only be scored by shooting within the opposition half). However, in order to meet the specific needs and circumstances of advanced-level 055-070+ players, 3v3 game formats need to be customized and carefully designed for high quality football experiences.

Pitch size: 3v3 pitches (outdoor or indoor) that are too long in length require excess sprinting and endurance running, or in contrast, result in excessively pedestrian basketball-style transitions from team offence to defence. If a 3v3 pitch is too narrow it can result in excessive sideline kick-ins and inhibits the flow of a game. Thus, the customised length (e.g., 50-60 feet) and width (e.g., 50-60 feet or "live" side-walls) of a 3v3 pitch size is critical to sustain high quality game experiences for advanced-level 055 -070+ players.

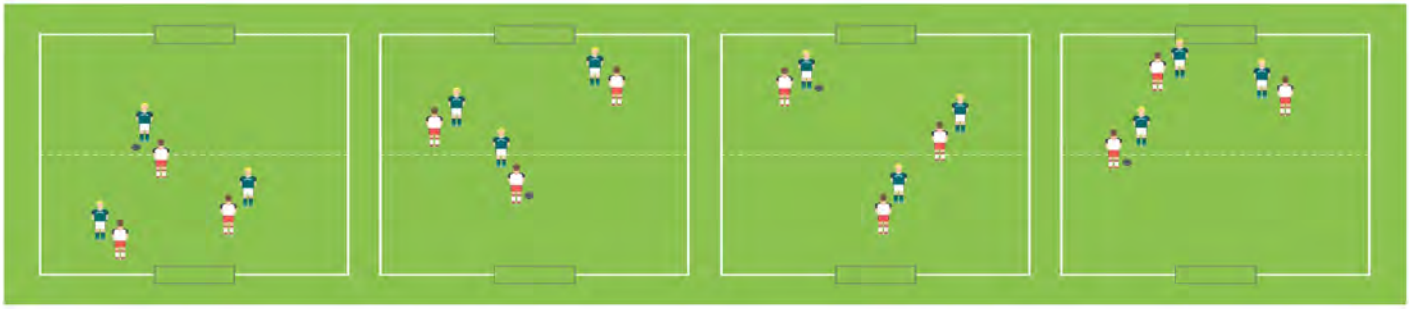
Goalposts: Inadequate 3v3 goal post sizes (relative to the length of the 3v3 pitch) often results in far too many or too few (if any) goals scored. Thus, the customised width (e.g., 9-11 feet) for 3v3 goal posts is critical to sustain high quality game experiences for advanced-level 055-070+ players. For example, simple ground-level wooden bench/ board-style goalposts (e.g., 9-11 feet width by 1-2 feet height) are easy to assemble and enable complete ground-level (i.e., passing and shooting) 3v3 football games.

Game duration: Excessive duration of competitive 3v3 games (especially without carefully planned and strategic breaks), can lead to unnecessary fatigue, injury, less enjoyment and unreflective practice for advanced-level 055-070+ players. Thus, teams should be provided with strategic opportunities for water breaks, game-planning or debriefing, and coaching and/or reinforcement of key team and player development skills.

Team selection: Unequal 3v3 team selection processes (e.g., without consideration of players' skills, fitness, ability) often result in excessive scoreline differences between teams and less enjoyment for advanced-level 055-070+ players. Strategically, pre-selected or randomly selected 3v3 teams (including multiple substitutions) maximize team and player development.

055-065+ MASTERS 3-A-SIDE GAME | TOURNAMENT FORMAT

- **4 mini-pitches |** 50-60 feet (length) x 50-60 feet (width) OR "LIVE" side-walls
- **Goalposts |** 10-11 feet (width) x 1-2 feet (height)
- **8-team round-robin format |** (multiple subs option)



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Effective 3v3 team strategies for advanced-level 055-070+ players

Effective 3v3 team strategies for advanced-level players do not simply occur through game participation or assertive team talks. Effective 3v3 team strategies are based on many factors (e.g., the coach's selection of specific players for particular team roles, team cohesion to execute specific game-plans, progressive performance history, etc) and are developed through repetitive, team competition and reflective practice experiences. Thus, no one-size fits all. The following 3v3 team strategies were developed over an 8-month period with a successful team of advanced-level 055-070+ players.

Adopt strategic 3v3 team offence and defense positional formations: Maintain tactical depth and breadth with interchangeable triangular formations. Based on the team's capabilities, adopt full or half pitch man-to-man close marking, or zonal marking defensive strategy. "Read and respond" to the unfolding 3v3 game dynamic by identifying, predicting, and acting upon game patterns such as the strengths and weaknesses of the opposition, as well as your own team's abilities. Send continual and effective game-related signals (verbal or non-verbal) to both team mates.

Assert team's influence on the "tone" of the 3v3 game: Play with impact!: During offence, execute "smart" and quick advances/counter-attacks toward the opposition's goal area (e.g., give-go-and-call moves, rapid ball passing with a trajectory in close proximity to team mate), and create space and options for the ball carrier. In contrast, for defence, rapidly challenge the opposition ball carrier while two other team mates mark an opposition player or cover vital space in front of your team's goal area.

3v3 game analysis (including video recording): Self -reflection and/or team debrief: Consider questions such as: To what extent was the overall team game-plan successful against this specifc opposition? To what extent was the team defence strategy successful against this specifc opposition? To what extent was the team offence strategy successful against this specifc opposition? Improvements and implications for next game?

Conclusion

3v3 football is a unique, effective, and underutilized version of small-sided games for advanced-level 055-070+ players. However, poor design and implementation can significantly undermine the purpose, authenticity, enjoyment and motivation for these players to participate in 3v3 football. Our research suggests that, as part of a broad suite of football opportunities for advanced-level 055-070+ players, and when tailored to meet their specific needs and circumstances, and designed appropriately for high quality football experiences (e.g., with customized 3v3 pitch size and goal posts, appropriate game duration and breaks, and intra-squad team selection), 3v3 football initiatives significantly enhance strategic team and player development. Insights from this research will assist coaches and event programmers to enhance customized 3v3 football experiences for advanced-level 055-070+ players.

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Female Football Proprioception Training could help, but not in Sprint and Agility Performances

Keishana Kelly[1], Monèm Jemni[2]

[1]University of Greenwich, UK; [2]Sport Science Program, Qatar University

The term Proprioception is often thought of as the sixth sense and is used to describe the sensory information that contributes to the sense of position and analyses that information and reacts consciously and unconsciously to the stimulation with proper movement (Houglum 2005).

Proprioception can be defined as the complex input of neural signals from mechanical stimuli which are transmitted along the afferent pathways to the central nervous system to generate motor response. The neural input to the central nervous system (CNS) is through specialised peripheral mechanoreceptors which are located in the joint, capsules, muscles, ligaments, tendons and skin (Lephart & Fu 2000). The spinal level motor response provides dynamic muscular stabilisation and synchronisation of muscle activation patterns based upon spinal reflexes. The cerebellum can be categorised into two parts, lower brain and higher brain. The lower brain processes information from the somatosensory, visual and vestibular subsystem and is concerned with the maintenance of posture and balance. The higher brain such as, the motor cortex are responsible for cognitive programming of muscular skeletal motion.

The somatosensory system commonly divided in two modalities static and dynamic. Static sense provides us with information about static forces that act on the muscles, tendons and joints which maintain limb position. Muscle spindles are a type of proprioceptor that provides sensory information about changes in muscle fibre length and the role of change in the length.

The static and dynamic components of the somatosensory system play a role in the development of a football player's performance since players are often balanced of one foot during shooting, kicking and heading movements. It has also an influence of joint stabilisation which is vital in the prevention and rehabilitation of sports injuries. The ability to improve proprioception will allow improved biomechanical efficiency, optimal efficiency of locomotive movements in the kinetic chain through range, efficient dynamic postural alignment and control, and development of joint by joint mobility and stability. In addition the neuromuscular efficiency will be developed through optimally engaged neural pathways. An improvement in motor abilities using proprioceptive training is noticed in a recent study by (Hewett et al, 2006) further studies have found development in upper leg strength. This is considered a key area for football players who require optimal leg strength for improved speed performance. What is especially interesting are the studies in the field of unstable surface training, commonly used for the rehabilitation of injuries (Romero-Franco et al., 2014; Osborne et al., 2001; Willardson 2004) these authors found improvements in functional ankle stability training. However even more interesting (Eric et al, 2006) found that unstable training improved performance markers in athletic performance. It is documented that such training will enhance performance via improvements of balance and kinaesthetic sense which are part of the proprioceptive system (Ruiz & Richardson, 2005). Further studies have reported a significant decrease in injuries through proprioception intervention programmes (Hewett et al., 2006; Heidt et al., 2000). Considering the motor system adaptations found by, (Ruiz & Richardson, 2005) and the extensive studies concluding significant effects of proprioception training as an injury preventative measure it has raised questions as to whether such a programme could be implemented into a strength and conditioning programme, recent studies have suggested that proprioception may not only reduce injury but also enhance performance.

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Overall, proprioception training has been overlooked in the development of a soccer player's fitness and conditioning regimes but mostly applied for injuries rehabilitation; although, improving proprioception can be achieved using little or no equipment. The most basic form of training proprioception is through full weight bearing closed kinetic-chain exercises with foot or feet on the ground with and without the benefit of vision and an incorporation of movements that involve multi-joint and multi-muscle coordination. Other improvements can be achieved through using wobble or foam boards which support multi-directional movements allowing replication of sports specific movements in dorsi and plantar flexion and medial and lateral side sways.

Based on the above review, we questioned the effectiveness of proprioception training on females footballers agility and sprinting abilities.

Sprint speed is an essential component of the game; numerous studies have highlighted the shortness of sprints during games with a mean duration of 4-6 seconds (Svensson et al., 2005) It is therefore relative that assessment of sprint speed is a measure of both acceleration, which is normally achieved over the first 15meters and maximum running speed, usually attained during the transition phase between 10-40meters. (Svensson et al., 2005) Agility represents the ability for a player to change his or her body position in space rapidly and accurately without loss of balance. Muscular power involves activities such as jumping, tackling, kicking, turning and changing pace all of which make up the percentage of different changing activities during a soccer match. Therefore it is apparent that a high level of muscular power is beneficial and has a critical role in achieving competitive fitness levels.

A science-based study was set with the hypothesis that proprioception training could increase agility and sprint performances indirectly through the literature-mentioned strength enhancement.

Seventeen healthy trained members (ages 18-24 years) from the Football Association's Woman's UK Premier league participated in the study. The experimental (PT) group (n =8) accompanied their normal football conditioning training programme with proprioceptive exercises with and without the benefit of vision on stable and unstable surface (shoes on and shoes off respectively). The control (NT) group (n =8) performed their normal soccer conditioning programme. 15m sprint speed and Illinois agility scores were assessed pre and post intervention. The results showed that there were no statistically significant differences or important differences between the two groups (Figure 1 and 2). Unexpectedly, agility time increased in both groups but without reaching any statistically significant difference. However, sprint time decreased in both groups between the pre and post tests, but again with no significant differences.

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Innovation related to coaching: The integrated physical preparation approach- a decision-making tool for professional coaches (short report)

By: Zakaria Labsy

University Paris Sud

Introduction

The goal of physical preparation and training methodology is to have operational players showing the best possible performance on the field. We have recently integrated physiological, motor and emotional (behavior) variables, all together within a new conceptual model as a holistic approach not only to prepare footballers but also to help coaches making the right choice when choosing their players.

Our model was aiming to apply the highest scientific and logic approach possible.

The questions that were bouncing back were:

What set of reliable criteria that we have to retain?

What are the criteria to determine the player's performance?

Amongst the real-monitored variables what are the ones to pick out enabling to support the coaches in their choices?

How does it work?

Football games as well as a full week of training sessions (mainly small sided games) are monitored via video tapes and specific software. Following many trials, the variables that were retained are the following:

1) Individualized training loads and their quantifications in relation to the playing time for each player.

2) Match variables based on instructions chosen by the coach in connection with the game fundamental principles. Such as:

-The number of attack/defense ratio won within a game (Dellal et al 2012),

-The fundamental game intentions based on the chosen instructions/tactic,

-The principles of the game integrating the entire group to collectively succeed the actions (Halouani et al 2017; Labsy et al 2013).

Among these principles, we shall mention (Labsy et al 2013):

1) Individualized training loads and their quantifications in relation to the playing time for each player.

2) Match variables based on instructions chosen by the coach in connection with the game fundamental principles. Such as:

-The number of attack/defense ratio won within a game (Dellal et al 2012),

-The fundamental game intentions based on the chosen instructions/tactic,

-The principles of the game integrating the entire group to collectively succeed the actions (Halouani et al 2017; Labsy et al 2013). Among these principles, we shall mention (Labsy et al 2013):

-Individual and collective player's reaction when the ball is lost

-The repeated sprints ability while asking for the ball (this can offer many offensive solutions and many game's variability)

3) The player's behavior during competition, such as adaptability, combativeness, creativity, mental strength ... Etc. (Labsy et al 2013).

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The repeated sprints ability while asking for the ball (this can offer many offensive solutions and many game's variability)

3) The player's behavior during competition, such as adaptability, combativeness, creativity, mental strength ... Etc. (Labsy et al 2013).

Small-sided games (or reduced games) offer indeed rich sources of information to the technical staff. They allow the application of "magnifying glasses effect" that is close to the reality of the games. It draws on key elements that characterize the players' potential. Reduced number of players allows a greater individual interaction with the ball and with the other players that can optimally experience the technical, physical and emotional skills.

The goal is to allow coaches to make informed / accurate choices. The pragmatic use of such data makes it possible to reduce "the incertitude part" (pre-judgment / individual opinion) when choosing a game system or choosing players' profiles in relation to the game project.

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The impact of congested periods on match performance and physiological markers in elite football

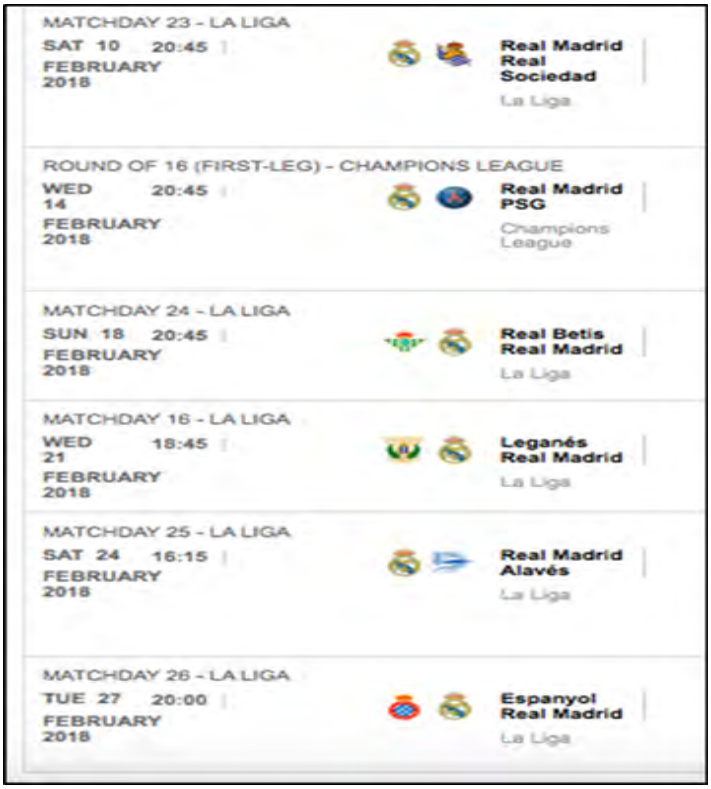
By: Djaoui Leo

Inter-university Laboratory of Human Movement Biology, University Claude Ber-

Players must be able to participate in about 50 games per season in the modern professional football. This number of games imposes a congested calendars, in which two to three matches can be played per week (Strudwick, 2012). These congested periods occur particularly at elite level, where teams compete in international midweek (Champions League) competitions, in addition to national championship games. One of the first paper of the literature in which the effect of congested periods on match performance were observed reported the analyze of their impact on players well-being, their injury rate, and their preparation for a major international competition like a Euro (Ekstrand et al., 2004). Since then, all the published papers showed that no changes in physical activity at high-intensity occurred despite the lower number of days in between matches, for two or more games in a row (Carling et al., 2015; Djaoui, 2017). Post-match physical profiles were not either altered by the number of matches played in the week, in professional football players (Rollo et al., 2014). Even the technical activity would not be affected by these series of matches in top-level football players (Dellal et al., 2015). However, from a tactical perspective, a drop in players' movement synchronization of lateral and longitudinal displacements on the pitch could be observed (Folgado et al., 2015).

The number of injuries during the congested periods would not seem to be affected (Carling et al., 2012). Such observations were justified by the use of post-match recovery strategies (e.g. massages, cold baths, adapted nutrition / hydration, etc.), players' rotation strategy, the fitness level of players and the training loads adaptation during the week (Carling et al., 2015). But if no impact was observed during the matches, and during the periods observed, different observations have been made for the periods that followed these congested periods of matches. Indeed, Ekstrand et al. (2004) found that the players who played the most matches in a season were the worst performers and the ones who get the most injured during the big international championship that followed the season (a European championship in their study). The injury rate was also observed to be increased in the periods following the congested periods analyzed by Dellal et al. (2015) in French "Ligue 1". Thus, it seems that some kind of accumulated fatigue appeared, with a significant impact observed on the injury rates.

Real Madrid FC congested schedule in February 2018



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Several studies recently reported the physiological impact of congested periods. The immunological status, analyzed through the salivary immunoglobulin-A (sIgA) variations, was altered over English Premier League players over a 30-day period of seven games (Morgans et al., 2014). Over three games played in seven days, the levels of plasma creatine kinase (marker of muscle damage) were significantly higher after the second match, played three days after the first one, than after the third match, which was played four days later (Mohr et al., 2016). The changes of plasma urea were also greater in post-match recovery kinetics observed in a three-match per week cycle vs one-match (Lundberg & Weckström, 2017). Such observations have opened up quite broad perspectives to study the influence of congested calendars on the post-match physiological recovery kinetics, especially during the following days.

Special cases of matches were analyzed in young players tournaments. Arruda et al. (2015) found that distances covered at different intensities did not change in five (2 x 25-min) games played in three days, but that the number of accelerations was significantly better in the first match. In the same way, Moreira et al. (2016) found no variation in physical activity and technical activity of young players in seven games (2 x 20-min games) played in seven days. On the other hand, defensive actions such as tackles and interceptions decreased in the last three games, both for the reference team observed in the study and for their respective opponents (Moreira et al., 2016). In this same study, relatively low levels of salivary testosterone were observed at the end of the second day, as a marker of some accumulated fatigue, despite some rate of perceived exertion scores remained unchanged (Moreira et al., 2016). Finally, sIgA levels were also higher at the end of the second and seventh days, suggesting that the intensity, the difficulty of the games and the anxiety of the competition induced alterations of the immune system in these young players (Moreira et al., 2016).

Recent reports highlighted the influence of playing positions on the impact of congested calendars. Defensive positions seemed to be more influenced by the lack of recovery in between matches as reported by Folgado et al. (2015) over tactical synchronization in professional players, Moreira et al. (2016) over technical activity in young players, Penedo & Jamardo (2017) over total distance covered in professional players and Djaoui (2017) over acceleration profiles in professional players. Defensive players are less involved in rotation and substitutions strategies than offensive players during official games (Bradley et al., 2014) and this might have an incidence on their ability to recover during congested periods.

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In conclusion, some fatigue occurs in congested periods as highlighted in:

•Post-match recovery kinetics of the inflammatory process,

•Injury rates,

•Specific positioning defensive activity.

Some practical applications were suggested by the literature:

•The use of recovery strategies (massages, cold or alternated immersion, compression garments, adapted nutrition (and supplementation, see Ranchordas et al. (2017)) / hydration, etc.),

•The monitoring and thus the regulation of training loads,

•The use of players' rotation strategies, also for defensive players.

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Being Sport Scientist and a football coach: Does it help? How does this paradigm co-exist ?

By: Wassim Moalla

UR 15JS01 EM2S, Education, Motricity, Sport and Health, High Institute of Sport and Physical Education, University of Sfax, Tunisia.

Being a sports scientist researcher and practitioner coach was of high interest to me, enabling close integration of the theory and the practice. In general, most coaches, especially strength and conditioning ones get some staff development sessions on an annual or biannual basis (coaching workshops, conferences and seminars, etc.). Nevertheless, sports science grows up quickly and challenges to optimize performance increase constantly too.

The aim of most coaches was the need to know how to connect sport science and coaching practices. Accordingly, various top soccer teams introduce the lab in their structure with a head of performance (usually a sport scientist background) in the last decade. In fact, this lab includes various departments such as physical, scouting, medical, psychological, technical, etc. with the principal objective is to identify strengths and weaknesses and then to suggest the adequate plans and programs to optimize performance. However, the primary goal of this lab is to win matches and prevent injuries, and to build the "tomorrow's player" in the youth categories through talent identification, development and scientific follow-ups.

Based on my own personnel experience, the strength conditioning coach (or fitness coach) that rallies theory and practice will be more helpful inside the team and to the staff. In fact, based on his background, he could better design and delivery physical training programs, mapping and monitoring training load as well as performance, implement recovery strategies (including nutrition with nutritionist), cope with medical staff regarding the rehabilitation of injured players.

To progress and achieve the high performance, sport sciences and coaching should be closer each other since each area is focused and based on some concepts. In fact, the coaches are interested on result and performance (winning), on communication, background and sometimes on feeling and mental strength, whereas the sports sciences are interested on data, facts, methodology (validity, reliability), measures and evidence. Consequently, the appropriate and good communication between them should be effective and useful enabling sharing information and optimizing performance. Thus, the impact on the team's result should be undoubtedly certain.

In reality, this insight in the clubs' structure has also encouraged many universities and federations to develop sport science and coaching degrees whilst getting to use world-leading research and applied practice to prepare the new generation of coaches and sports scientists.

In conclusion, sports science contributes to the success of the individuals who make the teams, and is nowadays a field that needs to be taken into consideration when building a team. The role of sport science is crucial to support players and optimize their performance in close collaboration with coaches.

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Figure 1: Some practical recommendations for the practitioners (Naciss 2018).

https://georgenassis.blogspot.qa/2018/01/the-best-scientists-get-out-and-talk-to.html

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QUESTIONING THE EFFECTIVENESS OF POST-MATCH RECOVERY STRATEGIES IN SOCCER

By: Mohammad Mohammadpour

Sports Science Program, College of Arts and Sciences, Qatar University

Strategies that optimize recovery after physically intense competition are essential to enhance, or at least maintain, performance in sporting events like soccer. Different recovery strategies are routinely implemented by team sports after competition and training (Tessitore et al., 2007). Some strategies have gained more popularity among various soccer teams based on their effectiveness.

We have undertaken a short review of the available contemporary studies that investigated the effectiveness of different post-match recovery strategies, on physical performance, physiological measures, and players' perceptions of recovery after intense soccer training or matches; here what we found:

Reviews suggested that combined recovery strategy (cold water immersion and active recovery) had substantially higher perceived quality of recovery than other strategies (Kinugasa, Kilding, 2009). Cryotherapy immediately after soccer match reduces muscle damage and discomfort, contributing to a faster recovery of neuromuscular function (Ascensao et al., 2011). Studies investigating the different effects of using passive or active recovery strategies showed that there is no significate difference between the strategies on muscle contractile properties using tension-myography and perceived muscle soreness after training (Rey et al., 2012).

Cold water immersion and contrast-water therapy as recovery strategies did not show significant positive effects on physical performance measures, but they reduced fatigue perception. The beneficial effect of a reduced perception of fatigue can improve training and competitions in young soccer players (De Nardi et al., 2011).

Finally, reviews indicated that contrast water immersion (alternating between cold and hot water immersions) has gained special popularity among various soccer teams because of the mentioned benefits.

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Football talent identification models in Aspire academy Qatar and in the UK A short case

By: Saad Salem Al Quraishi and Monèm Jemni

Sports Science Program, College of Arts and Sciences, Qatar University

What are coaches looking for? What is the best model for football talent identification? How talents could be measured? Do these measurements ensure long-term elite performance?

Talent identification is considered to be the most significant process across a number of different domains, especially in sports. Usually team coaches seek to recruit the best qualified players to achieve success; this process of talent identification begins from a young age to ensuring all young individuals receive a practice and development for a period of a minimum 10 years (Abbott et al., 2005). Talent identification is a complex process; it is necessary to interpret its fundamentals enabling the build-up of the necessary technical and psychological skills, hence guaranteeing sustainable performance of talented youngsters.

This short report compares the soccer talent identification models between Aspire Academy, Qatar and the United Kingdom.

We have checked various online sources, magazine, newsletter, official website and other secondary literature databases to find out the answers.

Football Talent Identification in Aspire Academy Qatar

Since 2007, over 550.000 football players from 14 different countries were screened. Testing trials last 4 days per country. 50 players per country will be selected at this stage; these will go through a final selection stage that consists of a 3-weeks trial testing including international games, training and medical/performance testing. The investigators will then select the top 3 players and the top 3 goal keepers according to testing results. Those who got selected shall join Aspire Football Academy in Doha, Qatar. Statistics shows that over 90% of the graduating student-players from Aspire football program have been selected by their respective Football Associations to represent their countries in junior and senior national team competitions.

This selection model is considered to be a simple and not complex approach to follow. It shows a smooth progression between 3 phases. However, this model is not very specific to football as football needs more complex and intensive talent identification procedures. This model lacks of football related tests and under-supervision period. It is clear that Aspire academy gives opportunities to young football players from developing countries to reach international level through careful training and development, focusing on school education and personality development at the same time.

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Football Talent Identification in the UK

Football Academies adopts a three Phases Model of talent identification. In phase one, children from age 14-16 are assessed psychologically and physically in their schools all over the UK. Then the results are compared to the national database. If the results are positively correlated, then talents will progress to the second phase. The second phase is considered as the selection stage where the tests become more specific to football to determine if there were an increase in the potential performance when it comes to specific tests related to football. In the third phase, children identified as being talented will be asked to join the talented athlete development program to develop and strengthen their talents (Talent Identification Programmes, 2010). This later lasts at least 6 months and included intensive training and testing.

Regardless of the different models, talent identification is considered as a significant process when it comes to minimising time and efforts. The process needs to minimise errors when selecting and developing athletes to avoid deceived athletes that do not have the potential to play.

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Heart Rate Variability to monitoring training load in soccer

By: Guillaume RAVÉ[1] and Hassane ZOUHAL[2]

[1]Stade Lavallois Mayenne Football Club, France [2]University of Rennes, M2S - Laboratoire Mouvement, Sport, Santé - EA 1274, Rennes, France.

Soccer at the elite level is characterized as a high intensity sport and physical demanding game. As soccer is known as a very complex sport, monitoring tools that might explain decrements in physical capacity as well as predicting the players' risk of injury or overtraining/ overreaching is in demand. One such tool could potentially be frequent analysis of heart rate variability (HRV). HRV can be measured using different methods, one of the most applicable is the linear method (Dong, 2006). The main parameters of this method are the time and the frequency domain (Dong, 2006). RMSSD is the root mean square of the successive differences between RR intervals and is an index of high frequency variances or vagal modulation (Karim, 2011). Another index of the HRV linear method is the frequency domain, measured in hertz (Hz). High frequencies (HF) represent parasympathetic activities, and low frequencies (LF) represent at a time sympathetic, parasympathetic activities (Task Force, 1996). The ratio of LF to HF is an indicator of the autonomic balance between sympathetic and parasympathetic system representing the performance of the autonomic nervous system and sinoatrial node (Dong, 2016). HRV provides a window through which the ability of the heart to respond to normal regulating impulses can be observed and this provides physiological information about cardiovascular control.

Several studies have proved the usefulness of parasympathetic index in endurance sports (Kiviniemi et al. 2007; Le Meur et al. 2013; Buchheit 2014; Vesterinen et al. 2015). Furthermore, the physical and tactical constraints of soccer lend it to the fight or flight response which involves a reaction by the sympathetic branch of the autonomic nervous system (Jansen et al. 1995). In theory, it seems interesting to assess the sympathetic branch during an activation test (Olufsen et al. 2008 ; Ravé et al. 2016). The stand test is a conventional activation test used to investigate the ANS (Task Force 1996). Accurate quantification of sympathetic nervous activity is difficult and would not be practicable for in-field experiments. Thereby, the low frequency domain (LF) of HRV spectral analysis is influenced by the sympathetic nervous system in addition to the influences of the parasympathetic nervous system (Task Force 1996).

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Therefore, a change in sympathetic nervous system should lead to a change in LF. LF has not been studied very much in the training context since it is well known that it cannot reliably assesses the sympathetic nervous system when heart rate is high like during physical activity (Pichon et al. 2004). However, LF (or its logarithmic transformation logLF) has been largely studied in the context of slight activation (associated with a slight increase in heart rate) as is seen during the stand test (Task force 1996). Moreover, Schmitt et al. (2013, 2015) showed that LF or logLF in the standing position provides additional information to HRV in the supine position in endurance sports and is involved in reflecting the state of fatigue in Nordic skiers and in runners (Schmitt et al. 2013, 2015). Lastly, we recently showed that it correlates to the perception of fitness in professional soccer players in the intermittent sport context (personal communication). More recently, we showed a change in LF domain of spectral analysis in the standing position during a soccer training period in professional soccer players (Ravé et al. 2016). However, this change was not clear due to a sympathetic alteration since the other spectral analysis domains were also altered (T, VLF and HF). This change reflected an overall increase in HRV (total power of spectral analysis, T) and its meaning remains unclear (Ravé et al. 2016). In our last study (Ravé et al. 2016) we concluded that HRV in the standing position could monitor training adaptation in intermittent sports, as soccer, contrary to the index usually employed in endurance sports. However, the significance of the HRV change in the standing position during training remains unclear.

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Monitoring athletic performance – the first step for injury prevention in soccer

By: Pedro Silva & Eduardo Santos

Shanghai SIPG Football Club, China

Elite football players are exposed to prolonged periods of training and high match frequencies with congested periods that can lead to the accumulation of fatigue and increased injury risk (Carling, et al., 2015). When a permanent mismatch between training stress and recovery persists, athletes may enter into an overtrained state that place them at a higher risk of injury. A high number of training days and matches lost due to injury can have a detrimental impact on team performance, especially on teams that are not able to replace injured players with others disposing similar skills. In this sense, monitoring training load is paramount to determine whether an athlete is adapting to a training program without developing non-functional overreaching, illness or injury.

Currently, there is emerging moderate evidence for a relationship between training load and risk of injury and illness in athletes (Lakens, 2013, Singh et al., 2007). This is the reason why an increasing number of coaches have been implementing a scientific approach to their methodologies with the aim of monitoring their training programs for better decision making regarding which athletes are ready for the demands of match play. Monitoring training load can provide a scientific explanation for changes in performance and help coaches to predict injury risk minimizing the associated degree of uncertainty. For this purpose, a number of potential training load markers are available for use. In this report we will briefly address neuromuscular fatigue, heart rate variability, hormonal and biochemical markers and data driven from Global Positioning Systems (GPS) as means of monitoring athletic performance in soccer.

Neuromuscular fatigue refers to the reduction in maximal voluntary contractile force that result of deficits within the central nervous system in the neural drive to the muscle or within the muscle itself. The use of vertical jumps to assess neuromuscular fatigue in athletes is a common approach. Force plates can be used to measure jump height, mean and peak power, mean and peak velocity and peak force (Taylor et al., 2012). Through such measurements, other variables, like the reactive strength index (RSI) can be calculated. The RSI is considered as a measure of explosiveness and calculated as follows, using a countermovement jump (Newton and Dugan, 2002): RSI = Jump height / contact time

By knowing each player RSI in a rested condition, practitioners can evaluate the degree of neuromuscular fatigue accumulated, for instance, after a match by comparing the two scores . Another possibility for detecting signs of overtraining in elite football players is through assessment of heart rate variability (HRV) (Plews et al., 2013). HRV is a measure of the normal variation in beat-to-beat intervals and it can be determined using several indices. Its validity as a marker is still not clear but one of the most reliable measurements is the natural logarithm of the square root of the mean sum of squared differences between adjacent normal RR intervals (Ln rMSSD). Despite its complex terminology, the Ln rMSSD can be easily determined to assess HRV taking only 1 or 2 minutes using a heart rate band and a smartphone app like Elite HRV. A low HRV means that the sympathetic nervous system is driving the heart rate response and thus, the player is not being able to cope with the training load (Buchheit, 2014).

In what regards the analysis of hormonal and biochemical markers, several measurements have also been used in athlete monitoring as information about training stress and readiness to perform.

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Salivary measurements of testosterone and cortisol can be a useful monitoring tool in football. They are usually preferred over blood measurements because they are easier to obtain. Testosterone is an anabolic hormone (responsible for muscle growth and protein synthesis) while cortisol is a catabolic hormone (responsible for increases in protein breakdown in skeletal muscle during metabolism). Therefore, the testosterone-to-cortisol ratio (TCR) is indicative of an anabolic or catabolic status. A low TCR may be indicative of a reduced adaptation to training (Urhausen et al., 1995).

Time-motion analysis is another possibility for monitoring the load imposed on athletes. The development of athlete-tracking systems like wearable global positioning systems (GPS) and accelerometers have allowed coaches to measure the external training loads in team sports. Through the use of such devices, coaches and sport scientists can collect specific information about the distances covered in high-intensity activities, sprinting velocities, impacts, accelerations and decelerations during training and competition (Scott et al., 2016). The information obtained from GPS devices can be used for a variety of purposes. Practitioners are often interested in monitoring fatigue over the course of training and competition to prevent non-functional overreaching or injury.

When a coach or practictioner is involved in a monitoring protocol encompassing several markers of training load, he (or she) will be confronted with vast amounts of data. Detecting meaningful changes in performance with scientific and statistical approaches can provide more confidence and certainty when making conclusions about the data (Coutts, 2014). In this regard, the smallest meaningful change (SMC) can be particularly useful to compare athletes. The SMC can be applied to any training load marker and it is calculated as follows (Hopkins et al., 2009):

SMC = 0.2 x between-athletes standard deviation

Let's say, as an example, that in a football team the reactive strength index (RSI) is measured every 48 hours after the last competitive fixture to assess neuromuscular fatigue. Considering the team's standard deviation of 1.8 for baseline values, the smallest meaningful change would be 0.2 x 1.8 = 0.36. Therefore, any negative change in individual RSI values above 0.36 48h after the match would be considered meaningful and indicative of insufficient recovery at the neuromuscular level.

Despite the usefulness of each one of the aforementioned markers, decisions about the training readiness should not be made solely on the basis of one monitoring tool. A combination of several measures can provide a more complete picture about an athlete's training status, fatigue and injury risk. Monitoring systems should be practical, intuitive and provide efficient data analysis and interpretation, and enable efficient reporting of simple, yet scientifically valid, feedback .

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Doing things out of the box for footballers fitness: Partner resisted exercise – Improving strength and power without equipment

By: André Sousa

Zhejiang College of Sports, Hangzhou

Partner Resisted Exercise (PRE) presents an effective and fun way to implement strength and power training with athletes, when little equipment is available or simply when a change of stimulus is warranted. The exercises use a partner's strength and bodyweight to provide resistance to specific movements, through mechanical advantage. This mechanical advantage allows for the spotter (the athlete that resists the movement) to provide resistance over a wide spectrum of intensities, making this type of exercises an intense enough stimulus even for the stronger athletes.

The main advantage of this type of training is the fact that it can be performed with little to no equipment and can be employed virtually anywhere. This represents a solution for teams that work on a lower budget, or for teams that travel frequently to training camps or competitions outside their regular training environment.

The fact that the resistance is provided by a partner allows for a sort of healthy competition that leads athletes to willingly perform at high intensities and helps break the dullness of the weight room. It is possible that it can also improve athletes' perception of self-efficacy when dealing with an opponent, which can be particularly important in sports where physical contact is key.

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The training content must conform to the type (subcategories) of the desired speed development. According to Gomes and Souza (2008), sprint resistance training should include an average of 3 to 7 sprints at a distance of 20 to 60 meters. Pauses between the exercises should be 15 to 30 seconds and between the sets of exercises 2 to 3 minutes. Oviously, these variables could change depending on the position of the player and the period of the season.

The training for faster reaction time should be supplied via signals and these can be optical, acoustic or tactile. Distances should vary from between 5 to 10 meters with a maximum of 10 repetitions per exercise and a rest period of approximately 2 minutes (Carravetta, 2001).

An example of a reaction speed exercise is: a player must react to a sound by quickly moving short distances of 5 to 8 meters that include a change of direction to the right or left, circles, zigzags, with jumps in the middle of a sprint and medicine ball throws, alternations of slow to fast movements or alternations of fast to slow movements.

Final considerations

It is necessary to practice the motor capacity speed and its subcategory, as we know that it is a complex requirement in football. A soccer player's ability to compete can be improved through more specialized training that requires the right metabolic energy system.

As a final point, it is important to note that the highest levels of reaction time and displacement speed can only be achieved after 8 to 10 years of specialized speed training.

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Creation of a soccer shoe traction outsole for playing on multiple grounds

By: Thorsten Sterzing

R&D and Innovation Center, Xtep (China) Co Ltd, Xiamen, PR China

Introduction: Soccer traction depends on the player, the action, the surface, and the shoe. Shoe outsole configurations influence running and kicking performance as well as lower extremity loading of players (Sterzing, 2016). Regarding the functionality of soccer shoe traction their actual biomechanical utilization of players should be predominantly referred to, rather than solely addressing the purely mechanical availability of traction provided. Subsequently, traction properties of soccer shoes can be adjusted to player subgroup characteristics and also to those of individual players (Sterzing, 2017). The soccer shoe outsole mediates the interface of the player's foot and the surface, and certain outsole configurations have evolved matching the specific characteristics of different surfaces. While the popularity of soccer continues to spread around the globe, traditional traction concepts are challenged, for instance, when shoe creation must account for specific regional and socio-economic circumstances, in order to align with the business needs of manufacturers.

Purpose: To design, develop, and evaluate a functional but cost-effective traction outsole for the evolving sub-elite soccer community in China, playing on diverse surfaces, like on hard/firm clay grounds and on low/medium quality artificial grass grounds.

Method: Interactions of different stud and surface characteristics were analyzed and categorized for their specific traction mechanisms. Insight gained was transferred into the functional product brief of an innovative stud configuration addressing the combined functional needs of multiple soccer surfaces in China. Following design and development of the traction outsole, two prototype versions featuring different stud lengths were manufactured and empirically evaluated for better performance.

Results: The main traction mechanisms identified were shoe-ground-friction and shoe-ground-penetration, alongside specific force generation mechanisms observed for diverse stud characteristics. In close collaboration with designers, developers, and manufacturing experts, scientific expertise of these soccer traction and force generation mechanisms was turned into an innovative soccer shoe outsole. Additional empirical evaluation of outsole performance was needed for the fine-tuning of stud length.

Conclusions: Traditionally, specific stud configurations were considered almost exclusively suitable for only one surface type. However, the presented hybrid soccer shoe outsole technology is suitable to provide good levels of soccer traction on various surfaces. Such approaches add to the existing soccer traction concepts and illustrate smart responses to the increasingly complex demands of the global soccer market.

Keywords: traction mechanism, shoe-ground-friction, shoe-ground-penetration

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Short Feedback Report following the ISAFA in China 2017

By: Gu Yaodong and Meizi Wang

Research Academy of Grand Health Ningbo University, Zhejiang, China

The ISAFA in China 2017 was heald at Ningbo University, Ningbo, China between the 20th and the 23rd of July. Thanks to Tengri Group (our gold partner) and the patronage of the academic experts from Ningbo University, the football and science workshops and conference have contributed into China vision to building capacities in the football provisons and development.

The ISAFA provides indeed a good platform to strengthen communication and cooperation with international entities. The summer 5-days event hosted professors, football tutors, coachesand managers from England, Qatar, Ireland, Brazil, Portugal, France and other countries… More than 100 attendees registerted to the event from all over the country and beyond. All have enjoyed not only the practical side but also the theortical background of football fitness coaching provided by the skilled experts and the experienced scholars. Insights on the latest skills training, integrated football, innovative physical training and cutting edge sciences have been provided to all participants who successfully obtain the ISAFA Football Fitness Certificate.

The cooperation with ISAFA was a greaty experience and provided extra network opportunities between the attendeed, the delegates and the guest experts for further development.

THANK you ISAFA and we will miss you this summer.

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