ISCTE Business School

New Pathways to Football Refereeing Development

João Paulo Carvalho Aragão e Pina

A Thesis presented in partial fulfilment of the Requirements for the Degree of Doctor in Management: Specialization in Human Resources and Organizational Behavior

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Abstract

The main goal of the present thesis is to contribute to football refereeing development, theoretically and in practice. The thesis includes one theoretical and three empirical studies. Study 1 provides a comprehensive panorama of football refereeing research. Through an integrative review, 267 full text articles, published in peer-review journals, were grouped into seven themes and 54 sub-themes. In addition to summarising the current state of the literature, possible paths for future research on the topic of football refereeing were outlined. Study 2 aims to identify, categorise and analyse the distinctive characteristics of top level referees that excel. Ninety-three subcategories (e.g., leadership, resilience, game reading) and 1833 units emerged from the data analysis process and were grouped into seven themes. Participants' responses concerned Individual characteristics (82.00%), Group characteristics (14.02%), and Organisational characteristics (3.98%). Study 3, expand the results of the study 2, and based on our analysis of the opinions of 24 football experts, we demonstrate the multidimensionality of excellence in the performance of football referees. Finally, concerning the lack of research on football refereeing teams, Study 4 test how individual and team cognitions promote team adaptation and team performance within the football refereeing context. Results supported our three hypotheses: (i) team adaptation was positively associated with team performance; (ii) self-efficacy affects positively team adaptation; and (iii) as mental model increase within teams, the relationship between self-efficacy and team adaptation will be enhanced. Hence, it was found a mediation indirect effect of self-efficacy on performance through team adaptation.

We believe that this thesis summarises the current state of literature on football refereeing and outlines possible paths for future research, not only at the individual level but also at the group / team and organisational level. It also contributes to the identification of the characteristics of high level football referees, aiming to promote the growth of competency

development models of different areas (eg., technical, tactical, psychological) and levels (e.g., individual, team), that allow the referee, the refereeing and the football evolution.

Keywords: Football refereeing, refereeing teams, performance, excellence

Resumo

A presente tese pretende contribuir para o desenvolvimento teórico e prático da arbitragem do futebol. A tese inclui um estudo teórico e três estudos empíricos. O Estudo 1 fornece um panorama abrangente da literatura sobre a arbitragem do futebol. Através de uma revisão integrativa, analisaram-se 267 artigos publicados em revistas científicas com revisão por pares, que foram agrupados em sete temas e 54 subtemas. Além de resumir o estado atual da literatura, foram sugeridas linhas de investigação para a arbitragem do futebol. O Estudo 2 visa identificar, categorizar e analisar as características distintivas dos árbitros de topo que se destacam entre pares. Noventa e três subcategorias (por exemplo, liderança, resiliência, leitura do jogo) e 1833 unidades emergiram do processo de análise de dados e foram agrupadas em sete temas. As respostas dos participantes diziam respeito a características individuais (82,00%), características de grupo (14,02%) e características organizacionais (3,98%). O Estudo 3, expande os resultados do estudo 2. A análise das opiniões de 24 especialistas em futebol, evidenciou a multidimensionalidade da excelência no desempenho dos árbitros de futebol. Finalmente, considerando a falta de investigação sobre as equipas de arbitragem que dirigem os jogos de futebol, o Estudo 4 testa como as cognições individuais e de equipa promovem a adaptação e o desempenho da equipa de arbitragem. Os resultados sustentaram as três hipóteses que formulámos: (i) a adaptação da equipa foi positivamente associada ao desempenho da mesma; (ii) a autoeficácia afeta positivamente a adaptação da equipa; e (iii) o aumento do modelo mental das equipas, contribuirá para o aumenta da relação entre a autoeficácia e a adaptação da equipa. Verificou-se, também, a existência de um efeito indireto de mediação da autoeficácia no desempenho, por meio da adaptação da equipa.

Acreditamos que esta tese resume o estado atual da literatura sobre a arbitragem do futebol e delineia caminhos possíveis para futuras pesquisas, não apenas ao nível individual, mas também ao nível de grupo / equipa e organizacional. Contribui, também, para a

identificação das características dos árbitros de futebol de alto nível, com o objetivo de se criarem modelos de desenvolvimento de competências de diferentes áreas (ex: técnica, tática, mental) e níveis (ex: individual, equipa), que permitam a evolução do árbitro, da arbitragem e do futebol.

Palavras-chave: arbitragem do futebol, equipas de arbitragem, desempenho, excelência

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Introduction and Summary

My daughter Margarida is four years old. On her schoolyard, drawings and sentences about the professions they would like to have are exhibited, and we can see that they want to be fireman (n=3), driver (n=2), policeman (n=2), pharmaceutical (n=2), beautician (n=2), veterinary (n=2), drivers (n=1), hairdresser (n=1), students (n=1), doctor (n=1) or even Santa Claus (n=1), Spiderman (n=1) or Frozen (n=1). Nobody wants to be a referee!? How can that be!? According to this sample, we could generalise the result of this "rigorous study" to the world population, with $p<.001$, but, in fact, this is just a hint with no scientific value. Nevertheless, this same question was asked by Garcia-Aranda (2003), a former international football referee that was in charge of the refereeing at FIFA. He questioned why football was progressing while the interest on being a referee was declining. Today, fifteen years later, this problem subsists despite the importance of refereeing to the quality (Cuskelly & Hoye, 2013) and "organization and functioning of sporting competitions in every sport system" (Wicker & Frick, 2016, pg. 1306). Referees are so vital that the lack of them may cause the discontinuing of some sports (Kellett & Warner, 2011).

But allow me to go back to 1988 and share a vivid memory. Please imagine two neighbourhood indoor soccer teams, an amateur tournament, a hostile atmosphere and a "curious" as a referee. I was seeing that game when a player broke his leg in a dispute with another player and, even today, I remember the sound of the bone clicking, followed by the player's cry. I immediately left the game, troubled with this event, and I felt that, in part, the referee could have done something to avoid that. Suddenly, my thoughts were interrupted by a question written on a yellow paper and posted inside the club: "Do you want to be a football referee?". You may guess what happened... a few months later, a skinny eighteen years old student, with no relevant sport practice, was already a referee, moved by the justice desire,

aiming to do better than that "curious" referee. Thirty years later, I'm no longer a referee (I quit when I was 32) but I still want to do something to improve refereeing.

My past as a football referee, as president of a football refereeing club, as a referee's trainer, as vice-president of the Lisbon Referees Committee, as trainer and consultant of the Liga Portuguesa de Futebol Profissional' Referees Committee, as technical director of the Federação Portuguesa de Futebol' Referees Academy, and as refereeing researcher, allows me to deeply understand football refereeing. While this strong connection to refereeing may sometimes be a key factor to the present study, I'm sure that some kind of bias limited my approach, but I will later address to this issue.

Along my refereeing career of 14 years, I always felt that Refereeing Organisations provided little support to referees. In Lisbon (and also in Oporto), we were lucky because we had the chance to train twice a week with a physical trainer. Nevertheless, we rarely trained in a football pitch and we never trained with players, unless during the games that we officiate! In the beginning and in the half of every season we had a one-day seminar course, mainly addressed to law changes and physical and technical evaluation. Monthly, the most, we had a two-hour session about technical issues, in a room full of referees from different refereeing levels. This was our formal training and it was very similar to top level referees' train. Our informal train was done with older referees during the games and in weekly sessions organised by refereeing clubs.

After quitting refereeing as a referee, already with a professional life in teaching and trainer, I started to contribute to refereeing in different fields, as I already mentioned, and one question started to echo in my head: "what made the difference?". In fact, since I, and others, had the same opportunities, almost under the same circumstances, why some had success (i.e., achieved top level refereeing in Portugal, and some of them achieved an international career), others (as myself) had moderate success (i.e., a National career), others just performed at

district level and others quitted months or few years after enrolling in refereeing? What made the difference? What could be done to improve refereeing Organisations, transform the support and the training that they provide or, at least, provide a "map" that could guide someone to a success career?

This thesis may contribute to football refereeing literature and practice in four key areas. The first contribution is the clarification of the current state of the football refereeing literature, due to an integrative review of research published until September 2016 (Study 1). The review of almost thirty 30 years of publications and 765 peer-reviewed articles, resulting in 267 full text articles analysed, allowed us to (i) summarise and (ii) categorise the current state of the literature, which some authors characterized as recent and scarce (e.g., Casajus & Gonzalez-Agueero, 2015) and (iii) propose future research topics on football refereeing since, "the results of our review suggest that there is a need to extend the scope of empirical research in refereeing to include various other topics, as well as a need to further develop theoretical models regarding the performance of football referees, which could be used in their training and development" (Aragão e Pina, Passos, Araújo, & Maynard, 2018, p. 10).

The second contribution of this thesis is linked to the question that was echoing in my head: "what made the difference?" (Study 2). It gains scientific relevance due to the importance of football industry, which requires referees' superior performance, and the lack of research on football refereeing excellence showed on the first study and questioned by several authors. The identification of several distinctive characteristics that seem to shape a referee's performance level contributes to the scarce literature that exists, while the categorization of those characteristics in Individual, Group and Organizational characteristics and other (sub)categories may provide new insights on the study of excellence.

The identification of 93 sub(categories) that may differentiate top referees from a good referee (study 2) ignite our curiosity to further research on this topic, exploring the

multidimensionality that characterizes excellent referees and identifying dimensions of referee performance excellence by leveraging both perspectives from within football referees as well as from those with a more "outside" perspective of the game (Study 3). To the best of our knowledge, this third study contributes on two innovative ways: (i) considering the excellence framework (giftedness, expertise and wisdom) on the football refereeing research; (ii) utilizing a relatively novel methodology in this field by combining Categorical Principal Components Analysis (CatPCA) with qualitative data analysis, which we believe that may provide new and complementary insights about football refereeing performance excellence.

Finally, study 4 is a first approach to investigates the refereeing team given: (i) the urgency to improve referees' performance due to the profound impact on the outcomes of games and seasons (Can, Bayansalduz, Soyer, & Pacali, 2014; Helsen, Gilis, & Weston, 2006; Webb, Wagstaff, Rayner, & Thelwell, 2016); (ii) the increase of the refererееing teams from three members to up to six individuals, or even more, in certain competitions (Webb, Wagstaff, et al., 2016). Likewise, technology adoption such as those surrounding video assistant referees (VAR) now links referee teams on the field to referees viewing the game and providing advice from afar (Dohmen & Sauermann, 2015); and (iii) the lack of research on the topic (Aragão e Pina et al., 2018). In response, within the current study, we leverage both individual- and team-level factors, considering the main referee perspective. Specifically, we investigate how an individual-level cognitive factor (self-efficacy) shapes team adaptation and how this relationship is shaped by a team-level cognitive factor (mental models) and how team adaptation in turn shapes team performance within the football refereeing context.

These questions took me to this PhD. Ready solutions and that "success map" are not already full designed but this work may turn this dream on a true beautiful story.

Section I: Theoretical Background

1. The Referee Role in the Football Industry

Football (or "soccer", or association football) is no longer just the most popular sport in the world (Alarcon, Duran, & Guajardo, 2014; Giulianotti & Robertson, 2004), but an industry (Baroncelli, & Lago, 2006) or a business (Dobson & Goddard, 2011; Rickman & Witt, 2008) that generates massive financial rewards (e.g., Nevill, Webb, & Watts, 2013; Svantesson, 2014), with many professional football clubs being valued in excess of $1 billion US dollars (KPMG, 2016). The difference between success and failure in football is often quite narrow and therefore the actions of players and the decisions of referees may have a relevant financial and social impact on clubs or national teams (Buraimo, Forrest, & Simmons, 2007; Dawson, Dobson, Goddard, & Wilson, 2007).

Even though players and managers get most of the attention, the important role that referees play within the sport has been increasingly acknowledged (Gulec & Yilmaz, 2016; Wicker & Frick, 2016), together with the recognition that their function is complex (Casajús, Matute-Llorente, Herrero, Vicente-Rodríguez, & González-Agüero, 2016; MacMahon, Helsen, Starkes, & Weston, 2007; Mascarenhas, Button, Hare, & Dicks, 2009). On the one hand, the referees' physical activity may be similar to that of players, even though referees may be 10-15 years older (Weston, Drust, Atkinson, & Gregson, 2011). On the other hand, football referees' role and performance have increasingly come under strong criticism and scrutiny (Hacicaferoğlu & Gündoğdu, 2014; Helsen et al., 2006; Johansen, 2015; Webb, 2016) given the social and financial importance of football as suggested previously, as well as the increasing number of games broadcasted (FIFA.com, 2006), the improvements in video technology (which allows for replay analysis of split-second decisions) (Dawson et al., 2007; Parsons & Bairner, 2015; Webb, Dicks, Thelwell, & Nevill, 2016), and the desire to win at all costs

(Cleland, O'Gorman, & Bond, 2015). Therefore, controversy and hot debates about refereeing are guaranteed (Hacicaferoğlu & Gündoğdu, 2014; Scoppa, 2008; Svantesson, 2014), increasing the pressure placed on referees which may affect referees' performance, well being and personal life (Pedrosa & García-Cueto, 2015; Perreau-Niel & Erard, 2015; Samuel, 2015).

2. The State of de Art of Football Refereeing Research

As a result of the increasing awareness regarding the important role of football referees (Gulec & Yilmaz, 2016; Wicker & Frick, 2016), research on football refereeing has become more prevalent in the literature over the past two decades (Weston, 2015). In fact, a recent integrative review on football refereeing revealed that five peer-reviewed publications (out of 267) were published until 2000 and 220 articles (i.e., 82.41%) were published in the last decade (Aragão e Pina, Passos, Araújo, & Maynard, 2018). These figures, while revealing a flourishing field of research, may undercover some weaknesses, such as: (i) a knowledge structure that lacks visibility (Hancock et al., 2015); (ii) contradictory results that need further explanations (e.g., Castagna, Abt, & D'Ottavio, 2004; Louvet, Campo, & André, 2015; Mascarenhas et al., 2009); (iii) lack of research in some topics (e.g., refereeing professionalism); (iv) lack of studied populations (e.g., assistant referees, female referees, observers).

Considering the nature of the refereeing studies, i.e., mature and emerging topics (Mascarenhas et al., 2009), from different fields (Dell, Gervis, & Rhind, 2014; Fabrice, Sylvain, Alan, & Edoh, 2011), with contradictory results (e.g., Castagna, Abt, & D'Ottavio, 2004; Louvet, Campo, & André, 2015; Mascarenhas et al., 2009), and using different methodologies (e.g., Constantinou, Fenton, & Pollock, 2014; Helsen & Bultynck, 2004; Plessner & Betsch, 2002), Aragão e Pina, Passos, Araújo, & Maynard (2018) conducted a integrative review through September 2016, using the Web of Knowledge and Scopus

database. This review aimed to (1) organise the football refereeing research by categorising the published articles; (2) create a comprehensive panorama of football refereeing research, by highlighting the researched topics, their evolution, methodological approaches and geographical contexts; and (3) Provide a research agenda on football refereeing, by identifying research topics that need to be further studied.

Several contributions were presented in the previously mentioned integrative review, but concerning the aim of this study, we will highlight two that will be further explored in the next chapters:

1. There is a lack of published empirical research that validates and defines expertise in refereeing (Mascarenhas, et al., 2005). Weston and colleagues (2012) also emphasise the need to understand the differences between expert and non-expert referees and suggest that there are too little published studies for that purpose. Hence, the path from the bottom to the top, or the path to excellence, is of special interest for young people starting their careers within the refereeing profession (see, MacMahon et al., 2007).
2. To date, there has only been one study that has addressed the entire refereeing team (Boyer et al., 2015). Therefore, as also claimed claimed by Samuel (2015), more research is needed concerning this topic. In particular, it could be interesting to explore the role of shared mental models on team performance (see, MacMahon et al., 2014, pg. 137; Mohammed, Ferzandi, & Hamilton, 2010).

3. Distinctive characteristics of top level referees

It is known that refereeing a football match is a complex activity (Dell, Gervis, & Rhind, 2014; Mascarenhas, O'Hare & Plessner, 2006; Weston et al. 2012), that referees' physical activity is similar to that of players, even though referees may be 10-15 years older (Weston, Drust, Atkinson, & Gregson, 2011) or that players have the support to optimise their performance (Kizilet, 2011; Teixeira, Gonçalves, Meneses, & Moreira, 2014; Webb, 2014) while referees historically have not had such support (e.g., Castagna, Abt & D'Ottavio, 2005; Kizilet, 2011; Weston, 2004). Hence, UEFA and FIFA, together with national and local organizations that manage football and refereeing, are committed to improve referees' performance (Catteeuw, Gilis, García-Aranda, et al., 2010), aiming to reduce the occurrence of errors that are probably irreducible (eg, Groot, 2009; Hill, 2009). This pressure to ensure the consistency and accuracy of the referees' decisions (Dawson, Dobson, Goddard, & Wilson, 2007) has led to changes such as audio communication systems for referee teams, the increased number of elements that make up a refereeing team (the 4th referee, the two goal referees, and, more recently, the Video Assistant Referees - VAR) and the debate about the introduction of technological aids, such as the technology on the goal line and video support (D'Orazio et al., 2009; Solomon, Paik, Alhauli, & Phan, 2011).

Another way to improve refereeing performance is through training programmes (e.g., Catteeuw, Gilis, García-Aranda, et al, 2010; Slack, Maynard, Butt, & Olusoga, 2013; Weston et al, 2012), but it is crucial to know what to train and how to do it. Therefore it is important to understand how referee's performance is impacted by constructs such as the activity profiles (i.e. distance run, running speed, etc.) and the physical ability of referees (Mallo, Navarro, Aranda, & Helsen, 2009), decision making (Dawson, 2012; Oudejans et al., 2005), conflict

management (Mascarenhas, O' Hare, & Plessner, 2006), coping skills (Poolton, Siu, & Rich, 2011), nutrition (Paes & Fernandez, 2016).

Considering the excellence on football refereeing, two studies (Slack and colleagues, 2013; Schnyder & Hossner, 2016) reported several physical, environmental, and psychological factors that may contribute to increase performance such as mental toughness attributes, support networks and services, game management qualities, pre-match preparation, performance-level enhancement, opportunities to thrive, personal characteristics, superior physical components, educability, game management qualities, football intelligence, and experience. In the next chapters, we will try to expand this knowledge about factors that contribute do excellence on football refereeing looking specifically to what differentiate top referees from top referees that excel.

4. Research on excellence

In a variety of contexts, researchers focus on factors that shape superior performance (Swann, Moran, & Piggott, 2015). Such work has a long history (Galton, 1892; Terman 1926) and includes studies from a variety of perspectives which have tried to understand what determines performance excellence in various fields (Baltes & Staudinger, 2000; Ericsson, Krampe, & Tesch-Römer, 1993; Gagné, 2004; Hollingworth, 1942; Renzulli, 2016; Simon & Chase, 1973). For example, within the organisational psychology literature, researchers have examined what gives rise to both individual employee excellence and overall organisational excellence (Evans & Jack, 2003; Luthans, Norman, Avolio, & Avey, 2008).

While much of the work that examined performance excellence through theses lenses has predominantly been focused on the area of organisational psychology, research has also

considered the factors that shape performance excellence within a variety of sport contexts (Durand-Bush & Salmela, 2002).

Within the sports literature, many researchers have tried to highlight the characteristics that enable athletes to excel in a variety of sport domains (Bortoli, Bertollo, Hanin, & Robazza, 2012; Gould & Maynard, 2009; Macnamara & Collins, 2013). Primary influences on expertise such as genetics, training, and psychological factors and secondary influences such as socio-cultural and contextual elements were reviewed by Baker and Horton (2004). This multidimensional and dynamic process that defines performance excellence (Den Hartigh, Van Dijk, Steenbeek, & Van Geert, 2016) shows the difficulty in trying to predict performance excellence (Baker & Horton, 2004).

This study focuses on how performance excellence can be attained by football referees, which is critical because despite the social and economic importance of football (Dobson & Goddard, 2011) and the relevant and complex role that referees play in this sport (Helsen & Bultynck, 2004; Mascarenhas, O' Hare, & Plessner, 2006; Wühr, Fasold, & Memmert, 2015), a recent integrative review (Aragão e Pina, Passos, Araújo, & Maynard, 2018) shows that the study of football refereeing is still rather limited overall. In particular, the results of this review indicate that little attention is given to the study of excellence among football referees (Gilis, Helsen, Catteeuw, Van Roie, & Wagemans, 2009) and therefore, we do not know enough about what distinguishes those referees who are excellent from those who merely perform at a satisfactory level.

In fact, there are apparently only two studies that have considered performance excellence within the context of football refereeing (Slack, Maynard, Butt, & Olusoga, 2013; Schnyder & Hossner, 2016). Analysing these two studies, it is of particular interest to note that they emphasise the multidimensionality of excellence in football refereeing. Likewise, interesting insights are gained by grouping the information provided by these two studies.

The first study was conducted by Slack et al. (2013), and focused on the performance levels of 15 English Premier League referees. The results point out a variety of physical, environmental, and psychological factors that contribute to performance excellence, such as mental toughness attributes, support networks and services, game management qualities or superior physical components. The second study was conducted by Schnyder and Hossner (2016), who interviewed 23 international referees from 17 European countries and, among other findings, they reported characteristics of a good elite referee such as educability, football intelligence, and experience.

With this in mind, we may infer that research on football referee performance excellence is in its infancy, and there is limited knowledge about the characteristics that distinguish an excellent from a satisfactory referee. Therefore, our two main objectives with this study were: i) to explore the multidimensionality that characterises excellent referees; and ii) to identify dimensions of referee performance excellence by analysing the "inside" perspectives of football referees with the ones of those with a more "outside" perspective of the game.

Accordingly, based on our review of the literature, this study brings forward two new contributions. First, it includes a diverse sample of participants, which provides an "inside" (e.g., referees, coaches) and "outside" perspective of the game (e.g., referees' observers, trainers, journalists). Most of studies thus far have only considered the inside perspective (Durand-Bush & Salmela, 2010; Schnyder & Hossner, 2016), which may not provide a full picture of the topic. This triangulation of perspectives will further enhance our understanding of performance excellence in football refereeing (Slack et al., 2013). Second, we use a relatively novel methodology in this field by combining qualitative and quantitative data analysis. By doing so, we hope to provide new and complementary insights on football refereeing performance excellence.

5. Self-Efficacy, Adaptation, Mental Models and Performance

The dynamics and unpredictability of football (Praschinger, Pomikal, & Stieger, 2011), the environmental and external circumstances that may influence referees' performance and behaviour (Diotaiuti, Falese, Mancone, & Purromuto, 2017; Tom Webb, Wagstaff, et al., 2016; Watkins et al., 2014), the number of observable and non-observable decisions under extreme time pressure (Hancock, 2011; Helsen & Bultynck, 2004), make football refereeing one of the most difficult tasks in sport (Cuskelly et al., 2008), compared to high-profile jobs such as surgeons, firefighters, law enforcement officers or pilots (Dawson, 2012; Mascarenhas, O' Hare, & Plessner, 2006).

Research on football refereeing conducted thus far has predominantly focused on factors that that impact football referees' performance at individual-level, such as physiological (Caballero et al., 2011; da Silva, de los Santos, & Cabrera, 2012; Ghasemi, Momeni, Rezaee, & Gholami, 2009), physical (Barberó-Álvarez, Boullosa, Nakamura, Andrín, & Weston, 2014; Castillo, Yanci, Cámara, & Weston, 2016; Weston et al., 2011), psychological (Kruger, Ekmekci, Strydom, & Ellis, 2012; Mathers & Brodie, 2011; Pietraszewski, Maszczyk, Roczniok, Golas, & Stanula, 2014), and technical factors (Adnan, Muzayin, & Sulaiman, 2013; Gilis, Weston, Helsen, Junge, & Dvorak, 2006; Mellick, Flemming, Bull, & Laugharne, 2005). Cognitive factors that shape referee performance, as adaptation or self-efficacy, have been neglected, besides rare exceptions (e.g., Guillén & Feltz, 2011).

Efficacy expectation was defined by Bandura (1977, p. 193), as "the conviction that one can successfully execute the behaviour required to produce the outcomes." and has been associated with football refereeing excellence (e.g., Samuel, 2015; Schnyder & Hossner, 2016; Slack et al., 2013). Referees' self-efficacy beliefs seem to have positive effects on confidence (Nazarudin et al., 2014; see also, Fothergill & Wolfson, 2015), satisfaction and stress (Diotaiuti

et al., 2017) while, in contrast, a lack of efficacy may have negative impact on attention, reactions time, judgments and stress, increasing burnout (Guillén & Feltz, 2011).

The evidence that self-efficacy is an essential component of adaptation is provided by research within organisational settings (e.g., Ashford & Taylor, 1990; Fay & Frese, 2001; Kozlowski et al., 2001; Martin & Rubin, 1995) which suggests that "adaptable behaviour is unlikely to occur unless one first has the confidence to perform such behaviour." (Griffin & Hesketh, 2003).

An important finding of the integrative review performed by Aragão e Pina et al. (2018), was that to date, there has only been one study that has addressed the entire refereeing team (Boyer et al., 2015). In fact, the football refereeing literature has dedicated limited academic attention to the topics of teams and teamwork (McEwan & Beauchamp, 2014), which is intriguing given several trends within the football referee practices such as the enlargement of teams from three members to up to six individuals, or even more, in certain competitions (Aragão e Pina et al., 2018; Webb, Wagstaff, et al., 2016).

In addition to the mentioned individual-level factors, in complex and demanding contexts such as professional football, team adaptation is also vital. In particular, within this context, referee teams need to adapt quickly and appropriately to recurrent changes adjusting their cognitive and behavioural processes, and evaluating and analysing the situations in short periods of time (Baard et al., 2014; Burke et al., 2006a; Rosen et al., 2011; Uitdewilligen, Waller, & Pitariu, 2013). Given the dynamic nature of refereeing within football, we envision that the positive relationship that has been noted between team adaptation and performance in other contexts (Maynard et al., 2015), is likely consistent within the context of football refereeing.

Given that constructs such as mental models, experience and collective efficacy are salient for team adaptation (Maynard et al., 2015), it is also plausible that the same effect occurs

in this refereeing context. Hence, mental models are the basis for reasoning, decision-making and behaviour (Jones, Ross, Lynam, Perez & Leitch, 2011), each of which is crucial to football referees' performance. Likewise, according to Cannon-Bowers, Salas, & Converse (1993), team mental models allow team members to anticipate other members' needs and actions and adapt their behaviours concerning the task demands and the other members.

Finding support, once again, in the organizational literature, there is evidence to suggest that mental models are important to enhance team effectiveness through team processes such as coordination and communication (e.g., Marks, Zaccaro, & Mathieu, 2000; Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2000). In fact, to achieve excellent performance, the refereeing team must: i) coordinate several tasks (e.g., travelling, game preparation) according to the game that they were appointed to Samuel (2015); ii) understand the task they will perform and share technical and tactical knowledge (Mallo et al., 2012; Mascarenhas et al., 2006; McEwan & Beauchamp, 2014) to be able to have performance levels adequate to match game needs; iii) establish a communication protocol during the game, to help the decision-making process (Samuel, 2015); iv) learn continuously with experience and the team members (Collina, 2003); among others.

Unfortunately, little is known about the effects of team-level constructs within football refereeing research (Aragão e Pina, et al., 2018; Slack et al., 2013). That said, we contend that the four content domains underlying team mental models proposed by Cannon-Bowers et al. (1993), i.e., equipment model, task model, member model and teamwork model deserve research attention. Accordingly, even though it has yet to receive much research attention, we think it is important to explore the moderating impact of mental models.

Section II: Thesis Structure and Goals

The main purpose of this thesis is to contribute to football refereeing development. To achieve this purpose, we aim to create a comprehensive panorama of football refereeing research that will allow to identify research topics that need to be further explored. Second, we aim to analyse the distinctive characteristics of top level referees that excel, which is an innovative approach in the refereeing literature, and explore the multidimensionality that characterises excellent referees. Third, we aim to call attention to the need to study refereeing in a different perspective, i.e., exploring the team level analysis rather than just the individual level of analysis. Therefore, we will test how individual and team cognitions promote team adaptation and team performance within the football refereeing context. In order to accomplish these goals, we developed a theoretical study and three empirical studies (Table 1).

Table 1. Research questions, methodology and outputs of the thesis

	Study 1		
Methodology	Integrative review		
Stage	Published (1)		
Research Question	Is football refereeing supported in solid research models?		
	Study 2	**Study 3**	**Study 4**
Methodology	Interview Analysis	CatPCA (4)	Mediation/Moderation
Stage	Under Review (2)	Under Review (3)	Preparing to submit
Research Question	What are the distinctive characteristics of top level referees that excel?	What are the dimensions of referees' performance excellence?	How do self-efficacy influence team performance?

(1) Aragão e Pina, J., Passos, A. M., Araújo, D., & Maynard, M. . T. (2018). Football refereeing : An integrative review. Psychology of Sport & Exercise, 35(January 2017), 10–26.

(2) European Sport Management Quarterly

(3) Journal of Sports Science

(4) Categorical Principal Components Analysis

Section III: Studies

Study 1: Football Refereeing: An Integrative Review

Abstract

Objective: The number of football-related studies has increased considerably in recent years, in part due to the worldwide popularity of this sport. However, in what concerns football refereeing, literature is still very scattered. Thus, the purpose of this study was to provide an updated integrative review of studies addressing refereeing within football.

Design: Our study is an integrative review of the football referee literature.

Method: Using the keywords “Soccer Referee”, “Football Referee” and “Football Association Referee,” a review was conducted through September 2016, using the Web of Knowledge and Scopus databases.

Results: Literature search resulted in 267 full text articles which were grouped into seven themes and 54 sub-themes. Themes and sub-themes were generated through an inductive and deductive process of data analysis.

Conclusion: In addition to summarising the current state of the literature, we also outline possible paths for future research on the topic of football refereeing. In fact, the results of our review suggest that there is a need to extend the scope of empirical research in refereeing to include various other topics, as well as a need to further develop theoretical models regarding the performance of football referees, which could be used in their training and development.

Keywords: integrative review, referees, association football

Introduction

Football has been heralded as the most popular sport in the world (e.g., Giulianotti, 2012). Even though players and managers get most of the attention, the important role that referees play within the sport has been increasingly acknowledged (Gulec & Yilmaz, 2016; Wicker & Frick, 2016), together with the recognition that their function is complex (Casajús, Matute-Llorente, Herrero, Vicente-Rodríguez, & González-Agüero, 2016; MacMahon, Helsen, Starkes, & Weston, 2007; Mascarenhas, Button, Hare, & Dicks, 2009). Additionally, the referees' job is under strong scrutiny (Johansen, 2015; Parsons & Bairner, 2015; Webb, 2016) as everyone hopes for indisputable decisions (Lex, Pizzera, Kurtes, & Schack, 2014; Wühr, Fasold, & Memmert, 2015), since football has become a very important industry (Can et al., 2014; Gulec & Yilmaz, 2016) with many professional football clubs being valued in excess of $1 billion US dollars (KPMG, 2016).

While referees are responsible for each football game, the sport as a whole is supervised by several governing bodies, two of the more significant being the Federation International Football Association (FIFA) and the Union of European Football Association (UEFA). FIFA "has 211-member associations around the globe and its goal, enshrined in its Statutes, is the constant improvement of football" (FIFA.com, 2017), while UEFA "[…] is the umbrella organisation for 55 national football associations across Europe. Its objectives are, among other things, to deal with all questions relating to European football, to promote football in a spirit of unity, solidarity, peace, understanding and fair play […] (UEFA.com, 2017). These and other governing bodies, including the International Football Association Board (IFAB), are developing new ways to improve referees' performance (Catteeuw, Gilis, García-Aranda, et al., 2010) by reducing the occurrence of errors, something that many feel is impossible to achieve (e.g., Groot, 2009; Hill, 2009b).

These governing bodies have explored (and continue to do so) diverse ways to ensure the consistency and accuracy of the referees' decisions (Dawson, Dobson, Goddard, & Wilson, 2007; Nevill, Webb & Watts, 2013), including various human resource and technological changes. In terms of human resource initiatives, in 1991, after the Mexico World Cup, the Fourth Official was introduced (Tenèze, Joncheray, & Arnal, 2015) to help the referee to control the game, and since then the role and responsibilities of the Fourth Official have been growing (Laws of the Game 2016/17, 2016). In 2009, two additional assistant referees were added to the refereeing team in experimental games (Tenèze, Joncheray, & Arnal, 2015), and today the Laws of the Game 2016/17 allow the appointment of these two extra referees to assist the referee in controlling the game (Laws of the Game 2016/17, 2016).

Likewise, football has increasingly leveraged technological advancements in the hope of enhancing referee performance. Specifically, in 2003, an audio communication system was tested allowing the entire refereeing team members to communicate with one another. FIFA believed that "The use of such a system would improve the coordination of actions between the match officials in a more efficient manner" (UEFA.com, 2013). In fact, nowadays, in top competitions, as well as in amateur leagues, referees are increasingly using this communication system. Likewise, the sport has experimented the goal-line technology, which verifies whether a ball completely crosses the goal-line (Goal-Line Technology, n.d.). In 2012 the IFAB allowed this technology to be used (see, Tenèze, Joncheray, & Arnal, 2015) and since then, major UEFA and FIFA competitions (e.g., Euro 2016; World Cup 2014), as well as some national football leagues, have successfully implemented this technology ("Greater use of goal-line technology," 2016). In addition to these technological aids, the use of video assistant referees (VAR) (Dohmen & Sauermann, 2015; Solomon, Paik, Alhauli, & Phan, 2011) is currently being explored. In essence, VAR would allow for certain refereeing decisions made on the field (i.e. goals, penalties, red cards, and mistaken identity in awarding a card) to be reviewed by an

individual located in a video operation room where that referee can analyse multiple camera angles to provide input on such decisions. On the 5th March 2016, at the Annual General Meeting, "the IFAB agreed in principle that video experiments based on the drafted protocol would be the best way to understand the pros and cons of videos assistance in full" (FAQ: Experiments with video assistant referees, 2016).

The hope of these measures is that they may reduce or eliminate the mistakes that can occur during the match. However, despite the information provided using such technological aids, they do not contribute, per se, to the development of the referees' skills. Instead, for these technological tools to help in that development, and thus improve referee performance, they need to be integrated into a formalised error/no error analysis process that inputs into a feedback system available to referees and trainers (see, Slack, Maynard, Butt, & Olusoga, 2013).

Having said that, there have been research initiatives focused on understanding how referee's performance is impacted by constructs such as the activity profiles (i.e. distance run, running speed, etc.) and the physical ability of referees (Mallo, Navarro, Aranda, & Helsen, 2009), as well as the biases in referee's decision-making (Dawson, 2012). Likewise, in the last decade there has been an increasing interest in researching other topics, such as refereeing-related tasks (Castagna, Abt, & D'Ottavio, 2007), training referees (Mascarenhas, O'Hare, & Plessner, 2006) and assistant referees (Put et al., 2014). Nevertheless, more research is needed in football referee literature addressing topics such as training on conflict management (Mascarenhas, O' Hare, & Plessner, 2006), coping skills (Poolton, Siu, & Rich, 2011), the role of assistant referees, (Catteeuw, Helsen, Gilis, Van Roie, & Wagemans, 2009), recruitment and retention (Johansen, 2015), gender effects (Kim & Hong, 2016), body composition (Casajús et al., 2016), professionalism (Casajus & Gonzalez-Agueero, 2015), injuries (Oliveira, Reis, & Inácio, 2016), physical abilities (Yanci, Los Arcos, Grande, & Casajús, 2016), age-related

effects (Castillo, Yanci, Casajús, & Cámara, 2016), the refereeing team (Samuel, 2015); dropout and burnout (Johansen, 2015), nutrition (Paes & Fernandez, 2016), and decision making (Oudejans et al., 2005), among others.

To the best of our knowledge, conceptual models (e.g., Guillén & Feltz, 2011; Mascarenhas, Collins, & Mortimer, 2005; Samuel, 2015), conceptual frameworks (e.g., Lane, Nevill, Ahmad, & Balmer, 2006) and specific reviews about refereeing are scarce, with a few exceptions (e.g., Hancock, Rix-Lievre, & Cote, 2015; Plessner & Haar, 2006; Weston et al., 2012). In addition, existing reviews tend to focus on a particular topic within football refereeing. While this may have some advantages, we argue that within a complex field like football refereeing, there is a strong need to initially have a broad understanding of all topics and clarify the current state of the literature (see, Hancock et al., 2015), to help researchers to meaningfully contribute to the refereeing development literature.

Therefore, our aim was to conduct an integrative review in order to:

(1) Organise the football refereeing research by categorising the published articles;

(2) Create a comprehensive panorama of football refereeing research, by highlighting the researched topics, their evolution, methodological approaches and geographical contexts; and

(3) Provide a research agenda on football refereeing, by identifying research topics that need to be further studied.

Methods

Football refereeing research addresses mature and emerging topics (Mascarenhas et al., 2009) from different fields (Dell, Gervis, & Rhind, 2014; Fabrice, Sylvain, Alan, & Edoh, 2011), with contradictory results (e.g., Castagna, Abt, & D'Ottavio, 2004; Louvet, Campo, & André, 2015; Mascarenhas et al., 2009), and using different methodologies (e.g., Constantinou,

Fenton, & Pollock, 2014; Helsen & Bultynck, 2004; Plessner & Betsch, 2002). Therefore, we consider an integrative review to be a useful approach to define and give meaning to the state of the knowledge, as well as suggesting topics for future research (Cooper, 1982; Soares et al., 2014). The reasoning behind this decision involves the integrative reviews' ability to review, criticise and synthesise representative literature on two types of topics (mature and emerging topics), combining different types of research designs, as well as qualitative and quantitative data (Torraco, 2005; Whittemore & Knafl, 2005). Moreover, integrative reviews have been called "one of the most comprehensive, evidence-based approaches to review literature and providing guidelines for future initiatives" (Schulenkorf, Sherry, & Rowe, 2016, p. 23).

In order to conduct this integrative review, we followed Cooper's (1998) five-step procedure: (1) identify the research problem; (2) collect data; (3) evaluate data; (4) analyse data; and (5) present data. The *identification of the research problem* was addressed in the introduction section.

The *collection of data* involved searching two databases (Web of Science and Scopus) using the terms *Soccer Referee* AND *Football Referee* AND *Football Association Referee,* in the domains of topic, title, abstract, and/or keywords. From this initial search, 735 peer-reviewed articles were retrieved through September 2016.

For the *data evaluation process*, we screened the retrieved articles. First, we checked for and eliminated any duplicate articles (n=281) between the two databases. Then, we eliminated the articles (n=5) written in languages we are not able to read (e.g., German: Messner & Schmid, 2007), thus leaving only articles written in English, Spanish, French or Portuguese. The last step of the evaluation process, involved excluding 182 articles which (i) were related to the refereeing of other sports such as basketball (e.g., Leicht, 2007), rugby (e.g., Rainey & Hardy, 1997), handball (e.g., Souchon, Livingstone, & Maio, 2013) and indoor football (e.g., Kellett & Warner, 2011) – 46 articles; (ii) were not related to soccer refereeing

(e.g., Nuytens & Penin, 2010) – 88 articles; (iii) were related to players, coaches or others (e.g., Salokun, 1994) that are not referees – 44 articles; and (iv) were not available in either full text or abstract formats (e.g., Solstad, 1996) – 4 articles. After applying these criteria, 267 articles remained, and these articles became the final sample upon which our integrative review is based.

In the *data analysis process*, we read the full text of the 267 articles. For each article, we collected information regarding: i) the authors' names; ii) the countries or organisations where the study took place; iii) the participants (referees and assistant referees) and the number of matches analysed; and iv) the level of refereeing of the study participants (Top, National, and Regional). According to MacMahon et al., (2007) we defined that the highest refereeing level would include the FIFA referees and assistant referees and those who act in the top competitions of each country. National level refers to those who participate in national competitions, while the Regional level includes the referees and assistant referees that participate in regional competitions.

The data analysis process continued with further categorisation of the 267 articles in our sample. This categorisation process was performed by the first author and discussed with the remaining authors. It involved identifying the main theme of each article, by taking a close look at the articles' title and keywords and reading the full text with a focus on the abstract and main conclusions. From our analysis of these 267 articles, five themes that underpin football referee performance and efficacy (e.g., Mascarenhas et al., 2005; Slack et al., 2013; Weston et al., 2012) were identified.

Specifically, Table 2 shows the five identified themes: Physical Performance; Technical Performance; Psychology; Organisation; and Injuries. However, after identifying these five themes, we noticed that the topics addressed in 22 articles were not linked to our initial five themes. Accordingly, based on our review of these remaining 22 articles, two additional themes

(Physiology and Development Models) were added, so that these articles could be included. Several authors highlight the importance of physiology for the development of refereeing, as well as its role in shaping referees' physical performance and health (Castagna et al., 2007; Barbero-Alvarez, Boullosa, Nakamura, Andrin, & Castagna, 2012; Slack et al., 2013), which encouraged us to include this theme into our categorisation system. Similarly, the importance that some authors (Mascarenhas et al., 2006; Slack et al., 2013; Weston et al., 2012) attribute to refereeing development models underlined the need, usefulness and relevance of this final theme. Studies that addressed more than one theme were grouped according to their primary scope. For example, the study by Mascarenhas et al., (2009) addresses aspects related to both the referees' physical and technical performance, but as it was primarily aimed at the first topic, it is included in the theme Physical Performance.

For each theme, we also identified a list of sub-themes to depict a more detailed understanding of football refereeing research. Therefore, the articles distributed among the seven themes were further grouped into smaller themes (sub-themes) within the same theme. Each theme and sub-theme were defined to describe the topics they covered (see Table 2). Afterwards, to validate this categorisation system, two independent researchers were asked to code a random collection of 75 articles (28.09% of the full sample; 13 related to the themes and 62 to the sub-themes). They successfully coded the 13 articles (100%) into their appropriate themes and 53 of the 62 articles (82.81% of the random collection) into the sub-themes initially picked by the first author. Therefore, this provided a high inter-rater reliability confirmation (Creswell, 1998), showing that it was not necessary to change the categorisation system.

Table 2. Organisation and justification of the inductive and deductive categories

Theme	Mascarenhas et al. (2005)	Guillén & Feltz (2011)	Weston et al. (2012)	Slack et al. (2013)
Physical Performance	Physical fitness, positioning & mechanics	Physical fitness	Physical performance in matches, fitness testing and fitness training	Superior physical components
Technical Performance	Knowledge & law application Contextual judgment	Game knowledge		Multifacted pre-match preparation
	Personality and game management	Decision-making skills Strategic skills Communication/Game control		Performance-level enhancement Effective game Management qualities
Psychology	Psychological characterisitics of excellence	Psychological skills	Perceptual-cognitive expertise	Mental toughness attributes Personal characteristics
Organisation				Support networks and services Opportunities to thrive
Injuries			Injuries	
Physiology				
Development Models				

The presentation of data is the last step of the integrative literature review procedure proposed by Cooper (1998). It will be described and discussed in the following sections of this article.

Results

The results of this integrative review should be interpreted as a "constellation rather than a star", meaning that we intend to provide information about the current state of the football referee literature, rather than focusing exclusively on a specific topic. Our first aim was to organize the football refereeing research. Therefore, Table 3 presents our proposal to categorise the 267-full text peer-reviewed articles into the previously mentioned seven themes and 54 sub-themes. The second aim was to create a comprehensive panorama of football refereeing research, regarding the researched (sub)themes, their evolution, methodological approaches (research sample and research methodology) and geographical contexts.

Researched (Sub)Themes and Their Evolution

Research on football refereeing, published in peer-reviewed journals is a relatively recent phenomenon with the first article being published in 1988. Table 3 shows the articles' publication distribution across the years. The growing interest on football refereeing is obvious. By dividing the total time span (1988 to 2016) of published articles in blocks of mainly 5 years, we were able to determine that only five articles (1.87%) were published between 1988 and 2000, 36 articles (13.48%) between 2001 and 2005, 77 articles (28.84%) between 2006 and 2010, and 148 articles (53.56%) between 2011 and 2016. It became clear that the football refereeing literature has become more popular at an increasing rate over the past couple of decades.

Table 3. Definitions and examples of themes and sub-themes

Theme	Sub-theme		Definition		Reference	
Physical Performance			The evaluation of referees' physical activities during training, tests or games			
	Match		The evaluation of referees' physical activities during games	Abt (2007)	Weston, Castagna, Impellizzeri, Rampinini, &	7
	Physiology		The influence of physiology on referees' performance studied during a match		Castagna, Abt, & D'Ottavio (2002)	9
	Fitness Tests		The evaluation of referees' physical activities during fitness tests and tests' adequacy		Boullosa, Abreu, Tuimil, & Leicht (2012)	0
	Training		The evaluation of referees' physical activities during training		Weston, Helsen, Macmahon, & Kirkendall (2004)	
	Nutrition		Dietary intake behaviour before, during and after competition		Teixeira, Gonçalves, Meneses, & Moreira (2014)	
Technical Performance			Referees' conscious or unconscious decisions regarding the best game outcome			
	Bias		Referees' judgement which is considered to be unfair due to several causes		Dohmen & Sauermann (2015)	
	Social Pressure		Unfair judgement caused by the crowd size or the architecture of the stadium		Constantinou, Fenton, & Hunter Pollock (2014)	2
	Home Advantage		Unfair judgment due to one of the teams playing at home		Riedl, Bernd, Heuer, & Rubner (2015)	
	Players	height or race	Unfair judgment due to players' characteristics such as uniform colour, vocalisation, gender,		Lex, Pizzera, Kurtes, & Schack (2014)	
	Successive Decisions		Unfair judgement based on the influence of one decision on the following one		Schwarz (2011)	
	Team		Unfair judgement related to the tournament hosting team or the team's international ranking		Torgler (2004)	
	Nationality		Unfair judgement due to the referee and players' home country being the same		Pope & Pope (2015)	
	Close Game		Score difference at the end of the match		Lago-Peñas & Gómez-López (2016)	
	Decision making		The process of selecting a solution from a pool of alternatives		Dohmen & Sauermann (2015)	
	Laws of the Game	yellow/red cards	Making a decision regarding technical and disciplinary rules, such as offside, fouls and	(2016)	Put, Wagemans, Spitz, Williams, & Helsen	9
	Game Management		Analysing the match context before issuing disciplinary sanctions		Webb & Thelwell (2015)	
	Referees' Satisfaction		Referees' perception of their decisions' accuracy		Can, Bayansalduz, Soyer, & Pacali (2014)	
	Training		Decision making skills and improvement of knowledge levels		Gulec & Yilmaz (2016)	
	Unethical Decision-making		Making wrong judgments to destabilize a football match to have a better evaluation		Fruchart & Carton (2012)	
	Team		Decisions considering the refereeing team involvement		Boyer, Rix-Liêvre, & Récopé (2015)	
Psychology			The study of referees' mental processes which influence their behaviour and performance			
	Stress		The level of emotional strain emergent from demanding circumstances		Gencay (2009)	
	Coping		The ability to deal in a very effective way with a difficult issue	(2009)	Louvet, Gaudreau, Menaut, Genty, & Deneuve	
	Training		A course targeted at the development of specific skills		Ramírez, Alonso-Arbiol, Falcó, & López (2006)	
	Motivation		Desire to be a referee		Ferreira & Brandão (2012)	
	Perceptual-cognitive		The abilities involved in the perception and processing of information	Stanula (2014)	Pietraszewski, Maszczyk, Roczniok, Golas, &	
	Commitment		The state of being dedicated to a specific cause or outcome		Koslowsky & Maoz (1988)	
	Mobbing		Level of psychological intimidation that referees are exposed to		Hacicaferoğlu & Gündoğdu (2014)	
	Self-aggrandizement		Referees' perception that they are superior to other referees		Fothergill & Wolfson (2015)	
	Anxiety		The state of inner turbulence		Johansen (2015)	
	Well-being	physical)	Resources which are used to overcome different types of challenges e.g. psychological, social,		Pedrosa & García-Cueto (2015)	
Organisation			Football refereeing governing body, such as FIFA, UEFA, National or Regional football associations or Referee's Committee from FIFA, UEFA, National or Regional football associations		Webb (2016)	
	Human Resources		Activities related to referees' recruitment, retention, orientation, training or job satisfaction		Gencay (011)	
	Recruitment and Retention		The process of attracting, selecting and maintaining referees		Wicker & Frick (2016)	
	Meaning		The purpose of refereeing significance	(2011)	Brandão, Serpa, Krebs, Araújo, & Machado	
	Job Satisfaction		Balance between referees' commitment, expectations, opportunities and sense of justice		Çoban (2010)	
	Career Development		The ongoing process of referees' life management, learning, work and refereeing activities		Cobley, Schorer, & Baker (2008)	
	Professionalization		The referees' profession status		Horn & Reis (2016)	
	Sexism		Women discrimination		Forbes, Edwards, & Fleming (2014)	
	Training		Evaluation and development of courses, seminars and teaching materials	(2013)	Armenteros, Liaw, Fernandez, Diaz, & Sanchez	
	Sports Policy		Plan/course of action intended to influence and determine decisions and actions		Svantesson (2014)	
	Technologies		Technologies contribution to improve refereeing		Svantesson (2014)	
	Corruption		Game perversion		Bezerra & Teixeira-Diniz (2016)	
	Assignments		Referees' appointment process from assignments to evaluation)		Mancini & Isabello (2014)	
	Development	performance	Discuss and evaluate opportunities and programs to improve the game and the referees'		Webb (2014b)	
	Competitive Balance		The competition fairness economically and sportingly)		Groot (2009)	

	Theme		Sub-theme		Definition		Reference	
s	Injurie				Types of injuries taking place during referees' training sessions, tests and/or games			
		Injuries	Musculoskeletal		Characteristics and frequency of wounds related with the musculoskeletal system		Oliveira, Reis, & Inácio (2016)	1
			Rare Injuries		Wounds which do not occur on a very frequent basis		Cooper & Wolin (1999)	
ogy	Physiol				The study of the referees' body work and functioning outside of the match context			
			Somatotype		The structure of the body based on the combination of physical and psychological traits	(2011)	Da Silva, Fernandez, Paes, Fernandes, & Rech	
			Cardiovascular		The structure and operation of the cardiovascular system		Galanti et al. (2008)	
		Profile	Body Composition		The percentage of fat present in the body	Agueero (2014)	Casajus, Matute-Llorente, Herrero, & Gonzalez-	
			Respiratory		The performance of the respiratory muscle, based on inspiratory resistive breathing		Birinci, Yılmaz, Erkin, Şahbaz, & Aydın (2014)	
		Function	Pre-competition		A standardized medical evaluation for cardiac and/or orthopaedic risk factors realized before		Bizzini, Schmied, Junge, & Dvorak (2012)	
		Assessment	Visual Field	competition	The total area which can be seen peripherally when focusing on a central point		Delfim & de Jesus (2011)	
			Haemostatic		The process through which the flow of the blood within the blood vessels is retarded or stopped		Peat, Dawson, McKenzie, & Hillis (2010)	
		Performance	Muscular		The strength related capacities of the muscular system		Palmer, Hawkey, Smith, & Thompson (2014)	
		Resistance	Thermoregulation		The cognitive performance in adverse environmental conditions		Taylor et al. (2014)	
pment Models	Develo				Frameworks which incorporate evolving factors for a determinant outcome		Slack, Maynard, Butt, & Olusoga (2013)	

Beyond the increasing attention given to football refereeing over the past twenty-plus years, a closer examination of Table 4 also highlights that the first researched theme was Psychology, and it focused on referees' commitment (Koslowsky & Maoz, 1988). Commitment, together with personality variables, was used to differentiate between football and track and field referees. Five years later, in 1993, two other themes triggered researchers' interest. The first one was Injuries, and researchers specifically addressed referees' injuries and musculoskeletal complaints, by exploring the effect of shock absorbing heel inserts in the incidence of soreness (Fauno, Kalund, Andreasen, & Jorgensen, 1993). The second theme was Physical Performance, and researchers looked at a physiological aspect, describing the work-rate profiles of referees during football matches and recording heart-rate responses (Catterall, Reilly, Atkinson, & Coldwells, 1993). In 1996, researchers' interests focused on a new theme, Technical Performance, and they explored referees' biases in decisions caused by social pressure (Nevill, Newell, & Gale, 1996). Later, in 1999, the Injuries theme captured researchers' attention again. However, this time, researchers' interest focused on another sub-theme: rare injuries (Cooper & Wolin, 1999).

From 2001 to 2005, 36 (13.48%) studies were published in peer reviewed journals. Similarly to the previous time period (1988-2000), during this period (2001-2005), there was also a growing interest in different refereeing themes, such as Organisation (e.g., Groot, 2005), Physical (e.g., Castagna & D'Ottavio, 2001), Technical Performance (e.g., Jones, Paull, &

Erskine, 2002), and Psychology (e.g., Alonso-Arbiol, Falcó, López, Ordaz, & Ramírez, 2005). Physical performance during matches and different types of referees' biases were the most studied sub-themes.

Refereeing research, in the next 5-year period (2006-2010), doubled the publication numbers across every theme studied in the previous period, and some new sub-themes emerged, such as career development (Cobley, Schorer, & Baker, 2008), corruption (e.g., Hill, 2009a), game management (Unkelbach & Memmert, 2008), technologies (e.g., D'Orazio et al., 2009), cardiovascular profile (e.g., Galanti et al., 2008), and coping strategies (e.g., Lane et al., 2006). Beyond these *new* topics, physical performance during matches and referees' biases continued to be popular topics for researchers during this 5-year span, as these were the two most published sub-themes during this time period. Decision-making about laws of the game, mainly offside judgments (e.g., Catteeuw, Gilis, Wagemans, & Helsen, 2010), emerged during this time period, and represented the third sub-theme with a significant number of publications.

Publications in the final six years included in our review (2010-2016) doubled again when compared to the prior 5-year period. During this last period, Development Models emerged as a new theme and 54 sub-themes were studied. Among these sub-themes there were some new topics, such as job satisfaction (Gencay, 2011), sexism (Forbes, Edwards, & Fleming, 2014), nutrition (e.g., Metz et al., 2015), thermoregulation (Taylor et al., 2014), self-aggrandizement (Fothergill & Wolfson, 2015), unethical decision-making (Fruchart & Carton, 2012) and the refereeing team (Boyer, Rix-Lièvre, & Récopé, 2015). In comparison, the sub-theme physical performance during matches lost some fervour among researchers (see, Weston, 2015), while bias and decision making maintained their prior levels of research attention. Likewise, themes such as Injuries, Organisation, Psychology, Physiology, and Development Models were studied more in these six years than ever before.

In sum, some of the key findings from our review include that: (i) researchers' interests have been focused mainly on referees' physical (*n*=74) and technical performance (*n*=90), which is reflected in 61.42% of the publications; (ii) research on Physical and Technical Performance has been published uninterruptedly since 2001; (iii) referee's bias (*n*=53, 19.95%) is the most studied sub-theme; (iv) in terms of referee's decision-making (with a particular focus on laws of the game), topics such as offside calls appear to receive more attention than fouls and disciplinary sanctions; (v) technologies (*n*=7, 2.62%), corruption (*n*=5, 1.87%) and assignments (*n*=5, 1.87%) are the main published topics within the sub-theme of sports policy, while recruitment and retention are the most published topics within the (*n*=9, 3.37%) human resources sub-theme.

It is also interesting to notice that various sub-themes have been researched in different ways over the last two decades. While there are some mature sub-themes (e.g. match performance, bias/social pressure, physiology and match performance, and decision-making/offside), we found some sub-themes (e.g. burnout, well-being, professionalisation, and sexism) that are just beginning to trigger researchers' curiosity.

Table 4. Publications' evolution

	1988	1993	1996	1999	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
Technical Performance			1		1	5	1	2	4	3	8	7	4	8	9	7	7	12	8	3	90
Bias			1		1	4	1	2	3		5	5		4	5	3	5	8	5	1	53
Social Pressure			1			1			1		4	4		2	3	1	2	3			22
Home Advantage								1			1	1				1	1	3	1		9
Players							1		2					1	1	1	1	1	1		9
Successive Decisions					1	2									1						4
Nationality														1			1		1		3
Team						1		1										1			3
Close Game																			1	1	2
Decision Making						1			1	3	3	2	4	4	4	4	2	4	2	2	36
Laws of the Game						1			1	3	3	1	3	4	3	2	2	3	1	1	29
Game Management												1			1	1			1		4
Training																				1	1
Unethical Decision-making																1					1
Satisfaction																		1			1
Team																			1		1
Physical Performance		1			4	4	2	3	4	2	6	3	7	4	10	5	3	4	4	8	74
Match					4	2	1	1	2	2	5	2	4	4	5		2	1	1	1	37
Physiology		1				2	1	1					2		1	2	1	2	1	5	19
Fitness Tests									2		1	1	1		2	1				2	10
Training								1							2	2					5
Nutrition																		1	2		3
Organisation						1			1			4	4	2	4	2	2	9	7	6	42
Human Resources						1						2		1	2		2	2	5	3	18
Recruitment and Retention						1						1			1		1	1	2	2	9
Meaning																			3		3
Job Satisfaction														1	1						2
Career Development												1									1
Professionalization																				1	1
Sexism																		1			1
Training																	1				1
Sports Policy									1			2	4	1	2	2		7		2	21
Technologies													1			2		4			7
Assignements									1			1						2		1	5
Corruption												1	2	1						1	5
Refereeing Development															2			1			3
Competitive Balance													1								1
Psychology	1					1		1	2	1	1		4		2	2	2	4	5	1	27
Stress									1				2		1	1		1			6
Coping						1				1	1		1						1		5
Training								1											2	1	4
Motivation													1		1	1					3
Perceptual-cognitive																	1	2			3
Commitment	1								1												2
Anxiety																	1				1
Mobbing																		1			1
Self-aggrandizement																			1		1
Well-being																			1		1
Physiology												2	1	2	5	2	1	4	1	2	20
Cardiovascular Profile												1		1	2						4
Somatotype												1			2					1	4
Body Composition																1		1	1		3
Precompetition Assessment																1	1				2
Respiratory Function																		1		1	2
Visual Field													1		1						2
Haemostasis														1							1
Thermoregulation																		1			1
Muscular Resistance																		1			1
Injuries		1		1							1		3		3		2			1	12
Injuries and Musculoskeletal Complaints		1									1		3		3		2			1	11
Rare Injuries				1																	1
Development Models																1	1				2
Total	1	2	1	1	5	11	3	6	11	6	16	16	23	16	33	19	18	33	25	21	267

Table 5 summarizes the various sub-themes (12 out of the 54 total sub-themes) with more than six publications, representing 59.5% of all articles included in our review database. Psychology (*n*=27, 10.11%), Physiology (*n*=20, 7.47%) and Development Models (*n*=2, 0.75%) are three out of the seven themes that do not have any sub-themes with more than six publications. The database also reveals sixteen sub-themes with one publication (e.g., Johansen & Haugen, 2013), seven with two publications (e.g., Delfim & de Jesus, 2011), nine with three publications (e.g., Pope & Pope, 2015), five with four publications (e.g., Sanchez, Caballero, & Ojeda, 2010) and three with five publications (e.g., Hill, 2010). Again, this starts to *paint the picture* of the gaps existing within the football referee literature.

Table 5. Sub-themes with more than five publications

Theme	Sub-theme	n
Physical Performance	Match	37
Technical Performance	Decision Making / Laws of the Game	29
Technical Performance	Bias / Social Pressure	22
Physical Performance	Physiology	19
Injuries	Injuries and Musculoskeletal Complaints	11
Physical Performance	Fitness Tests	10
Organisation	Human Resources / Recruitment and Retention	9
Technical Performance	Bias / Home Advantage	9
Technical Performance	Bias / Players	9
Organisation	Sports Policy / Technologies	7
Psychology	Stress	6
	Total	168

Participants

Gender & Roles. As Table 6 shows, to date, the vast majority of research focused on football refereeing addresses male referees who officiate in top level games. By taking a closer look, we find that of the 267 studies included in our review, 227 (85.02%) publications focus exclusively on male referees, 66 (24.72%) focus on male assistant referees, 32 (11.99%) focus

on female referees, and seven (2.62%) consider female assistant referees. The percentages listed above exceed 100% in total, because some studies have mixed samples.

Table 6. Publications by refereeing level, gender and role

	Top					National					Regional				
	MR	FR	MAR	FAR	G	MR	FR	MAR	FAR	G	MR	FR	MAR	FAR	G
Development Models	1														
Injuries	6	1	4	2	3	4		1			3	1			
Injuries and Musculoskeletal Complaints	5	1	4	2	3	4		1			3	1			
Rare Injuries	1														
Organisation	21	2	2		2	7		1			10	6			
Human Resources	6	1	1			5		1			9	6			
Career Development	1														
Job Satisfaction	1		1								1				
Meaning	1	1									1	1			
Professionalization															
Recruitment and Retention	1					5		1			7	4			
Sexism												1			
Training															
Sports Policy	15	1	1		2	2					1				
Assignements	4														
Competitive Balance															
Corruption	5					1					1				
Refereeing Development		1	1		1	1									
Technologies	6				1										
Physical Performance	45	1	20	1	35	19	2	5		3	13	3	1	1	1
Match	26	1	9	1	28	3		1		1	4		1		1
Fitness Tests	6		3		1	5	1	1			5	1		1	
Nutrition	1		1			2					1				
Physiology	8		5		5	9	1	2		2	3	2			
Training	4		2		1			1							
Physiology	11	1	3	1		9		1			4				
Body Composition	3		1			1									
Haemostasis	1														
Precompetition Assessment	1	1	1	1											
Respiratory Function	1		1			2					1				
Somatotype	1					2		1			2				
Thermoregulation	1														
Cardiovascular Profile	1					4									
Muscular Resistance	1														
Visual Field	1										1				
Psychology	16	5	5			10	3	1			8	3			1
Anxiety	1	1													
Commitment						1					1				
Coping	3	1				3	1				3	1			
Mobbing						1	1				1	1			
Motivation	3	2	1												
Perceptual-cognitive	3		2												
Self-aggrandizement	1										1				
Stress	2	1	1			3	1	1			2	1			
Training	1					2									1
Well-being	1		1												
Technical Performance	18		18	2	38	11	3	3		2	11	1	1		
Bias	9				34	5	1			1	6	1			
Home Advantage					8						1				
Nationality	1				1										
Players	1				3	2	1			1	2	1			
Social Pressure	7				17	2					2				
Successive Decisions					1						1				
Team					2	1									
Close Game					2										
Decision Making	8		17	2	3	6	2	3		1	5		1		
Laws of the Game	5		16	2	2	4	2	3			2		1		
Game Management	2		1		1	1				1	1				
Training	1										1				
Unethical Decision-making						1					1				
Satisfaction															
Team	1		1		1										
Total	118	10	52	6	78	60	8	12		5	49	14	2	1	2

In what concerns male referees, the most studied theme is Physical Performance (*n*=45, 16.85%), and under this theme, the most studied sub-theme is match (*n*=26, 9.74%) (e.g., Ardigò, 2010), including evaluation of referee's physical activities during games. While much of the research focuses on the head referee, some researchers also address the role of the assistant referees. Here, much of the attention is given to the assistant referees' Physical and Technical Performance. Within such studies, we find researches addressing the sub-themes laws of the game (Baldo, Ranvaud, & Morya, 2002) and match (Krustrup, Mohr, & Bangsbo, 2002) sub-themes.

The popularity of studies involving assistant referees is increasing. In fact, after 2004, studies on assistant referees started to be published every year, with the main focus being on their offside calls (i.e. laws of the game sub-theme).

As we have previously mentioned, the study of female referees is scarce. Some studies included female referees in their sample (e.g., Alonso-Arbiol, Falcó, et al., 2005; Kruger, Ekmekci, Strydom, & Ellis, 2012), but conclusions were not drawn separately for female and male referees. Injuries (Bizzini, Junge, Bahr, & Dvorak, 2009a) and Technical Performance (Lex et al., 2014) were the only two themes with an exclusively female referees' sample. There is one study about Injuries (Keller, Bizzini, Feddermann, Junge, & Dvorak, 2012), with a sample based on female referees and assistant referees, and one publication about Physical Performance (Mallo, Cala, Frutos, & Navarro, 2010), exclusively on female assistant referees. Additionally, of the female referee samples, only one (e.g., Lex et al., 2014) was conducted outside FIFA tournaments.

Referee level. Nineteen (7.12%) studies lack information on the referee level. The other 248 studies examined the following sample levels: Top (*n*=158), National (*n*=31), Regional (*n*=21), Top & National (*n*=11), Top & National & Regional (*n*=10), Top & Regional (*n*=7), and National & Regional (*n=10*). Therefore, we can say that 38 studies combine different

refereeing levels, but clearly the emphasis has been towards examining refereeing within the top football levels. The first study included in this integrative review with an exclusive sample of top level referees was conducted by Nevill et al., (1996). Three years later, Cooper and Wolin (1999) published the second study, which focused on injuries. After 2001, studies involving top-level referees were published yearly. Overall, 41 sub-themes were studied with top-level referees.

However, this does not mean that research has not examined National or Regional referees. Studies with exclusively regional referees' samples started in 2001 (Plessner & Betsch, 2001) and, except for 2004 (with no publication), and 2011 (with three publications), in every other year, one or two studies were published. Fourteen sub-themes, from 5 themes (Injuries, Organisation, Physical Performance, Psychology and Technical Performance) were studied with regional referees' samples. National referees were exclusively studied in sixteen sub-themes, from all themes, except Development Models. These studies started to be published in 1988 (Koslowsky & Maoz, 1988), then in 1993 (Fauno et al., 1993), and regularly (one or two studies per year) since 2003. Five studies were published in 2011, 2015, and 2016.

Concerning articles with mixed levels samples, the first study was published in 2002 and was about recruitment and retention (Marrero Rodríguez & Gutiérrez Ascanio, 2002). Since then, except in 2003, 2006 and 2010, studies were published yearly, and, over these years, 23 sub-themes were studied. Unethical decision-making (Fruchart & Carton, 2012) was the only sub-theme where the study sample did not address top-level referees.

Research Methodology

Quantitative methodologies are the most frequently used techniques for football refereeing research. There are 213 (79.78%) publications using a quantitative approach, while 48 (17.98%) use qualitative methods, and six (2.25%) combine qualitative and quantitative

methodologies. The only theme without quantitative studies is Development Models. All studies in Physiology used quantitative approaches (e.g., Casajús et al., 2016; Ghasemi, Momeni, Rezaee, & Gholami, 2009) but Physical Performance (e.g., Weston et al., 2011) and Technical Performance (e.g., Drummond, Drummond, & Silva, 2014) are the main contributors to this methodology with 67 and 78 studies, respectively.

Qualitative research was used in all themes except Physiology. Organisation (e.g., Brackenridge, Pitchford, & Wilson, 2011; Kim & Hong, 2016) was the theme with most of the studies (*n*=22) being conducted using a qualitative methodology. The first qualitative study in this integrative review was about rare injuries (Cooper & Wolin, 1999). Three years later, two studies about referees' biased decisions were published (Mascarenhas, Collins, & Mortimer, 2002; Plessner & Betsch, 2002), and since 2005, with the exception of 2010, qualitative research has been regularly published. Nevertheless, 50% of published studies with qualitative methodologies occurred between 2014 and 2016, which demonstrates the increasing trend toward this approach in recent years.

Publications with mixed methods started to be published in 2009 by Hill (2009a) and Hill (2009b), and the sub-theme studied was corruption. This topic was also studied by Hill (2010) and by Bezerra and Teixeira-Diniz (2016). Recruitment and retention (Brackenridge et al., 2011) and training (Gulec & Yilmaz, 2016) were two other sub-themes that combine methodologies in their approach. In contrast to quantitative and qualitative studies, theoretical studies are scarce, with only a few exceptions (e.g., Hancock et al., 2015; Lane et al., 2006, Plessner & Haar, 2006).

Geographical Context

Research on refereeing has been done in UEFA (*n*=15, 5.62%), FIFA (*n*=30, 11.24%), and 32 different countries, mainly from Europe. More specifically, research has been conducted mostly in England (*n*=48, 17.98%), followed by Spain (*n*=27, 10.11%), and Italy (*n*=24,

8.99%). Outside of the European continent, Brazil (*n*=21, 7.87%) contributes the most to the football refereeing research domain. Furthermore, 29 (10.86%) publications did not mention where the studies took place.

Since there are 24 countries where five or fewer studies were conducted (e.g. Croatia: *n*=1; Austria: *n*=2; Switzerland: *n*=3; Iran: *n*=4 and Portugal: *n*=5), we decided to present a distribution of the most studied themes and sub-themes in countries with more than 10 publications, which represent 82.4% of the dataset (Table 7). From the 54 sub-themes, only six (rare injuries, competitive balance, haemostasis, muscular resistance, anxiety, and commitment) are not included in this distribution.

By taking a closer look at Table 7, we may say that:

(i) Technical Performance is the only theme studied in all countries;

(ii) Organisation and Physical Performance are studied in 9 countries each. There are no studies about Organisation in Belgium, and Physical Performance in Germany;

(iii) England has publications in all themes except Injuries; and

Psychology is not studied in FIFA and only has one publication in UEFA; referee's bias is more studied (*n*=53, 19.85%) than decision making (*n*=33, 12.36%); Physiology (*n*=17, 6.87%), Injuries (*n*=5, 1.87%) and Development Models (*n*=1, 0.37%) are the least explored themes.

Table 7. Publications by country

	England	FIFA	Spain	Italy	Brazil	Germany	Turkey	UEFA	Belgium	France	Total
Development Models	1										1
Injuries		3			2						5
Injuries and Musculoskeletal Complaints		3			2						5
Rare Injuries											0
Organisation	9	4	2	4	1	2	4	2		2	30
Human Resources	7	1	2		1	2				2	15
Career Development						1					1
Job Satisfaction							2				2
Meaning	1										1
Professionalization					1						1
Recruitment and Retention	3		2			1				2	8
Sexism	1										1
Training		1									1
Sports Policy	2	3		4			2	2			13
Assignements		1		2			1	1			5
Competitive Balance											0
Corruption				1				1			2
Refereeing Development	2						1				3
Technologies		2		1							3
Physical Performance	12	11	9	14	8		2	4	1	2	63
Match	8	7	1	1	4		1	2			24
Fitness Tests		1	4	3				1			9
Nutrition			1							1	2
Physiology	2	3	3	2	4		1	1		1	17
Training	2			1					1		4
Physiology	1	2	6	1	6		1				17
Body Composition			2		1						3
Cardiovascular Profile			3	1							4
Haemostasis											0
Muscular Resistance											0
Precompetition Assessment		2									2
Respiratory Function			1				1				2
Somatotype					4						4
Thermoregulation	1										1
Visual Field					1						1
Psychology	4		3		3		4	1		3	18
Anxiety											0
Commitment											0
Coping	2									2	4
Mobbing							1				1
Motivation					1					1	2
Perceptual-cognitive					1		2				3
Self-aggrandizement	1										1
Stress			1		1		1				3
Training	1		1					1			3
Well-being			1								1
Technical Performance	21	10	7	5	1	16	4	8	12	5	89
Bias	18	2	4	4	1	13	2	8		1	53
Close Game	1		1								2
Home Advantage	4				1	2		1			8
Nationality	1		1	1		1		2			6
Players	2	1				4	1	1		1	10
Social Pressure	10		2	3		4	1	4			24
Successive Decisions						2					2
Team	1	1									2
Decision Making	3	8	3	1		3			12	3	33
Laws of the Game	2	8	2			1			12		25
Game Management	1		1	1		2				2	7
Satisfaction							1				1
Training							1				1
Unethical Decision-making										1	1
Team										1	1
Total	48	30	27	24	21	18	15	15	13	12	223

Discussion and Conclusions

The aim of this integrative review was to categorise the existing theoretical and empirical research regarding football refereeing. More specifically, it aimed at providing a comprehensive understanding of the current state of football refereeing research and suggesting a research agenda for this literature stream to explore in the coming years.

Researched (Sub)Themes and Their Evolution: Is There Something Else to Explore?

The growth of published articles and the emergence of new topics indicate that research on football refereeing is flourishing. In fact, in the last decade, we noticed the emergence of themes like Development Models, Injuries, Organisation, Physiology and, even, Psychology. The number of sub-themes with less than three publications is 32, which means that more research on particular topics of football refereeing is needed to provide a broader understanding of this area (see, Cleland, O'Gorman, & Bond, 2015).

Technical Performance. In this integrative review, Technical Performance (*n*=90, 33.71%) is the most studied theme. The number of publications focusing on referee's bias (*n*=53, 19.85%) is almost equal to the number of publications on Organisation (*n*=42, 15.73%) and Injuries (*n*=12, 4.59%), and greater than the number of publication on Psychology (*n*=27, 10.11%) and Physiology (*n*=20, 7.49%). There is no doubt that it is relevant to know what is biasing the referees' judgments (e.g., Dohmen & Sauermann, 2015) in order to better deal with this problem and improve performance. Interestingly, even though the topic of referee bias is popular (e.g., Krenn, 2013; van de Ven, 2011; Wagner-Egger, Gygax, & Ribordy, 2012), few authors make any proposals on how to solve this problem (e.g., Boyko, Boyko, & Boyko, 2007; Nevill, Webb & Watts, 2013; van Quaquebeke & Giessner, 2010).

Based on the insights we gained through this integrative literature review, we believe that in order to improve referees' technical performance, it would be advisable to:

(i) analyse referees' bias research and propose pragmatic solutions to minimise this bias effect (e.g., Prüßner & Siegle, 2013);

(ii) understand the refereeing team (4th referee, assistant referees, and additional referees), their communication and coordination process, their collective decision making, their individual and collective objectives, among many other aspects and, above all, how these aspects influence referees' decision-making. Intriguingly, even though there is a wealth of evidence suggesting it is important to understand the dynamics of teams in different settings (e.g. Mathieu, Maynard, Rapp, & Gilson, 2008), we believe there is not sufficient research examining teamwork within the context of football referees: based on this integrative review there is only one study which focuses on the entire refereeing team (Boyer et al., 2015);

(iii) understand technologies' effect (audio communication, video referee, among others) on the decision-making process, since that there have been several technological advancements incorporated into the work of football refereeing (see, Dohmen & Sauermann, 2015);

(iv) explore how to improve decision-making training, at different refereeing levels. While some authors have already made some proposals (e.g., Catteeuw, Gilis, Jaspers, Wagemans, & Helsen, 2010; Put, Wagemans, Jaspers, & Helsen, 2013; Put, Wagemans, Spitz, Williams, & Helsen, 2016) others (e.g., Catteeuw, Helsen, Gilis, & Wagemans, 2009; Mascarenhas et al., 2009) recognise the inception stage of this research topic; and

(v) understand and quantify the importance of the referee's game knowledge, emotions, deliberation, and the game's scouting on his/her decision-making process (see, Samuel, 2015).

Physical Performance. Behind Technical Performance, Physical Performance is the second most studied theme (n=74; 27.72%). Weston (2015, p. 115) argues that "Over the past two decades, sports science has evidenced the high demands imposed on football referees during match play, factors influencing these demands and the potential for physical and perceptual-cognitive training to improve match performance. However, given the abundance of descriptive accounts within the current literature it may be fair to conclude that sports science has exhausted this evaluative aspect of referee performance." Based on our integrative review, the match sub-theme (n=37, 13.86%) represents fifty percent of the publications included in the Physical Performance theme. However, it appears that interest in this topic is decreasing, given that since 2011 only five publications were found in this integrative review dataset.

Weston (2015) claims that match performance is a widely studied theme, nevertheless, as we were able to ascertain, most of that research is mainly addressed at Top level male referees. Therefore, this topic may not be as exhaustively covered in terms of other levels and genders of referees. Nevertheless, the Physical Performance theme, besides the sub-theme match performance, integrates four other sub-themes such as fitness tests (*n*=10, 3.75%), nutrition (*n*=3, 1.12%), training (*n*=5, 1.87%), and physiology (*n*=19, 7.12%) that need further researchers' attention. We believe that physical match performance results from a combination of different factors such as training, nutrition, physiology, but also psychological well-being, motivation, among others, and research should take these into consideration. Therefore, in order to improve the referees' and assistant referees' physical performance (see, Weston, 2015), we suggest future research to:

(i) extend studied populations to include female and assistant referees from different levels. We believe that broadening the samples included is imperative since the presence of female referees across various levels is increasing, and research has

yet to understand the impact of such a trend. In this integrative review, only two studies were conducted with female referees (Mallo, Veiga, López de Subijana, & Navarro, 2010) and female assistant referees (Mallo, Cala, et al., 2010);

(ii) explore the relationship between physical performance in different organisational contexts (amateurs and professional referees) and different constraints such as rest, travelling, nutrition, medical support, number of games, and physical tests, among others, in order to better understand the role that these factors have on referee performance (see, Mallo et al., 2009);

(iii) understand the referees' and assistant referees' training process across gender, level, and age (see, Castillo, Yanci, Cámara, & Weston, 2016; Weston, Helsen, Macmahon, & Kirkendall, 2004). Should referees from different levels and age groups train together, and should they have different training session designs? Is it possible to differentiate training, considering facilities and technical assistance? By examining these questions, the various governing bodies that are responsible for training referees will have a better understanding of factors that may impact the efficacy of training programs (see, Oliveira et al., 2016);

(iv) analyse fitness tests according to refereeing level and age (see, Castillo, Yanci, Casajús, & Cámara, 2016); and

(v) explore nutrition's effect on fitness tests, training, and match performance (see, Reilly & Gregson, 2006; Reñón & Collado, 2014; Teixeira, Gonçalves, Meneses, & Moreira, 2014).

Organisation. Aspects linked to managing refereeing from the perspective of the entities that coordinate this sector (UEFA, FIFA, and National Federations) have begun to be of interest to researchers. Since 2008, 39 out of 42 (15.73%) studies have been published in the theme we called Organisation. Of these, 22 were published in the most recent 2-year period

included in our review (2014-2016), which may signal a real concern about aspects which are not directly linked to performance in the game but have a considerable impact on referees and in their performance. This Organisation theme was divided in human resources (*n*=21, 7.87%) and sports policy (*n*=21, 7.87%) sub-themes.

The human resources sub-themes includes *old* issues such as recruitment and retention (*n*=9; 3.37%), which is a big problem in some countries (see, Cleland et al., 2015; Wicker & Frick, 2016), and emergent topics on refereeing like career development (*n*=1, 0.37%), job satisfaction (*n*=2, 0.74%), professionalisation (*n*=1, 0.37%), and training (*n*=1, 0.37%). In terms of sports policy, the major sub-themes belong to emergent topics, such as technologies (*n*=7, 2.62%), assignments (*n*=5, 1.87%), and corruption (*n*=5, 1.87%) – with each of these topics being related to game fairness.

The sociological and economic impact of football is obvious. Referees are receiving ever more attention, and their role is gaining importance. Moving from amateur referees to professional referees (e.g., England, Portugal) will bring about a change in the very structure of the Refereeing Organisations (see, Webb, 2014a; Webb, Dicks, Thelwell, & Nevill, 2016). Therefore, we believe that future football refereeing research should focus more on the Organisation theme and, in particular, on the professional sub-theme, since currently little is known about these topics, and the role of the refereeing governing bodies on them.

Therefore, we propose that future research is developed to:

(i) characterise refereeing organisations. It is worth remembering that refereeing structures in different countries and regions can have different dimensions (number of teams, games, referees), with different problems, working with different objectives, with more or less efficacy. With few exceptions (e.g., Webb, 2014a), little is known about National and Regional refereeing structures or about people who work there and manage a considerable number of referees, assistant referees,

trainers, and observers from football, futsal and/or beach football. We believe this knowledge could be very informative to National Federations and Regional Associations;

(ii) identify and evaluate national training programmes. The need for higher investment in training referees and their development is recognised by different authors (Catteeuw, Gilis, García-Aranda, et al., 2010; Webb, Dicks, Thelwell, & Nevill, 2016; Weston et al, 2012) but, with few exceptions, research has not provided an effective solution to this problem;

(iii) promote a recruitment and development model in order to help regional associations to better recruit and maintain referees. This is important in a variety of countries where recruiting and retaining referees is problematic. It may also shed light on whether recruiting and retaining practices need to be changed, according to the different levels of referees (see, Brackenridge et al., 2011; Wicker & Frick, 2016);

(iv) analyse and evaluate refereeing training (see, Webb, Dicks, Thelwell, & Nevill, 2016) and refereeing trainers, in order to propose training programmes targeted at referees, observers, trainers and managers; and

(v) develop and evaluate programmes like the "Respect Programme" which seeks to promote respect among players, coaches, officials, referees, and supporters (see, Brackenridge et al., 2011).

Psychology. According to González-Oya & Dosil (2004) and Collina (2004), referees' success depends on the appropriate combination of physical, technical, tactical, and psychological preparation. As highlighted above, there has been substantial work on the areas of Physical and Technical Performance. However, not the same level of emphasis was placed on the psychological aspects of referees and assistant referees (Weston et al., 2012) – i.e. the

Psychology theme (*n*=27, 10.11%). In fact, research has been dispersed over the years, and across ten different sub-themes. For example, in UEFA there is only one study about Psychology (Samuel, 2015), while under the scope of FIFA none has been published yet.

To further develop psychological research, Samuel (2015) introduces several suggestions that researchers should take into consideration, such as stress-management techniques, coping, imagery, how to deal with wrong decisions or self-control. To extend these contributions, we challenge researchers to increase studies on sub-themes like anxiety, commitment, mobbing, motivation, perceptual-cognitive and well-being, or resilience, attention, focus, self-confidence, and rumination (e.g., Poolton, Siu, & Rich, 2011). More specifically, we suggest that future research in this area should:

(i) develop models of football referee performance that include a full array of psychological factors, so that researchers can better understand the relative importance psychological factors may play on the performance of referees and assistant referees (see, Brandão, Serpa, Rosado, & Weinberg, 2014; Mallo, Frutos, Juárez, & Navarro, 2012; Samuel, 2015); and

(ii) collect best practices from other sports in order to identify profiles of individuals who excel in difficult contexts and propose psychological programmes to the different referees' level (see, Louvet, Campo, & André, 2015).

Physiology & Injuries. Studies on Physiology (*n*=20, 7.49%) or Injuries (*n*=12, 4.49%) were published consistently since 2008 but they are still insufficient to give us a precise knowledge of these areas. Therefore, we suggest that future research could:

(i) extend studies to other countries, since the existing publications are mainly conducted in Brazil, Switzerland, Spain, and on FIFA. Therefore, we cannot be assured that these results may translate to other areas where recovery from injuries may be different, and where physiological differences may alter the results of

such research (see, Barberó-Álvarez, Boullosa, Nakamura, Andrín, & Weston, 2014; Bizzini, Junge, Bahr, & Dvorak, 2011; Casajus & Gonzalez-Agueero, 2015);

(ii) investigate the specific predictors of injuries among referees, as suggested by Gabrilo, Ostojic, Idrizovic, Novosel, & Sekulic (2013);

(iii) propose programmes to reduce injuries obtained during physical tests and training sessions (e.g., Oliveira et al., 2016); and

(iv) help FIFA implement a research project to characterise (somatotype, body composition, and cardiovascular profile) referees and assistant referees from different countries, at different levels, and to propose nutrition and training programmes to improve referee's performance and health (see, Casajús, Matute-Llorente, Herrero, Vicente-Rodríguez, & González-Agüero, 2016).

Development Models. In terms of specific Development Models for football referees and assistant referees, integrating the different areas related to performance, the database analysed only includes two studies (Slack et al., 2013; Weston et al., 2012), which is less than 1% of the research published about refereeing. Therefore, it is important and urgent to develop models that allow referees and assistant referees to achieve satisfactory performance levels more quickly (see, Weston et al., 2012), and more efficiently raise the desired performance levels to excellence. In particular, we propose the development of models in areas such as:

(i) Talent and expertise – in particular, trying to ascertain how certain referee skills (either physical skills or skills related to rule knowledge) may influence development patterns (see, Gilis, Helsen, Catteeuw, & Wageman, 2008; Ghasemi, Momeni, Jafarzadehpur, Rezaee, & Taheri, 2011; MacMahon et al., 2007);

(ii) Shared mental models (see, MacMahon et al., 2014, pg. 137) and, more specifically, the role of shared mental models on team performance and whether

team prior interactions and/or pre-game activities may assist with the creation of shared mental models within referee teams (Mohammed, Ferzandi, & Hamilton, 2010);

(iii) Decision making (see, Bar-Eli, Plessner, & Raab, 2011, pp. 29-49) – in particular, whether referee decision making abilities are enhanced over time, and what interventions can be employed to enhance the development of referees' decision-making abilities;

(iv) Communication (see, Cunningham, Simmons, Mascarenhas, & Redhead, 2014; MacMahon et al., 2014; Mascarenhas et al., 2005) and team communication (De Vries, Van den Hooff, and de Ridder, 2006) – in particular, it might be interesting to study the actual communication among team members using the technology-enabled communication channels and whether more (and certain types of) communication are more/less beneficial for referee team performance, and whether such communication within the team changes over the course of a given match or over the season as referee team members work together in multiple matches; and

(v) Team leadership (see, McEwan & Beauchamp, 2014; Zaccaro, Rittman, & Marks, 2002) and self-leadership (Manz & Sims, 1987). In particular, what impact the head referee has on the other team members' performance and development.

Research Participants: Should We Pay Attention to Someone Else?

As described previously, our integrative review of the football refereeing literature has categorised the research domain in terms of gender (male or female); level (top, national or regional); and role (referee, assistant referee, observer, trainer or candidate).

Concerning gender, as FIFA, UEFA, and some national football federations (e.g., Portugal) promote different programs to develop women's football, and since women referees and assistant referees participate in important tournaments (just as male referees do), it is

imperative to better understand the way research can help to develop female refereeing. Knowing that sample size can be a real problem for researchers, we suggest that future research:

(i) replicates studies conducted with male samples in order to evaluate gender differences (see Kim & Hong, 2016; Mallo, Cala, et al., 2010; Pollard & Gómez, 2014);

(ii) considers, in upcoming studies, the inclusion of female referees' samples that can be statistically representative of the studied population (see, (Alonso-Arbiol et al., 2005; Bizzini, Junge, Bahr, & Dvorak, 2009; Delorme, Radel, & Raspaud, 2013); and

(iii) examines whether male and female referees cooperating in a team play an important role on referee performance (see, Forbes, Edwards, & Fleming, 2014; Samuel, 2015). Likewise, it may be fruitful to examine if the gender of the referee has an influence on particular refereeing roles (i.e. whether it matters if the assistant referee is a male or a female; or if the head referee is a male or a female).

This integrative review also reveals that research is mainly about top level male referees and assistant referees. This would not be a problem if results could be generalised at national and regional levels. But, this is not possible due to several issues such as referees' age, experience, development or role.

Mascarenhas and colleagues (2005) mention that there is a lack of published empirical research that validates and defines expertise in refereeing. Weston and colleagues (2012) also emphasise the need to understand the differences between expert and non-expert referees and suggest that there are too little published studies for that purpose. In fact, this integrative review shows 10 (3.75%) studies that combine Top, National and Regional sample levels (e.g., Bartha, Petridis, Hamar, Puhl, & Castagna, 2009) and 27 (7.49%) studies that combine sample levels

as Top and National (e.g., Castagna, Bendiksen, Impellizzeri, & Krustrup, 2012) or National and Regional (e.g., Delorme et al., 2013). Even so, some of these studies (e.g., Fruchart & Carton, 2012; MacMahon, Helsen, Starkes, & Weston, 2007; Voight, 2009) do not draw separate conclusions, usually due to reduced sample size.

Some of the articles analysed in this integrative review are not clear when authors report participants' levels. It is, sometimes, difficult to compare information among studies or even understand what authors mean (see, Mallo, Aranda, & Navarro, 2007). Concerning refereeing' levels we found different categories, such as "experienced male referees" (Krenn, 2013, p. 223); "They had refereed across various levels of DFB (i.e. German Football Association) leagues, such as men's (fourth to ninth league) and women's (first to third league) football." (Lex et al., 2014, p.3); "qualified referees from the North Staffordshire Referees Club in England …ranging from newly qualified referees to 43 years of refereeing experience." (Nevill, Balmer, & Williams, 2002, p. 265); "They had refereed across various levels of DFB leagues (depending on their age), with a minimum experience of two years." (Unkelbach & Memmert, 2010, p.9).

Regarding level sampling we suggest future research to:

i) adopt a consistent refereeing sample level such as Top (international and professional leagues) (see, MacMahon et al., 2007), National and Regional (see, Hancock et al., 2015); and

ii) include, as much as possible, referees and assistant referees across levels (Top, National, and Regional) in order to compare results and draw conclusions that can help each level develop (see, Alonso-Arbiol et al., 2005; Louvet et al., 2015).

In addition to our suggestions of focusing on the level of football referees, authors such as MacMahon and colleagues (2007), Catteeuw, Helsen, Gilis, & Wagemans, (2009), Castagna, Bendiksen, Impellizzeri, & Krustrup, (2012) and Pietraszewski, Maszczyk and

colleagues (2014) mention also the specificity of the roles of referees and assistant referees at different levels. As seen in this integrative review, there are (n=11, 4.12%) studies exclusively focused on assistant referees, with most of these emphasizing the sub-theme laws of the game (i.e. off-side judgments). Comparative studies between referees and assistant referees with intragroup conclusions are scarce (n=19; 7.12%) and focus mainly on themes like Physiology (n=3; 1.12%), Physical Performance (n=8; 3.00%), and Injuries (n=4; 1.50%).

Our suggestions on role sampling are to:

(i) amplify the number of studies that take into consideration role specificity. It is worth mentioning that at National but mainly at Regional level, it can be difficult to study role specificity since referees and assistant referees often interchange roles. Distinction between the central referee operating on his/her own and the central referee performing as part of a team of 3 (or more), distinction between a football referee that also performs as a futsal (or even beach football) referee, or distinction between an assistant referee that also performs as a referee, among other possibilities, could be relevant (see, Louvet et al., 2015);

(ii) consider other refereeing team members, such as the 4th referee and the additional referees (see, Barbero-Alvarez et al., 2012; Boyer et al., 2015); and

(iii) reflect about other relevant functions such as the referees' coach (see, Webb, Dicks, et al., 2016), the referees' observer (see, Fruchart & Carton, 2012) or the referees' trainer.

Research Methodology: How Much Further Can We Go?

Sport is, traditionally, a field where quantitative methods are commonly used. This integrative review shows that football refereeing research follows this methodological approach. Nevertheless, the emergence of new themes, the need to further understand some

phenomena, and the existence of some journals that promote and encourage new methodological approaches, may have contributed to the emergence of new methodologies in football refereeing research.

Different authors used qualitative methodologies in their studies (e.g., Slack, Maynard, Butt, & Olusoga, 2015; Webb & Thelwell, 2015) and others have called for a greater emphasis on qualitative research (Castagna et al., 2012; Fothergill & Wolfson, 2015; Parsons & Bairner, 2015) or mixed methodologies (Coulomb-Cabagno, Rascle, & Souchon, 2005; Lane et al., 2006; Poolton, Siu, & Rich, 2011). Therefore, we just reiterate these authors' suggestions that researchers should base their methodological decisions on the research question that they are interested in, as certain methodologies may be better suited for certain questions as compared to other methodologies.

Geographical Context: How Far Should We Go?

Football is a cultural sport. We may forget that because, in general, people consume international tournaments and their own domestic competitions. Being the same game, it is played in different ways, at different levels. Matches played in Premier League, Bundesliga, La LIGA, Ligue 1, just to mention some European leagues, are played in different contexts, with different players, etc., and are necessarily different. Similarly, refereeing, even under the same laws, is necessarily different (see, Webb & Thelwell, 2015). According to our integrative review, 82.4% of the dataset publications were conducted in 8 countries, plus UEFA and FIFA. Our results also show that in 24 countries there were five or less studies (e.g. Croatia: n=1; Austria: n=2; Switzerland: n=3; Iran: n=4; and Portugal: n=5). This raises the question of how can research results be generalised, especially to countries such as those, where so little research has been conducted.

Given these findings and the role of cultural context (see, Dell et al., 2014; Webb, Wagstaff, Rayner, & Thelwell, 2016; Tiryaki, 2005), we strongly suggest, as other authors do (e.g., Johansen, 2015; Casajus & Gonzalez-Agueero, 2015; Wicker & Frick, 2016), that researchers replicate football refereeing studies across cultures or in cultures that have heretofore not been examined. By doing so, in ten years, not only football refereeing research could be flourishing, but also, we would better understand the impact of culture on such research. This would be essential to enable research within this literature stream to ascertain if it can be generalised across cultural boundaries, or if some research findings may only apply to a given culture.

An Integrative Review on Football Refereeing: Final Comments

Systematic research on football refereeing has been increasing but this is a relatively recent phenomenon. This review shows that 82.40% of the studies that address football refereeing have been published in the last decade. Despite the growing diversification of research areas, most of the published research is focused on Physical and Technical Performance, which account for over 61.42% of the studies. It is clear that research on the development of referees' skills is scarce when compared to that of the players (Catteeuw, Helsen, Gilis, & Wagemans, 2009). According to Mascarenhas and colleagues (2006) and Catteeuw, Helsen, Gilis, and Wagemans (2009), this research area (Development) appeared in the past 10 years, so it may be argued that it is still in an inception stage, which might account for the lack of conceptual models integrating the different areas of refereeing.

This review also points out that there is a growing interest in football refereeing and that this interest includes various authors drawn from different fields. We are aware that the categorisation of studies, while sustained in the published research, may allow for different interpretations. However, it is a first contribution to the *organisation* of the existing literature.

We believe that there are few solid research lines and insufficient theoretical models for the development of football refereeing.

Nonetheless, it is clear that some themes have been studied extensively, such as Physical and Technical Performance and, in particular, bias or match physical performance sub-themes. However, our review also identified a great number of other topics that need more attention. Specially, it appears fruitful for future research to consider themes such as: Psychology (e.g. referees' emotions, team emotions), and Organisation (e.g. professionalisation, recruitment and selection, career development). Likewise, we found it interesting to note the lack of research that has accounted for the fact that referees work in teams. Thus, we believe that future research should consider topics such as refereeing team management, as this certainly shapes referees' and assistant referees' performance. For example, refereeing has become a team activity, initially composed by three individuals, then increased to four and, more recently, to six. However, based on our review, there is currently only one study that has examined the leadership practices of the referee (Webb, Wagstaff, Rayner, & Thelwell, 2016), suggesting that it may be valuable for future refereeing researchers to explore whether the leadership practices and behaviours of the referee alters the communication, the coordination, and the affective, emotional and cognitive processes that occur within the team.

Furthermore, we suggest that future football refereeing research should take into account the specialisation of the different functions performed by referees and assistant referees, the role of gender, the selection processes used in picking referees, as well as the practices used to retain, train, and evaluate football referees. It is also significant to carry out studies with representative samples of the different refereeing levels (Top, National and Regional) and to draw conclusions concerning the respective levels. The path from the bottom to the top, or the path to excellence, is of special interest for young people starting their careers

within the refereeing profession. If there is a kind of excellence refereeing GPS, it should be widely implemented in order to reduce the time that referees take to achieve this level (see, MacMahon et al., 2007).

Regarding the external reliability of studies, it would be important to reproduce studies carried out within the context of FIFA or UEFA, or countries like England, Italy, Spain or Brazil, to validate the respective conclusions. Likewise, it is essential for future researchers to more precisely define their research samples, so that best practices from one context may be applied in other contexts. Unfortunately, as we were able to find in our review, there are many studies that do not state the country where their sample was drawn, or the categories of the participants. Additionally, there are many instances where the samples are not described in enough detail to allow for a clear conclusion if the findings could be applied to referees, assistant referees, male vs. female referees, or to those engaged in various levels of football refereeing.

Along these lines we have tried to provide a detailed review of the currently existing football refereeing literature and highlight a number of areas that are in need of attention by future researchers in this field. In particular, we tried to suggest research opportunities in each of the research themes that were identified as lacking in our review of the literature. Our hope in mentioning these research opportunities is that we can help research on football refereeing to address areas that may have been overlooked thus far, and maybe provide directions for future research to further strengthen work focused on football refereeing. Our ultimate hope is that our contribution may help in continuing the improvement of the wonderful sport of football.

Study 2: Striving for excellence: Improving performance in elite soccer referees

Abstract

The professional football industry is highly competitive and therefore requires exceptional performance from all participants, including referees. However, literature related to football refereeing excellence is very scarce. Thus, the aim of this study was to identify, categorise and analyse the distinctive characteristics of top level referees that excel, compared to those that, under similar circumstances, do not achieve excellent results. For that purpose, 24 semi-structured interviews were conducted with experts in football and football refereeing, providing an "inside" (i.e. referees, assistant referees and coach/managers) and an "outside" (i.e., technical and physical coach, observers, journalists) perspective of the game. Ninety-three subcategories (e.g., leadership, resilience, game reading) and 1833 units emerged from the data analysis process and were grouped into seven themes. Participants' responses concerned Individual characteristics (82.00%), Group characteristics (14.02%), and Organisational characteristics (3.98%). These results, in addition to identifying several characteristics that appear to shape a referee's performance level (and distinguish them as either good or excellent), highlight whether the characteristics emerge from the individual referee themselves, or are attributable to team or organisational factors. Our findings also identify areas which have not been adequately considered within football refereeing literature.

Keywords: football, referees, performance, excellence

Introduction

Finding ways to enhance individual performance is paramount across almost every facet of life. For example, almost every company is focused on ways to improve employees', as well as managers' performance, and governance, hoping at enhancing overall organisation performance (e.g., Cavallo, 2006; Collins, 2001; Elder & Miller, 1995; Jong & de Ruyter, 2004; Miller Burke & Attridge, 2011). However, this focus on identifying ways to enhance individual performance is not limited to for-profit organisations. For instance, as a result of competition, enhancing teacher performance is a relevant consideration within the education sector (e.g., Westerberg, 2009).

The sports industry is also highly competitive and therefore requires exceptional performance (e.g., Khan, Ahmed, & Abid, 2016; Orlick & Partington, 1988; Yarrow, Brown, & Krakauer, 2009). Within this micro level study (De Bosscher, De Knop, Van Bottenburg, & Shibli, 2006), we examine multiple factors that shape the performance levels of professional football referees. Although there seems to be a consensus regarding the importance of physical (e.g., Castillo, Yanci, Casajús, & Cámara, 2016), technical (e.g., Lex, Pizzera, Kurtes, & Schack, 2014), tactical (e.g., Mascarenhas, O' Hare, & Plessner, 2006), and psychological training (e.g., Samuel, 2015) to achieve excellent performances, research is in its infancy and still reveals little knowledge about the characteristics of an excellent referee (Aragão e Pina, Passos, Araújo, & Maynard, 2018). Instead, much of the work considering football referees conducted thus far has primarily focused on factors that may enable someone to attain the performance level needed to become a top-level referee. In contrast, little is known about what distinguishes an average professional referee from an excellent professional referee (i.e., super-elite-level soccer referee, as called by Castagna, Abt, D'Ottavio, & Weston, 2005). Therefore, our aim with this study was to identify and categorise the distinctive characteristics of top-level referees that excel compared to those under similar circumstances (i.e., being in the same

national or international category; being regulatorily able to be promoted) that do not achieve excellent results.

Theoretical background

Football importance and the urgency of the refereeing excellence performance

Considered by several authors as the most popular sport in the world (Alarcon, Duran, & Guajardo, 2014), football (or "soccer", or association football) triggers passions and moves crowds all over the world (Giulianotti & Robertson, 2004). In 2006, according to Ardigò (2010), there were 270 million people actively involved in soccer and the estimated TV audience for the 2006 FIFA World Cup was 3.2 billion people (FIFA.com, 2006), which illustrates the global involvement with football.

Economically, football is considered a business (Rickman & Witt, 2008) or an industry (Scoppa, 2008) with enormous financial rewards (e.g., KPMG, 2016). For example, it was estimated that the 2014 World Cup FIFA revenue was 4 billion dollars (AFP, 2013) and the total prize money offered for the tournament increased by 37.00% (i.e., US$576 million) compared to the 2010 World CUP (Svantesson, 2014). While this popularity provides economic growth and social and football development opportunities (Fédération Internationale de Football Association, 2015), football is facing challenges such as corruption (Boeri & Severgnini, 2008), match fixing (Hill, 2009), violence (Van Der Meij et al., 2015), and racism (Wagner-Egger, Gygax, & Ribordy, 2012).

Referees' performance may also influence the course and outcome of a football match (Fruchart & Carton, 2012), and has a vital impact on promotions, relegations or qualifications to tournaments, which may represent millions of dollars (Helsen, Gilis, & Weston, 2006). For instance, the 2014 World Cup was controversial due to several refereeing errors that impacted the results of numerous matches (Svantesson, 2014).

According to Aragão e Pina et al., (2018), several measures (e.g., goal line technology, Video Assistant Referees (VAR), increasing the number of referees per game; professionalisation) were implemented by governing bodies, such as the Federation International Football Association (FIFA), the Union of European Football Association (UEFA) or the International Football Association Board (IFAB), to ensure the consistency and accuracy of the referees' decisions (Dawson, Dobson, Goddard, & Wilson, 2007), and, consequently, the integrity of matches (Helsen & Bultynck, 2004).

There are numerous factors that put pressure on referees to perform better and better. As previously mentioned, these include the financial and social impact of this sport and the resulting pressure to ensure justice and/or fairness (Slack, Maynard, Butt, & Olusoga, 2013). Additionally, more and more matches are being broadcasted (FIFA.com, 2006) and as a result, referees and their in-match decisions are under greater scrutiny (Johansen, 2015; Webb, 2016). Likewise, referees' performance is evaluated for each match and they need to have good marks to be reappointed and maintain their position in the top leagues (Yavuz, Inan, & Fiğlali, 2008; Sutter & Kocher, 2004) and/or progress in their career (Kellett & Warner, 2011). Given the importance of the football referee (Gulec & Yilmaz, 2016; Wicker & Frick, 2016), research has started to explore what shapes the performance of referees (MacMahon, Helsen, Starkes, & Weston, 2007; Mathers & Brodie, 2011; Webb, 2017). However, there are some questions that remain unanswered within this domain of football refereeing, such as game preparation, leadership, team composition, team efficacy, and team mental models, among many other topics (Aragão e Pina et al., 2018).

Research on excellence and football refereeing

There are a myriad of practitioner-focused, as well as academic-focused, research projects focused on stimulating discussion and raising awareness on individual performance

and excellence (Sotiriadou & Shilbury, 2009). Considerations of individual performance have centred on methodologies, techniques, strategies, and best practices that help to further develop individuals' success (see, Ievleva & Terry, 2008). There are certainly individually derived dimensions that shape such performance, given that certain individuals manage to achieve excellent results while others in similar conditions are not as successful.

However, there are other factors that shape individual performance that are not influenced by the individuals involved (De Bosscher et al., 2006). In fact, individual excellence is considered a multidimensional process that develops over time due to multiple interactions among various personal and environmental components (Den Hartigh, Van Dijk, Steenbeek, & Van Geert, 2016; Macnamara & Collins, 2013).

Research focused on football refereeing has identified characteristics, behaviours and attitudes that contribute towards enhancing referees' performance. For instance, several researchers have argued that a referee's success is a combination of physical, technical, and psychological performance (González-Oya & Dosil, 2004; Webb, 2017). Other researchers, such as Dosil & González-Oya (2003), enumerated essential characteristics for excellence, such as being in control, being calm and empathic, verbal and non-verbal communication, and emotional management. Likewise, García-Más (2002) highlights skills that assist referees such as the fast recognition of game patterns, anticipation of the outcome of players' actions, and self-perception of their own skills.

Mascarenhas, Collins, and Mortimer (2005) considered that there was not sufficient evidence to truly define an "expert" referee and they developed and implemented a model of referee excellence with a focus on rugby referees. Within their model, the following five factors were identified: psychological characteristics of excellence; knowledge and application of game laws; contextual judgments; personality and game management techniques; and physical fitness, positioning and mechanics. Beyond these dimensions facets, Guillén & Feltz (2011)

leveraged Bandura's work on self-efficacy and identified six important dimensions for a football referee's success: knowledge of the game, decision making skills, psychological skills, strategic skills, communication/game control, and physical fitness.

Mathers & Brodie (2011) applied a five-stage program of mental skills intervention (education, assessment/profiling, mental skill learning, application of mental skills in context and evaluation) that was delivered to an elite Scottish football referee and observed a beneficial effect on the referee's performance through an increase of European and World Cup appointments. Samuel (2015) also observed performance progress on top level referees when a psychological preparation framework for elite soccer referees was applied over three seasons. Nevertheless, the authors of these two studies state the need to interpret the results with caution.

According to Ericsson, Krampe, & Tesch-Römer (1993) superior performance in many domains (e.g., chess, music, tennis) is achieved through deliberate practice. Engaging in deliberate practice is also important in football refereeing (Catteeuw, Helsen, Gilis, Van Roie, & Wagemans, 2009), but MacMahon, Starkes, and Deakin (2007) claim that since immediate and informative feedback is missing, at least during the games, referees rather engage in structured practice than in deliberate practice. Nevertheless, experience, and, in particular, the number of games officiated, predicts performance in football referees (Catteeuw, Helsen, Gilis, & Wagemans, 2009), which is also important to FIFA and UEFA to officiate at the elite level (Castagna et al., 2005).

As such, numerous factors have been identified as enhancing referee performance regardless of the actual sport being refereed. That said; specific to football, Slack and colleagues (2013) studied 15 English Premier League referees and found a variety of physical, environmental, and psychological factors that contribute to excellence, such as mental toughness attributes, support networks and services, game management qualities, pre-match preparation, performance-level enhancement, opportunities to thrive, personal characteristics,

and superior physical components, which point to the multidimensionality of refereeing excellence (Den Hartigh et al., 2016). Likewise, Schnyder & Hossner (2016) recently interviewed 23 international referees from 17 European countries and, among other findings, reported characteristics of a good elite referee such as educability, game management qualities, mental attributes, fitness, personal characteristics, football intelligence, and experience.

While such work is needed to understand the factors that may enable a referee to reach the elite levels of the sport, their focus was not on what distinguishes those that attain referee positions within this top level. Accordingly, the focus of the current work is to provide insight regarding the factors that impact whether a referee within this upper echelon of referees is excellent, i.e., super-elite-level soccer referee, or whether a referee within this upper echelon of referees is merely good.

Methods

Participants

This study was conducted after receiving approval from the first author's institutional ethics committee. The Portuguese National Referees' Committee provided a list of 52 potential football and refereeing experts, who were contacted by phone, and invited to participate in this study. A total of 24 (i.e. 46%) accepted our invitation to participate in this study, and a date and place was agreed to conduct the interviews.

The twenty-four experts in football and football refereeing were interviewed for our study and particular information regarding these individuals is detailed in Table 8. Specifically, these individuals have a vast professional experience ranging from 14 to 40 years (M= 22.25, SD= 6.84). This sample favourably compares to other qualitative studies (Dell, Gervis, & Rhind, 2014; Macnamara, Button, & Collins, 2010; Mellalieu, Neil, Hanton, & Fletcher, 2009), especially considering the stature of the individuals interviewed (see, Biddle, Markland,

Gilbourne, Chatzisarantis, & Sparkes, 2001) – i.e., most of them were either current or prior referees or coaches at the international level.

Table 8. Demographic characteristics of the sample

Perspective	Function/ Specialty	N	Participants	Mean age	Expertise	Mean years of practice
Inside the game	Referee	7	5; 8; 10; 11; 16; 21; 24	38.14 (SD = 3.44)	International	19.43 (SD = 2.82)
	Assistant Referee	2	18; 22	40.00 (SD = 0)	International	22.00 (SD = 2.83)
	Football Coach	2	2; 12	44.50 (SD = 7.78)	International	17.50 (SD = 3.54)
Outside the game (Refereeing Specialists)	Referee Committee	2	1; 15	56.50 (SD = 2.12)	National and International	29.50 (SD = 3.54)
	Psychologist	2	19; 20	47.50 (SD = 2.12)	Senior practioner	16.50 (SD = 2.12)
	Physical Coach	1	4	42	International	14
	Technical Coach	2	3; 6	49.50 (SD = 2.6.36)	International	30.00 (SD = 7.07)
	Observer	2	7; 17	62 (SD = 11.31)	National and International	44 (SD = 2.83)
Outside the game (Non-Refereeing Specialists)	Journalist	2	14; 23	45.50 (SD = 2.12)	Senior practioner	35.00 (SD = 7.07)
	Psychologist	2	9; 13	44 (SD = 2.83)	Senior practioner	16.50 (SD = 2.12)

Procedure

Data Collection

In accordance with the recommendations of Patton (2002) and Moran (2012), we developed a semi-structured interview script (see, Biddle et al., 2001), which was pre-tested and piloted with five participants. The focus of this pre-testing was to check if the questions were understandable, if the interview would take a reasonable amount of time, and to allow the main researcher to obtain practice in conducting the interviews. As a result of this step, minor changes were made to the interview schedule in order to enable a better comprehension of the questions.

The final interview script was composed of seven questions, focused on the different characteristics of top level referees and top level referees that excel (e.g." which are the characteristics of top level referees?"; "Considering these characteristics, which are the ones

that truly differentiate the best referees?"). Following Spradley (1979) suggestion, the first group of questions was more general, the second contained follow-up questions, and in the last question, respondents had the possibility of adding any details that they remembered or considered relevant.

At the beginning of the interview, the first author presented the purpose of this research project and asked participants to read and sign the informed consent and asked for their permission to audio record the interview. After signing the consent, participants completed a socio-demographic questionnaire, which consisted of questions to enable the sample characterization (e.g., age, academic background, marital status).

Data Analysis

The interviews, lasting between 26 to 66 minutes, were recorded and transcribed by the first author. To ensure that the transcripts accurately captured the interview (McLellan, MacQueen, & Neidig, 2003), five random interviews were completely reviewed. In addition, the three initial and final minutes, as well as minutes 23 and 32 (when applicable) of all interviews were also checked by an external expert who compared the transcription with the relevant audio file. As a result of this review, only minor changes were made such as word changes or grammar corrections. Accordingly, the transcriptions of interviews were accepted for further analysis.

The first author analysed the transcribed interviews with MaxQDA7 Software. Specifically, a thematic analysis was performed following the six phases proposed by Braun & Clarke (2006): i) familiarising yourself with your data; ii) generating initial codes; iii) searching for themes; iv) reviewing themes; v) defining and naming themes; and vi) producing the report.

According to Patton (2002), (sub)categories were created inductively and deductively. The three broader categories (Individual, Group and Organisational) were deductively created

considering the Organizational Behaviour Model proposed by Robbins & Judge (2012), while the (sub)categories were deductively and inductively created (see, Khan et al., 2016; Slack et al., 2013), based on the emerging data. Each (sub)category was defined to describe the units of analysis it encompassed (Table 9).

Table 9. Sample of transcription categorization.

Category	Definition	Unit of analysis
1.3.1 Physiology	Body functioning	Therefore, what he has to do is trying to get closer, but he will never be able […] to make the 50 meters, because […] was born to make the 50 meters, and the other wasn't. […]
1.3.2 Physiognomy	Set of distinctive and particular characteristics, features and traits, of the human face	But then a person remembers Pierluigi Collina, for example. Who is of the most exposed type – even because of his figure … and did that do him any wrong? […]
1.3.3 Image	Concerns of an individual regarding his/her physiognomy characteristics, and the creation of a personal brand	There is a characteristic that people tend to notice – and which is extremely important nowadays, with the TV -; that is the way you behave at every moment, how you appear at every moment. For example, whether your hair looks nice, or not; what type of clothes are you wearing. At the era of image … [...]

We started by selecting relevant excerpts and assigned them to an existing (sub)category or, if necessary, created a new (sub)category. Finally, we constructed a category dictionary with the name and definition of each (sub)category, along with examples of associated units of analysis, to support data codification. For example, when a participant mentioned "they can read the game better", the data should be coded as Individual/Referee Knowledge/Game Reading. In this case, the dictionary definition of Game Reading is "Perceive/anticipate the movements of players and teams".

The reliability of the conceptual category system was validated by randomly selecting 208 units of analysis (at least one per (sub)category) that were separately coded by two independent judges who were lecturers and graduate students, who had access to the category dictionary. Cohen's kappa (Cohen, 1960; Hsu & Field, 2003) showed a substantial strength of agreement between the two judges (Agresti, 2013; Landis & Koch, 2012, pg. 165), $\kappa = .640$, $p<.001$.

Data Quality

In order to guarantee the trustworthiness, credibility and rigour of the present study, we followed several steps of Braun & Clarke (2006), Creswell (1998) and Tracy (2014). In particular, Creswell (1998) identifies eight criteria for evaluating qualitative research and claims that at least two must be followed to establish credible data. In this study, we used four criteria: i) prolonged engagement and persistent observation of the main author (see, Lincoln & Guba, 1985); ii) triangulating sources, comparing experts with different viewpoints (see, Denzin, 1978; Patton, 1999; Slack et al., 2013); iii) colleagues and peer review and debriefing scrutiny was an important contribution to this study because it allowed to refine methods and improve our arguments' justification; and (iv) as another criterium of evaluation (Silverman, 2000), we compared our findings with others (Schnyder & Hossner, 2016) and we found congruent results (Tracy, 2014).

This study also considered Tracy's Criteria (Tracy, 2014) for excellent qualitative research. A worth topic in football refereeing was studied, i.e. a relevant, timely, significant and interesting topic, experts with different viewpoints (triangulation) were interviewed and the sampling, the data collection method and the data analysis were described in detail. By following these recommendations for qualitative research, we believe that our study can bring new insight, and that our contribution will be important to improve football refereeing.

Results

We present the main results across three major conceptual categories (Individual, Group, and Organisational), which encompass 93 subcategories (e.g., leadership) and 1833 units (Figure 1), which emerged from the data analysis procedures (Tables 10, 11, and 12). All tables present the (sub)categories ordered by the total number of participants who mentioned that characteristic. Likewise, our results are delineated based on whether the respondent had an "inside" (i.e., referee) or "outside" (i.e., observer) perspective. We provide quotes from

certain interviews (see, Culver, Gilbert, & Trudel, 2003) to emphasize the participant's view and allow readers to make their own conclusions.

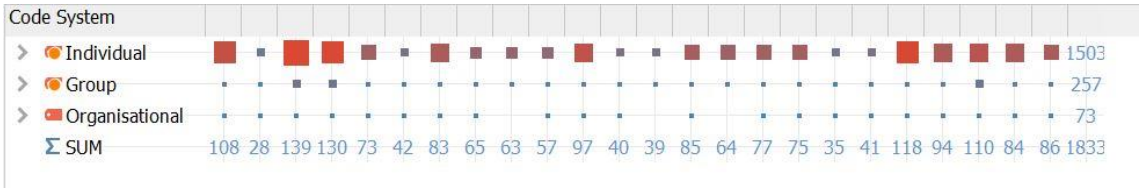

Figure 1. Code matrix per conceptual categories and participants' weighted responses

Figure 1 shows that 82.00% of the participants' responses were about Individual characteristics, 14.02% concerned Group characteristics and 3.98% mentioned Organisational characteristics. Nevertheless, only three participants (out of 24) did not mention, at least, one Organisational characteristic.

Individual level of analysis

Twenty-two participants (out of 24) identified 62 good and excellent referees' characteristics that were grouped in 7 (sub)categories: psychological characteristics, psychological skills, physical characteristics, refereeing knowledge, stability, educational background, luck, and genetics. Among these 62 characteristics, 20 (i.e., 32.3%) are exclusively associated with excellence, and there are 12 characteristics, i.e., 19.4%, (e.g., commitment, leadership) where the total number of participants who considered it excellent exceed by 10 the total number of participants who considered it good.

Table 10. Individual characteristics of good and excellent referees

	Inside Perspective (N=11)		Outside Perspective (N=13)		Total (N=24)	
(Sub)categories	**Good**	**Excellent**	**Good**	**Excellent**	**Good**	**Excellent**
Psychological characteristics	3	4	1	5	4	9
Personality	4	8	1	5	5	13
Openness*	1	3	0	0	1	3
Adaptability	0	11	0	9	0	20
Learning disposition	1	8	1	7	2	15
Values	5	7	2	6	7	13
Passion	0	6	0	3	0	9
Excellence seeking	0	3	0	4	0	7
Extraversion*						
Sociable	1	7	1	6	2	13
Positive emotions	0	6	0	3	0	9
Assertiveness	1	3	1	2	2	5
Conscientiousness*						
Planning and organisational skills	2	10	2	9	4	19
Commitment	3	9	1	9	4	18
Focus and distraction control	2	6	0	6	2	12
Goal setting	1	6	0	4	1	10
Realistic performance evaluation	1	7	1	3	2	10
Quality practice	1	5	0	3	1	8
Motivation	1	3	2	4	3	7
Independency	1	4	0	1	1	5
Agreeableness*						
Humility	3	7	1	3	4	10
Empathy	0	1	1	4	1	5
Listening ability	0	0	1	3	1	3
Emotional Stability*	1	5	0	2	1	7
Stay cool and demonstrating poise under pressure	2	7	3	6	5	13
(Self)confidence	3	4	3	6	6	10
Self-awareness	0	0	0	3	0	3
Leadership	3	10	2	10	5	20
Intelligence	1	2	1	2	2	4
Courage	1	2	0	2	1	4
Emotional intelligence	0	2	0	1	0	3
Narcissism	0	0	0	1	0	1
Psychological skills	0	0	0	2	0	2
Emotional regulation	6	6	3	9	9	15
Resilience	1	6	2	8	3	14
Recovering from making a bad call	3	8	1	3	4	11
Behavioural consistency	0	4	0	4	0	8
Imagery	0	0	0	2	0	2
Physical characteristics						
Image	0	7	1	4	1	11
Physiognomy	0	7	0	3	0	10
Physiology	0	2	0	2	0	4
Refereeing knowledge						
Physical fitness	9	11	6	11	15	22
Understanding the game	1	5	0	7	1	12
Knowledge and application of the laws	4	5	6	6	10	11
Tactics knowledge	2	9	1	9	3	18
Players knowledge	1	9	0	4	1	13
Game reading	1	5	0	7	1	12
Football practice	0	6	0	2	0	8
Refereeing skills						
Knowing where to stand and how to move in the field	0	8	0	8	0	16
Anticipating actions	1	7	0	9	1	16
Understanding proper officiating mechanics	0	2	0	6	0	8
Decision-making skills	0	0	0	1	0	1
Accurate judgements	2	3	3	6	5	9
Consistency	0	4	0	3	0	7
Making critical decisions during competitions	1	4	0	1	1	5
Experience	1	9	1	5	2	14
Intuition	1	4	1	1	2	5
Stability	1	5	1	3	2	8
Professional	1	3	0	2	1	5
Family	1	4	1	3	2	7
Financial	0	0	0	1	0	1
Genetics	1	5	0	1	1	6
Educational background	0	2	0	2	0	4
Luck	0	4	0	0	0	4

Note: variables with * were set a priori

Considering the participants' perspective, Table 10 shows that inside participants did not mention eight characteristics (e.g., listening capability) while participants with the outside perspective did not mention two (openness, and luck).

The 20 characteristics exclusively associated with excellence will now be addressed (e.g., adaptability), followed by the 12 characteristics where the total number of participants who considered it excellent exceed by 10 the total number of participants who considered it good (e.g., tactics knowledge).

Participants considered **adaptability** a key characteristic of refereeing excellence, and mentioned several situations where adaptation is needed during the game: (i) technical and tactical issues, such as "pace and velocity of the game" [4]; (ii) participants characteristics like personality, age, emotional state, educability or players "fair-play" [24]; (iii) game importance, considering relegations, type of competition or if it is a "broadcasted game" [16]; and (iv) where it is played, bearing in mind the weather conditions and the country and players' culture. The unpredictability of each game requires expert referees to be "very sensitive to environment and task variations" [13], in order to adapt to the game. Nevertheless, some concerns were raised by one participant:

> *Adaptability, par excellence, must come from the referee, but the team members might have the so called routine expertise, more based on routine, because if everything is under adaptation it is very hard to be robust. These things may not be separated: if there is too much variability, you will become ineffective. There is a combination of flexibility and robustness. He needs to be flexibly robust. He needs to adapt well, while still being competent. That mix is very interesting. [13]*

The second most mentioned characteristic that contributes to refereeing excellence was **knowing where to stand and how to move in the field** and was mainly associated to intangible arguments as the ability to "predict a positioning" [5] or "find secret ways" [21] to

be in the right place at the right time. Despite the participants' acknowledgement of the importance of physical performance to allow referees to be cognitively apt to decide, the majority claim that there is not a direct link between physical performance and knowing where to stand and how to move in the field, as summed up by one participant:

> *There are referees that are not true athletes but have the great ability to read the game, anticipating, they are better placed than the athletes. [19]*

The referee **physiognomy** and, in particular, being tall and thin, was pointed as an important excellence' characteristic. The former referee Pierluigi Collina was mentioned as an example of the importance of the physiognomy [23] and another participant stated:

> *I don't think a 1,5-meters referee is an excellent referee. He will not be so considered... he may even be a good referee but based on the model of a referee in people's mind, he will not be an excellent referee. [16].*

Physiology was another genetic characteristic that was mentioned as a differentiating excellence factor. Participants argue that some referees are better athletes than others for natural reasons, due to genetics [18] and point to speed as an example:

> *[name] has a lot of strength […] he is able to run 50 meters in 5 seconds, while [name]can run 50 meters in 6 seconds, and no matter how much he will work, he will never make it in 5, he might be closer, but he will never make it. [21]*

Passion should be felt during the game, but, also, in other activities such as preparing the game, training, meeting with colleagues. One participant revealed his excitement when he is refereeing a game:

> *I enjoy refereeing, I like the adrenaline of the game, I like to decide, if I could I would referee the most important matches in the championship, every week. [18]*

Three topics that deal with **positive emotions** were mentioned by participants: (i) the ability to deal emotionally with wrong decisions [14]; (ii) the ability to "see in every difficulty

an opportunity to retain something positive" [5]; and (iii) the ability to make people smile. This last topic was emphasised by one participant:

> *The way he is able to solve the issues, in a serene, quiet, pragmatic way, and even if he says no, he is able to make people smile... this is fundamental for him to be respected in the field. [24]*

Participants expect that excellent referees **behave consistently** before, during and after every seasons' game, and across seasons, "regardless the game, the game players or the context..." [19]. Participants also expect **decision-making coherence** across games and seasons, which allow people to understand and respect referees' behaviours and decisions. Nevertheless, one participant emphasized that excellent referees need to be consistent, yet adaptable, which is difficult to achieve [13].

In order to deal with players [1], knowing their tricks [9] and better understand the game [24], referees should **practice football** [16; 5].

Understanding proper officiating mechanics is one of the few characteristics that outside participants identified significantly more than inside participants. In order to manage the game, referees should be "above the game" (i.e., not getting involved in the game), define clear boundaries in the early stages of a match [20], let the game flow with the least interruptions possible [14] and deal with players and coaches according to the game context [9]. One participant talked about "class" and how to achieve it [23].

Seven participants identified the **excellence seeking** characteristic as a distinctive factor of refereeing excellence. It was mentioned that referees need to understand that "excellence is a path, not a point to be reached" [6] and, therefore, they need to "strive to reach perfection" [3] and to be committed towards "permanent improvement" [20]. In order to build an excellence culture, referees need to pay attention to every detail of refereeing activity and find ways to develop them [22].

Less than five participants mentioned several characteristics that contribute to refereeing excellence. **Educational background** was considered important due to social status, since clubs, players and the media will have greater respect for referees who have a degree [22] and have knowledge of different languages [1]. **Luck** was mentioned as an aspect in reaching the top of the game, due to the possibility of working with good referees and assistant referees [5], or as something divine:

> *On the one hand, we may say that I was blessed! Errors and mistakes are always around us, and I have been lucky enough for them not to hit me at the time of major decisions. [18]*

A referee with **Emotional intelligence** "will be better prepared for the different scenarios he might have to face" [11] and he will develop his **Self-awareness.** In particular:

> *[…] a very important dimension that is de-personalisation, i.e. the referee that is able to set the difference between the function and the person. [19]*

Two outside participants mentioned **Psychological skills**, and the importance of mental training [9], and, in particular, **Imagery** as the ability to "have positive images regarding performance, and involvement in refereeing" [20] and to visualise situations as almost real [19].

Decision-making skills [20], **Financial stability** [15] and **Narcissism** [6] were mentioned once by outside participants as differentiating excellent referees.

Besides the characteristics mentioned in the previous paragraphs, which were exclusively attributed to excellent referees, there are 12 characteristics with a relevant difference (greater than 10) between the number of participants who qualified as a good referee characteristic and those who said that it was an excellent referee' characteristic. Having this in mind, we will present the results of these characteristics.

Twenty participants considered **leadership** as a decisive factor for an excellent referee and mentioned four key points: the leadership style, and mainly, the ability to change styles according to situations and interactors and let others lead [8]; leading the refereeing team, since "The success of the major refereeing teams is having a good leader" [15]; leading the game, being able to establish different types of relationship it needs, i.e. the relationship with their own refereeing team, with the League delegates, with the team delegates [14] and to manage emotions, manage different tempers, different personalities, different ages, different ideas "without annihilating the personality of one another, but rather being able to let all those personalities flow together." [24].

Considering **planning and organisational skills**' characteristics, participants emphasized game preparation, life organisation (e.g., "not going out, not drinking too much,." [16], and routines (e.g., "I became a defender of routines in the last few years, because I believe that helps in reaching success." [18]). One participant emphasized:

> *He made an awesome plan, extremely meticulous plan, with all the details: it's a baby blue shirt with buttons on the collar; a pair of black shoes, with laces. [15]*

When addressing the **commitment** characteristic, participants mentioned professionalism and professional attitude [11], work capacity [20], and an example of dedication [4]. One participant emphasised the importance of excellent referees to deeply emerge in refereeing, to fulfil their mental space and their time with training but also with other refereeing activities, such as teaching regional referees, collaborating with regional associations or promoting refereeing in schools [6]. The ability to be perseverant to achieve demanding goals, was pointed out by one participant:

> *It's that perseverance, that continuous, systematised way of working, always and constantly and ever harder that will allow someone to achieve excellent results. We must understand that we have never conquered enough. [11]*

Understanding the game is an important characteristic to excel in refereeing. An excellent referee must understand that "The game is clearly much more than a ball" [9], and, therefore, understand the competition [17], external factors that may have impact on the game [2] and football multiculturality [11].

Tactics knowledge was a consensual characteristic among every participant. The relevance of knowing how teams play, their game model, in order to allow referees to be identified with the game [21] and to be prepared to face situations that may happen during the game [12]. This recent approach to better understand the game and the way some referees deal with this issue, was mentioned by one participant:

> *Before, nobody used to study the teams, we had more or less an idea of what the team was like […] Nowadays the referee tells one assistant to scout team A and the other to scout team B, and then they will all debate the findings. [17]*

Another participant, identified potential issues with pre-judging players and situations based on previous performances and incidents [12].

To better manage the game, excellent referees should have **players' knowledge** to recognize their motivations, behaviour, emotional state and ability to play. Concerning the ability to play, one participant mentioned:

> *A technically evolved player does not commit many fouls; a player that is not able to master the ball, will try to regain the ball, and wanting to regain it at any cost, he may commit a foul, and sometimes a very serious foul. [3]*

The ability to **read the game**, i.e., to perceive how the game is being played (technically, disciplinary and emotionally) will allow referees to decrease physical exhaustion [18] and anticipate plays [20].

An excellent referee **anticipates actions**, i.e., is proactive [14], "expect the unexpected" [5] and is "one step ahead" [8]. Nevertheless, as mentioned by one participant, referees must deal with the information that they acquire with caution:

> *[…] information serves only for him to anticipate more and better what is happening, and not being conditioned by something that was formatted in terms of ideas, and which may be conditioning him in terms of decision-making. [19]*

One characteristic that differentiates excellent referees is their **learning disposition** or the ability and availability to continuously learn, either seeking self-analysis tools or listening to other opinions. One participant [5] mentioned, learning as a vital continuum process because each career stage has different requirements. Eight participants mentioned the importance of self-learning, for example:

> *Because the referees follow the course of their careers with one or two very short training programmes, everything else is almost a full self-learning process. [11]*

Excellent referees need to be emotionally strong [14] considering the difficulty of being a referee at the professional level [1], dealing with the press [16] and the evaluation system [5]. Being **resilient** is an important characteristic since referees face several obstacles as "criticism, adversities, comments, the smiles you see in the street" [1].

Being **sociable**, as a social skill, almost an ambassador [5] is "critical to be able to have success at top level" [20]. Nevertheless, it is important to be cautious with private life and with the relationships established with other people [15].

Experience was a characteristic that was significantly more enhanced by participants with an inside perspective (9) than an outside perspective of the game (5). General life experience and personal competences [19; 17], maturity [18; 2; 12] and the number of games refereed [14; 16] were pointed out as relevant to the referee' experience.

1.1. Group level of analysis

Twenty participants (out of 24) identified 16 good and excellent referees' characteristics that were grouped in 2 (sub)categories as can be seen in Table 11. Nine characteristics (i.e., 56.3%) were exclusively associated with excellence and there are 3 characteristics (e.g., communicating effectively with players) where the total number of participants who considered it excellent exceed by 10 the total number of participants who considered it good. Dealing with the media was the only characteristic that was not mentioned by participants with the inside perspective. We now emphasize the nine characteristics exclusively associated with excellence, sorted by number of participants (e.g., Team performance).

Table 11. Group characteristics of good and excellent referees

	Inside Perspective (N=11)		**Outside Perspective (N=13)**		**Total (N=24)**	
(Sub)categories	**Good**	**Excellent**	**Good**	**Excellent**	**Good**	**Excellent**
Communication*						
Dealing with the media	0	0	1	1	1	1
Communicating effectively with players, coaches and co-official	2	10	2	10	4	20
Refereeing Team*						
Team Cognitive Processes*						
Training	0	3	0	1	0	4
Team preparation	1	6	0	11	1	17
Team tuning	1	7	0	6	1	13
Team Affective/Motivational Processes*						
Friendship	0	5	0	5	0	10
Peer recognition	0	3	0	2	0	5
Leverage colleagues	0	4	0	1	0	5
Team goals	0	6	0	4	0	10
Motivation others	0	3	0	1	0	4
Support	1	1	0	2	1	3
Trust	1	5	0	2	1	7
Cohesion	0	3	0	3	0	6
Team coordination processes*	1	3	1	7	2	10
Team performance	0	8	0	11	0	19
Team composition	0	6	0	5	0	11

Note: variables with * were set a priori

Changes in match speed and changes to the laws of the game, which assigned new roles and responsibilities to the refereeing team, increased the importance of assistant referees and the 4th official on **team performance**, as mentioned by one participant:

There's no doubt that for a referee to have a good performance in the match, he depends clearly on the assistants and on teamwork, and also on the 4th referee, which quite often is not a member of the team but is part of the team. [16]

Refereeing is now seen as a collective performance ("If one succeeds, we all succeed; if one fails, we all fail." [24]) and, therefore, the composition of the refereeing team it is of significant importance. Concerning **team composition**, participants defended fixed teams [24] chosen by the referee [20], according to his criteria of quality [18]. Complementarity competences within the team also contribute to team performance [11].

Concerning group characteristics that differentiate excellent referees, participants unanimously agreed that **team goals** should be set in order to achieve excellent results, even in short competitions [11] and mentioned also **Friendship, Cohesion**, **Leverage colleagues**, **Peer recognition**, and **Motivating others**. One participant said:

The referee who is able to motivate people, who understands that if I'm successful, you'll be successful, that your success is my success, and is able to establish this win-win relations, is the referee that will be able to reach the top. [11]

Participants stated that excellence can only be achieved with **training** and, in particular, "when the team trains together" [24], technically [20] and tactically [2] because "this is a little like in theatre, ok? You have to rehearse to succeed." [22].

Concerning **communicating effectively with players, coaches and co-officials**, twenty participants mentioned seven topics: body language, assertiveness [8], honesty, timeless [17], serenity, conflict management [2] and flexibility [22]. One participant remembered the former referee Pierluigi Collina and his non-verbal communication:

Quite often it would be enough for him to change his attitude, his look, a "je ne sais quoi", and the players would immediately understand. [14]

Recognising a mistake can be an efficient way to communicate effectively:

The referee said: "[name], I'm sorry, I made a mistake, I was wrong". This is one of the most disarming things for us, as players." [12]

An adequate word, at the right time, may contribute to lead or manage players adequately, as mentioned by one participant:

And he said "[name], take it easy, play quietly, and don't worry about a thing." He conveyed a feeling of relaxation to the player, calming him. [12]

Participants with an outside perspective of the game mentioned **team preparation** almost twice as much as the participants with an inside perspective, but all agree that is essential to achieve excellent performances. Dedication [24] and involvement [8] of a systematic and methodical approach to work [22] is crucial to develop team members competencies and autonomy [19]. The critical role of preparation was enhanced:

Sometimes the game is just a detail, a decision, a little hand on the ball that the referee was not able to see, he couldn't have ever seen it, but which the assistant can see because of his perspective. Therefore, it seems that teamwork has always been critical, it has grown in importance, and in the future it will be decisive. [20]

Team tuning is a consensual characteristic among participants with an inside and outside perspective. The refereeing team must work as a "Swiss watch", developing collective dynamics [2] and a strong complicity [24] in order to know each other's competencies.

1.2. Organisational level of analysis

The organisational category encompasses four characteristics that were identified by 16 (out of 24) participants, as can be seen in Table 12. Contextual factors was the only characteristic exclusively associated with excellence and was acknowledged as the characteristic with the biggest difference (15) among participants.

Table 12. Organisational characteristics of good and excellent referees

	Inside Perspective (N=11)		Outside Perspective (N=13)		Total (N=24)	
(Sub)categories	**Good**	**Excellent**	**Good**	**Excellent**	**Good**	**Excellent**
Organisational*						
Contextual factors	0	3	0	4	0	7
Perceived support	0	3	1	4	1	7
Opportunities	0	4	1	3	1	7
Acknowledgment	0	7	1	9	1	16

Note: variables with * were set a priori

According to seven participants, **contextual factors** as policies and regulations may have a strong impact on achieving excellence. Concerning training issues, one participant mentioned:

> *One of the main problems in refereeing is that we don't train refereeing […] sometimes we only train in the field once a week. Our training is widely separate in time. This is another reason why it takes longer for us to reach the top. [18]*

Concerning policies, another participant said:

> *There is a set of factors that don't only involve the competencies and skills of the referee to reach the top, but also all the surrounding conditions, the entire organisation around refereeing [4]*.

Acknowledgment was mentioned by 16 participants considering different viewpoints. While some participants emphasised that referees should be social role models in order to be accepted by others [11], others consider the importance of being recognised as knowing more than others (i.e. being an expert) as a differentiating factor because it helps to establish leadership, to gain authority [1]. Refereeing status and credibility may also "facilitate the mission of a referee" because mistakes are accepted as natural, rather than deliberate [24].

The results demonstrate areas of specific interest, and in the following section we identify these categories and critically analyse these findings in relation to the existing literature. The discussion section culminates with a consideration of the implications of our findings and the inferences for future research.

Discussion

Football referees deal with valuable clubs (KPMG, 2016), in competitions that are simultaneously demanding and high-value and consequently are under significant scrutiny (Parsons & Bairner, 2015), with several dimensions appearing to enhance referee performance, such as human resources initiatives (e.g., refereeing teams of six instead of three), and technological advancements (e.g., VAR). However, people are no longer satisfied with "good" referees, they want excellent referees. That said, while needed, excellence is hard to achieve.

As such, this study intends to contribute to this discussion by identifying and categorising the characteristics that distinguish excellent football referees from those that are not able to achieve excellent performance results. This distinction is critical as it could likely shape practices used by national associations, FIFA and UEFA. Specifically, it could impact recruitment practices as well as training programs designed to enhance referee performance. In line with excellence (Den Hartigh et al., 2016), sport (Khan et al., 2016) and refereeing research (Schnyder & Hossner, 2016; Slack et al., 2013) results show several characteristics that may contribute to refereeing excellence.

The categorisation of the 93 characteristics that emerged in this study in Individual- (82.00%), Group- (14.02%), and Organisational-level (3.98%) categories showed that participants are essentially concerned with themselves, which may be explained by the refereeing training history (Webb, Dicks, Thelwell, & Nevill, 2016). For many years, due to a lack of support provided by refereeing organisations, referees needed to be "self-made referees," learning and training by themselves (Webb, 2017). Today, physical, technical, psychological and medical support is provided by many organisations, but "self-made referees" still exist [11]. For instance, adaptability was considered an important characteristic of an excellent referee. However, to the best of our knowledge, while used in contexts and industries (i.e. military – Reivich, Seligman, & McBride, 2011), there is no training program on

adaptability supported by refereeing organisations. Even understanding the game (mentioned by 12 participants), which is a more tangible characteristic than adaptability, is not taught in refereeing programmes and, therefore, referees are required to be autodidacts [22].

The group category includes 14.02% of the characteristics mentioned by the participants. Concerning the growth of the refereeing team and the introduction of technological aids (e.g., audio communication; VAR), which implies more coordination and better communication among team members, we could question the percentage discrepancy between individual and group-level characteristics mentioned by the participants. In fact, recently refereeing has started to be seen as a true team performance. For instance, the referee team assembled to the Korea 2002 World Cup final was not the usual team of the referee Pierluigi Collina (FIFA.com, 2002), but in the Brazil 2014 World Cup, Nicola Rizzoli was appointed to the final with his two Italian assistant referees. Even so, the fourth official and the the reserve assistant referee were from Ecuador (FIFA.com, 2014). Given the focus on the main referee that also exists in the literature (Aragão e Pina et al., 2018), we may question if the study participants are sufficiently alert to the referee team dynamics and problems.

The organisational-level category contains 3.98% of the characteristics mentioned by the participants. Since professional football is a very important industry and despite the effort that institutions such as FIFA and UEFA are making to ensure the consistency and accuracy of the referees' decisions (Catteeuw, Gilis, Wagemans, & Helsen, 2010; Nevill, Webb, & Watts, 2013), refereeing performance cannot depend on individual efforts, as the participants in this study seem to believe. Therefore, national referee organisations must be structured to provide support programmes towards excellence (see, Aragão e Pina et al., 2018; Sotiriadou & Shilbury, 2009), not only at the top level, such as Premier League (e.g., Slack et al., 2013). If excellence is considered a process (Den Hartigh et al., 2016), the quicker referees are trained, the sooner results will be achieved.

The small percentage of characteristics in the organisational-level category may also reveal that participants could be insufficiently alert to the importance of regulations, policies or training programmes that refereeing organisations provide, and the impact that these issues may have in the referee's career. For instance, as reported by Montiel, Pina, & Pereira (2010), a Refereeing Organisation provided communication kits to referees at the beginning of the season but did not deliver a solid training program, which caused some problems during the first season games. This is an organisational policy measure that had a negative impact on referees' performance, promoting "self-made referees", who had to deal with this issue. After that, training was provided, and a communication protocol was established, and performance improved.

While some of the characteristics mentioned here have been discussed by others, there are other characteristics that are relatively novel and have not been discussed extensively in the literature.

(1) Individual. Considering personality, we highlight four characteristics: adaptability, learning disposition, passion, and excellence seeking. Adaptability is crucial in business (e.g., Maynard, Kennedy, & Sommer, 2015) and sports contexts have high variations and aspects of business theory previously linked to refereeing (Webb & Thelwell, 2015). As mentioned before, in the refereeing context, progress is made via "self-learning" which supports the learning disposition and excellence seeking characteristics that participants mentioned. Moreover, passion is essential as referees need to devote themselves completely to football refereeing in order to, eventually, reach excellence (Johansen, 2015; Vallerand et al., 2008).

Genetics was mentioned as a distinctive characteristic of excellent referees. In particular, physiology, mainly the ability to be fast, which is difficult to improve significantly (Castagna et al., 2017), and physiognomy, mainly height and weight, which is important to

look like an athlete (Webb, 2017). In this mediating field, where referees are frequently exposed to TV and other media (Webb, 2016), the referee image may be a differentiating factor.

(2) Group. Team processes (cognitive, affective, and coordination) were considered essential to achieve excellence but, paradoxically, it is one of the topics least studied in refereeing (Aragão e Pina et al., 2018; Boyer, Rix-Lièvre, & Récopé, 2015). In the last two decades, refereeing has changed substantially because of the increasing number of individuals on referee teams, their roles and the technologies employed. Nevertheless, the football industry demands a refereeing team that is tuned, prepared, trained, motivated, cohesive, and as fast as possible. This seems irreconcilable because people still learn by themselves in these areas. Hence, since the composition of the refereeing team either depends on the referee or the organisation, more work is needed to truly understand the factors that may shape overall referee team performance.

(3) Organisation. While organisational-level factors were not mentioned as much as individual- and group-level characteristics, they were still acknowledged by participants in our study as being important in distinguishing referees who are excellent versus those who are merely good. While there is a robust and mature literature on training programs within organisational settings (Bass & Avolio, 1990), the football industry has not dedicated sufficient attention to the best ways in which to develop excellent referees (Webb, 2017). Additionally, the larger football organisations also need to be considered in future research involving the football industry. We know from organisational climate research, that the broader organisational climate can have an impact on employee performance (e.g., Castro & Martins, 2018; Uddin, Luva, & Hossian, 2013). As such, it remains an unanswered question as to whether certain football organisations are different in terms of their climates (Webb, Wagstaff, Rayner, & Thelwell, 2016) and whether these climates impact the ability of referees within such organisations to become excellent.

In conclusion, by interviewing 24 experts within the field of professional football in Portugal, we identified various characteristics that seem to shape a referee's performance level and distinguish them as either being good or excellent. However, beyond merely identifying these characteristics, we highlight whether they emerge from the individual referees themselves or are attributable to team or organisational features. Likewise, we delineate where there are differences in these perceptions depending on whether the expert was internal or external to the sport of football. While the insights that we provide are salient to audiences seeking to understand characteristics of excellent football referees, our findings also pinpoint areas that appear important for football referee performance but have not been adequately considered within the literature. As such, we also identify areas where future research is needed. Therefore, this work has both practical and theoretical implications.

Study 3: To Be or Not to Be an Excellent Football Referee: Different Experts' Viewpoints

Abstract

Football is central to the lives of countless individuals around the globe. While most of the attention of those passionate about the sport is focused on the players, football referees are often just as important in shaping the outcome of the games. Therefore, research is increasingly examining the role of referees. Even so, our understanding of the factors that create an excellent football referee is still scarce.

Based on our analysis of the opinions of 24 football experts, we demonstrate the multidimensionality of excellence in the performance of football referees. From a Categorical Principal Components Analysis (CatPCA), we were able to pinpoint that football referee excellence is shaped by three distinct dimensions: individual preparation, game preparation and game management. Additionally, we were able to see if these perceptions were different from individuals "within" the game versus those "outside" the game. Namely, we used CatPCA to graphically display the main correlations between the latent dimensions of football refereeing performance and the "inside" and "outside" perspective of the game. The findings of our work contribute towards the knowledge of the factors that shape football referee excellence, while also highlighting areas in need of additional research attention.

Keywords: performance excellence, football referees, Categorical Principal Components Analysis (CatPCA)

Introduction

In a variety of contexts, researchers focus on factors that shape superior performance (Swann, Moran, & Piggott, 2015). Such work has a long history (Galton, 1892; Terman 1926) and includes studies from a variety of perspectives which have tried to understand what determines performance excellence in various fields (Baltes & Staudinger, 2000; Ericsson, Krampe, & Tesch-Römer, 1993; Gagné, 2004; Hollingworth, 1942; Renzulli, 2016; Simon & Chase, 1973). For example, within the organisational psychology literature, researchers have examined what gives rise to both individual employee excellence and overall organisational excellence (Evans & Jack, 2003; Luthans, Norman, Avolio, & Avey, 2008).

While much of the work that examined performance excellence through theses lenses has predominantly been focused on the area of organisational psychology, research has also considered the factors that shape performance excellence within a variety of sport contexts (Durand-Bush & Salmela, 2002).

Within the sports literature, many researchers have tried to highlight the characteristics that enable athletes to excel in a variety of sport domains (Bortoli, Bertollo, Hanin, & Robazza, 2012; Gould & Maynard, 2009; Macnamara & Collins, 2013). Primary influences on expertise such as genetics, training, and psychological factors and secondary influences such as socio-cultural and contextual elements were reviewed by Baker and Horton (2004). This multidimensional and dynamic process that defines performance excellence (Den Hartigh, Van Dijk, Steenbeek, & Van Geert, 2016) shows the difficulty in trying to predict performance excellence (Baker & Horton, 2004).

This study focuses on how performance excellence can be attained by football referees, which is critical because despite the social and economic importance of football (Dobson & Goddard, 2011) and the relevant and complex role that referees play in this sport (Helsen & Bultynck, 2004; Mascarenhas, O' Hare, & Plessner, 2006; Wühr, Fasold, & Memmert, 2015),

a recent integrative review (Aragão e Pina et al., 2018) shows that the study of football refereeing is still rather limited overall. In particular, the results of this review indicate that little attention is given to the study of excellence among football referees (Gilis, Helsen, Catteeuw, Van Roie, & Wagemans, 2009) and therefore, we do not know enough about what distinguishes those referees who are excellent from those who merely perform at a satisfactory level.

In fact, there are apparently only two studies that have considered performance excellence within the context of football refereeing (Slack et al., 2013; Schnyder & Hossner, 2016). Analysing these two studies, it is of particular interest to note that they emphasise the multidimensionality of excellence in football refereeing. Likewise, interesting insights are gained by grouping the information provided by these two studies.

The first study was conducted by Slack et al. (2013) and focused on the performance levels of 15 English Premier League referees. The results point out a variety of physical, environmental, and psychological factors that contribute to performance excellence, such as mental toughness attributes, support networks and services, game management qualities or superior physical components. The second study was conducted by Schnyder and Hossner (2016), who interviewed 23 international referees from 17 European countries and, among other findings, they reported characteristics of a good elite referee such as educability, football intelligence, and experience.

With this in mind, we may infer that research on football referee performance excellence is in its infancy, and there is limited knowledge about the characteristics that distinguish an excellent from a satisfactory referee. Therefore, our two main objectives with this study were: i) to explore the multidimensionality that characterises excellent referees; and ii) to identify dimensions of referee performance excellence by analysing the “inside”

perspectives of football referees with the ones of those with a more "outside" perspective of the game.

Accordingly, based on our review of the literature, this study brings forward two new contributions. First, it includes a diverse sample of participants, which provides an "inside" (e.g., referees, coaches) and "outside" perspective of the game (e.g., referees' observers, trainers, journalists). The majority of studies thus far have only considered the inside perspective (Durand-Bush & Salmela, 2010; Schnyder & Hossner, 2016), which may not provide a full picture of the topic. This triangulation of perspectives will further enhance our understanding of performance excellence in football refereeing (Slack et al., 2013). Second, we use a relatively novel methodology in this field by combining qualitative and quantitative data analysis. By doing so, we hope to provide new and complementary insights on football refereeing performance excellence.

Methods

Participants

Twenty-four individuals with vast knowledge of football as a sport and football refereeing in particular were interviewed for this study. These individuals had levels of professional experience ranging from 14 to 40 years (M= 22.25, SD= 6.84). Eleven of the participants (Mage= 39.64, SD= 4.41; Mexperience= 19.55, SD= 2.98) provided an "inside" perspective of the game (7 international referees, 2 international assistant referees, and 2 top level coaches), while the remaining 13 (Mage= 50.15, SD= 7.60; Mexperience= 24.54, SD= 8.15) provided an "outside" perspective of the game (2 members of the Referees' Committee, 2 practicing sports psychologists, 2 academic sports psychologists, 2 technical coaches, 2 observers, 2 journalists, and 1 physical coach).

Procedures

Data Collection. After receiving the approval of the Institutional Review Board, we contacted the National Referees' Committee in order to present the research idea and ask for their approval to conduct the study. From the 52-potential football and refereeing experts, which were contacted by phone and invited to participate in this study, 24 agreed to participate, and we arranged a date and place to conduct the interviews.

A semi-structured interview script (Biddle, Markland, Gilbourne, Chatzisarantis, & Sparkes, 2001) was developed according to Patton (2002). A pre-test with five participants was carried out to check interview duration and if questions where understandable. After some minor changes to enhance questions' comprehension, the final interview script included seven questions which focused on the different characteristics of top-level referees and top-level referees that excel (e.g." which are the characteristics of top level referees?"; "Considering these characteristics, which are the ones that truly differentiate the best referees?").

Participants were invited to read and sign the informed consent, which presented the study's objectives, and were also asked for their permission to audio record the interview. After signing the consent, participants filled in a socio-demographic questionnaire, which consisted of questions to enable the characterisation of the sample.

Data Analysis. The interviews, lasting between 26 to 66 minutes, were recorded and transcribed by the first author. To ensure transcripts' accuracy, an external expert compared the full transcription with the relevant audio file of five random interviews (McLellan, MacQueen, & Neidig, 2003). Also, the three initial and final minutes, as well as minutes 23 and 32 (when applicable), of all interviews were compared for accuracy purposes. Minor changes, such as word changes or grammar corrections, were made as a result of this review, and interviews were accepted for further analysis.

The transcribed interviews were analysed with MaxQDA7 software and a thematic analysis was performed according to the six phases proposed by Braun and Clarke (2006). We used a deductive approach to create major categories (Robbins & Judge, 2012) and some subcategories (Oh, Wang, & Mount, 2011) while other subcategories were created based on the emerging data (Patton, 2002).

The final category system[1] includes three major conceptual categories (Individual, Group, and Organisational) and 93 subcategories (e.g., Leadership, Resilience, Game Reading). We started by selecting relevant excerpts and assigning them to an existing (sub)category or creating a new (sub)category if necessary. Each (sub)category was defined in order to describe the unit of analysis it encompassed. Finally, according to Gaskell and Bauer (2000), we constructed a category dictionary[2] with the name and definition of each (sub)category, along with examples of associated units of analysis to support data codification.

The reliability of the conceptual category system was validated by randomly selecting 208 units of analysis (at least one per (sub)category) that were separately coded by two independent judges who had access to the category dictionary. Cohen's kappa (Cohen, 1960; Hsu & Field, 2003) showed a substantial strength of agreement between the two judges, $\kappa = .640$, $p<.001$ (Agresti, 2013; Landis & Koch, 2012). Afterwards, participants' answers were coded according to the frequency of each conceptual (sub)category, ranging from 0 (not mentioned) to 3 (mentioned three or more times). The conceptual (sub)categories that were mentioned by 50% or more of the respondents were included in further analyses and considered for interpretation purposes (Table 13). Although there is no statistical criterion, this cut-off intended to avoid using variables (conceptual (sub)categories) with a residual frequency in multivariate analysis (Greenacre, 2006).

[1] Available on demand.
[2] Available on demand.

To identify the structure that configures the football refereeing performance a Categorical Principal Components Analysis (CatPCA) was performed. This method was chosen for two reasons. First, CatPCA enables researchers to explore the associations between the multiple ordinal variables (i.e., the conceptual (sub)categories), that measure characteristics of an excellent referee. As such, this method provides a way to handle nonlinear relationships between variables, evidencing which variables are most correlated. Second, CatPCA can reduce an original set of variables into a smaller set of uncorrelated dimensions, enabling interpretation when it is necessary to deal with many variables.

Similar to the standard principal component analysis (PCA) for metric variables, the CatPCA algorithm allows the definition of new composite and standardised variables – dimensions (principal components, in PCA) –, maximizing the association between the input variables while simultaneously reducing the multidimensionality of the initial data matrix (Gifi, 1996; Leeuw, 2006; Meulman, 1992). Categorical variables are optimally quantified in the specified dimensionality contributing to a different loading (Gifi, 1996; Meulman, Kooij, & Heiser, 2004; Meulman & Heiser, 2012). CatPCA was used to *graphically display* the relationship between the multiple variables, providing an easier interpretation of the complexity of the data. The coordinates of the points (i.e. the variables) are given by the loadings of each variable on each analysed dimension (Gifi, 1996). The privileged associations between the variables are then emphasized by their geometric proximity. The variables closely grouped together in the plot are positively related. Thus, the configurations designed by those associations define, in this case, different dimensions of excellence in football refereeing.

Data Quality. Several evaluative criteria were used in order to guarantee the trustworthiness and credibility of the present study. Creswell (1998), identified eight criteria for evaluating qualitative research, and claimed that at least two must be followed. We defined four criteria to establish credible data: i) prolonged engagement and persistent observation of

the main author (see, Lincoln & Guba, 1985); ii) triangulating sources, comparing experts with different viewpoints (see, Denzin, 1978); iii) colleagues and peer review and debriefing scrutiny, which was an important contribution to this study because it allowed us to refine methods and improve the justification of our arguments; and (iv) as another criterion of evaluation (Silverman, 2000), we also compared our findings with others (e.g., Slack et al., 2013) and we primarily found congruent results.

According to Tracy's criteria for excellent qualitative research (Tracy, 2014), a worthy topic (relevant, timely, significant, and interesting) in football refereeing was studied, experts with different viewpoints (triangulation) were interviewed and the sampling procedures (i.e., the data collection method and the data analysis) were described in detail. Addressing our research question by following these recommendations for qualitative research, we believe our study brings new insights and gives an important contribution to the future development of football refereeing.

Results

Our first goal was to explore the multidimensionality that characterises excellent referees. The conceptual (sub)categories that were mentioned by 50% or more of the respondents (Table 13) are essentially related to individual characteristics (20 out of 25), such as physical fitness (N=22), experience (N=14) or game reading (N=12), which emphasise the multidimensional nature of referee performance. Likewise, participants alluded to some group characteristics (4 out of 25), such as communication and team preparation, and highlighted recognition as one organisational characteristic (1 out of 25).

Table 13. Frequency of participants according to an inside and outside perspective

(Sub)Categories	Inside Perspective			Outside Perspective		Total
	Referee	Assistant Referee	Coach	Refereeing Expert	Non-Refereeing Expert	
	(N = 7)	(N = 2)	(N = 2)	(N = 7)	(N = 6)	(N = 24)
Individual						
Physical fitness	7	2	2	6	5	22
Adaptability	7	2	2	4	5	20
Leadership	7	2	1	6	4	20
Planning and organisational skills	7	2	1	5	4	19
Commitment	6	2	1	5	4	18
Tactics knowledge	5	2	2	6	3	18
Anticipating actions	5	1	1	4	5	16
Knowing where to stand and how to move in the field	4	2	2	3	5	16
Emotional regulation	4	1	1	4	5	15
Learning disposition	6	2	0	4	3	15
Experience	5	2	2	3	2	14
Resilience	4	0	2	4	4	14
Personality	5	2	1	4	1	13
Players knowledge	6	1	2	3	1	13
Sociable	5	2	0	3	3	13
Stay cool and demonstrating poise under pressure	3	2	2	2	4	13
Values	6	0	1	3	3	13
Focus and distraction control	4	1	1	3	3	12
Game reading	3	1	1	3	4	12
Understanding the game	4	0	1	4	3	12
Group						
Communicating effectively with players, coaches and co-official	7	1	2	4	6	20
Team performance	6	0	2	6	5	19
Team preparation	4	1	1	7	4	17
Team tune	4	2	1	3	3	13
Organisational						
Recognition	5	2	0	6	3	16

The results of the CatPCA analysis suggested a three-dimension model to fit the data that characterises referee performance excellence. Those three dimensions (as principal components in PCA) accounted for 49.4% of the total variance. Each dimension explained 19.68%, 15.71%, and 13.96% (respectively) with good reliability (α_{Dim1} = .83, α_{Dim2} = .78 and α_{Dim3} = .74). Table 14 shows the loadings of each input variable and highlights the most important conceptual (sub)categories (variables) of an excellent referee in each dimension. Figures 2 and 3 are *variable* correlation *plots*, allowing to highlight the main correlations

between the variables in each of the 3 dimensions. In addition, the positively correlated variables are grouped together.

Table 14. Component loadings of the input variables

	Dimensions		
	1	2	3
	Individual preparation	Game preparation	Game management
Personality	**.419**	.280	**-.394**
Values	***.286***	.046	-.091
Adaptability	.090	.210	**.620**
Learning disposition	**.738**	-.230	.420
Sociable	**.674**	-.135	.126
Planning and organisational skills	**.584**	-.004	.267
Focus and distraction control	**.424**	.278	-.026
Commitment	**.782**	-.058	**-.311**
Stay cool and demonstrating poise under pressure	-.332	**.746**	.112
Leadership	**.406**	-.096	**.560**
Emotional regulation	**.687**	-.050	.175
Resilience	**-.384**	**-.393**	**.338**
Physical fitness	**.521**	**.544**	.167
Understanding the game	***.145***	***.138***	-.029
Game reading	.135	-.268	**.529**
Tactics knowledge	.135	**.687**	-.113
Players knowledge	-.160	**.901**	.129
Knowing where to stand and how to move in the field	.120	.032	**.652**
Anticipating actions	-.363	-.117	**.749**
Experience	-.049	**.412**	**.659**
Communicating effectively with players, coaches and co-official	-.200	**.804**	.109
Team preparation	**.636**	-.083	**-.509**
Team Tune	**.401**	**.470**	-.037
Team Performance Evaluation	-.126	**-.438**	.186
Recognition	**.710**	-.087	.209
% of explained variance	19.675	15.709	13.962

Dimension 1 was labelled as *individual preparation* because the variables that stand out were mostly associated with the *referee* (e.g., commitment, planning, emotional regulation, team preparation, learning disposition, leadership) (horizontal axis, dimension 1 in Figure 2). Figure 2 exhibit that those variables were positively correlated with dimension 1 (whose coordinates correspond to their loadings). Dimension 2 was called *game preparation* since the variables with higher loadings were, above all, associated with the game. Positively correlated with game preparation were players' knowledge, communication effectively, stay cool under

pressure and tactics knowledge (top of vertical axis, dimension 2 in Figure 2). Resilience and team performance evaluation were also relevant for dimension 2 but they were negatively related with game preparation (bottom of vertical axis, dimension 2 in Figure 2). Finally, dimension 3 was designated *game management* since the most important variables were connected to the process of leading the game (e.g., anticipating actions, experience, leadership, game reading) (top of vertical axis, dimension 3 in Figure 3). Additionally, commitment, team preparation and personality were important variables simultaneously for dimension 3 – *game management* (with a negative association) and for dimension 1– *individual preparation* (Table 13 and 4th quadrant in Figure 3).

As already mentioned, the results showed several cross-loadings variables that loads almost equally on two dimensions (i.e., personality, leadership, physical fitness, experience, team preparation and team tune) or even on the three dimensions, as resilience (Table 14).

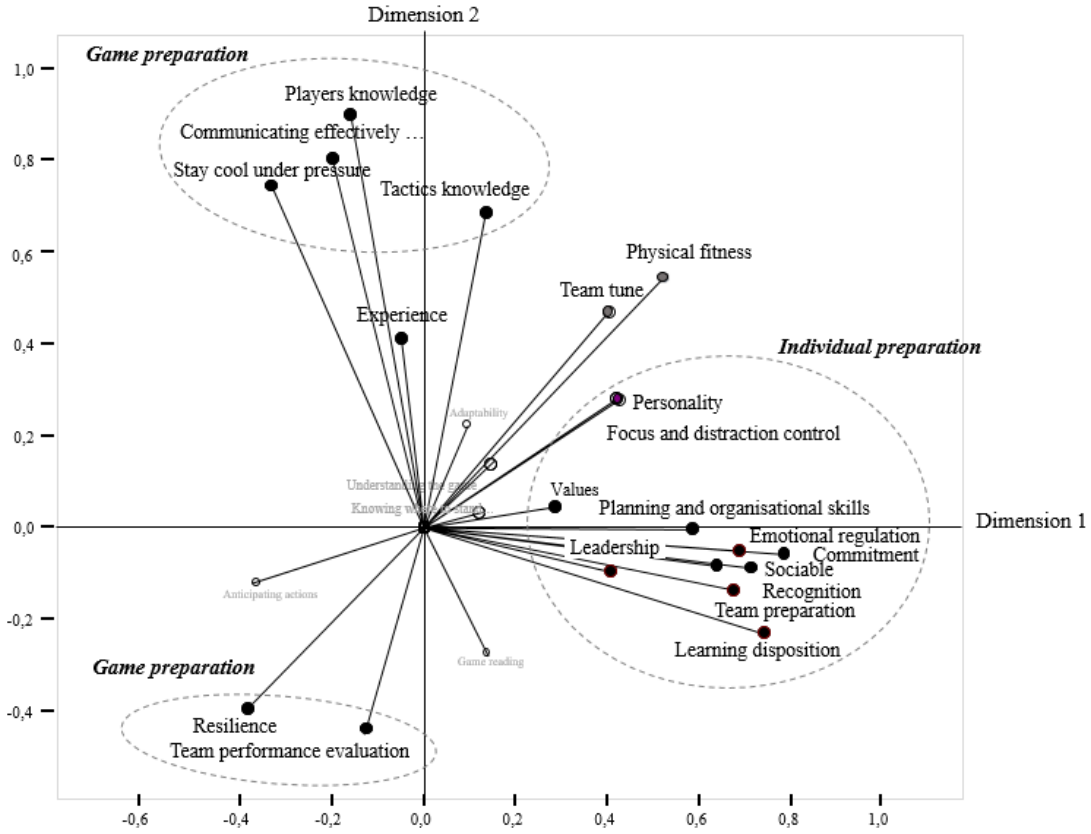

Figure 2. Loadings of the input variables on dimensions 1 and 2

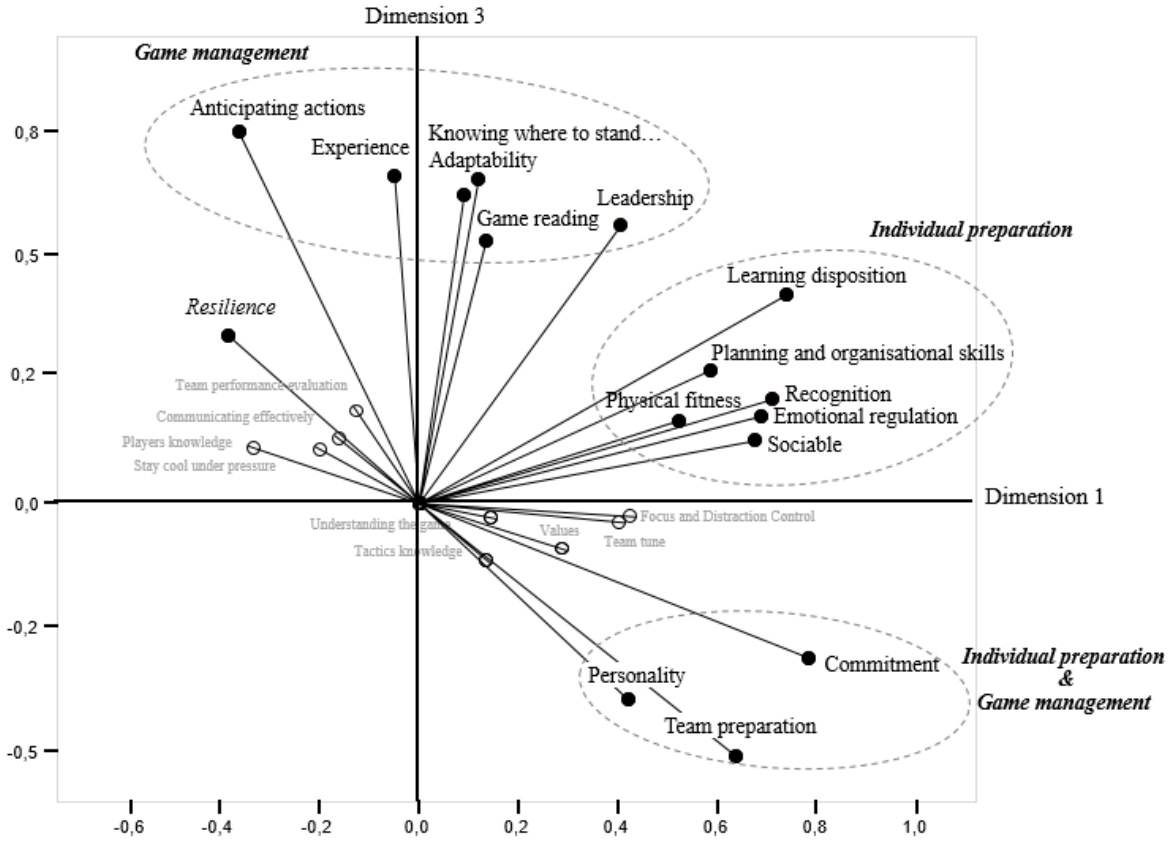

Figure 3. Loadings of the input variables on dimensions 1 and 3

Next, we went deeper into the description of the 3 dimensions of excellence according to an "inside" and "outside" perspective of the game. Figures 4 and 5 allow us to identify the position of the participant's according to their (inside or outside) perspective in each dimension. Figure 4 shows that inside and outside participants were indistinctly associated with *individual preparation* (right side of dimension 1).

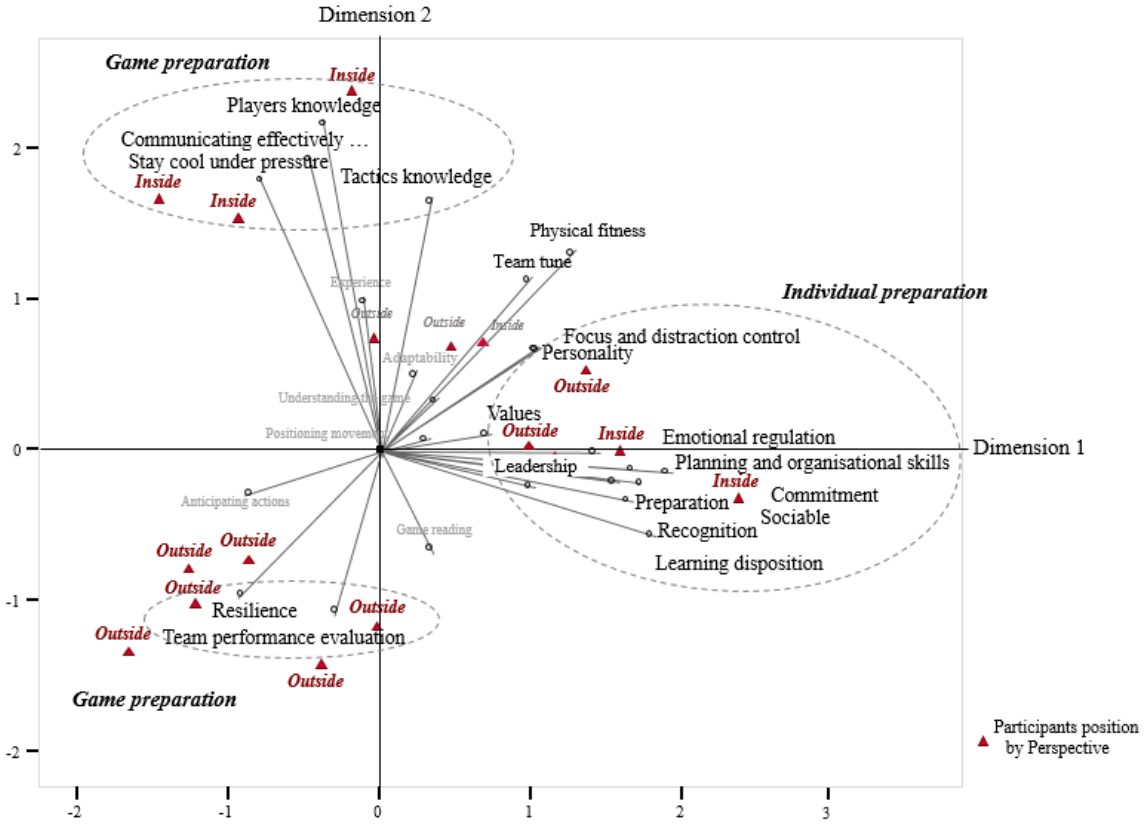

Figure 4. Perspective of the game across dimensions 1 and 2

The perspective of the game was differently related with *game preparation* (dimension 2). Inside participants privileged mainly player's knowledge, communicating effectively with players, coaches and co-officials and staying cool under pressure and tactics knowledge (top of the vertical axis, dimension 2 in Figure 4). In opposition, outside participants appeared near resilience and team performance evaluation (bottom of the vertical axis, dimension 2).

In what concerns *game management* (dimension 3), anticipating actions, experience, adaptability, knowing where to stand and how to move in the field, leadership and game reading were mainly surrounded by inside participants (top of the vertical axis, dimension 3 in Figure 5). On the other hand, commitment, team preparation and personality were options for outside participants (4th quadrant in Figure 5).

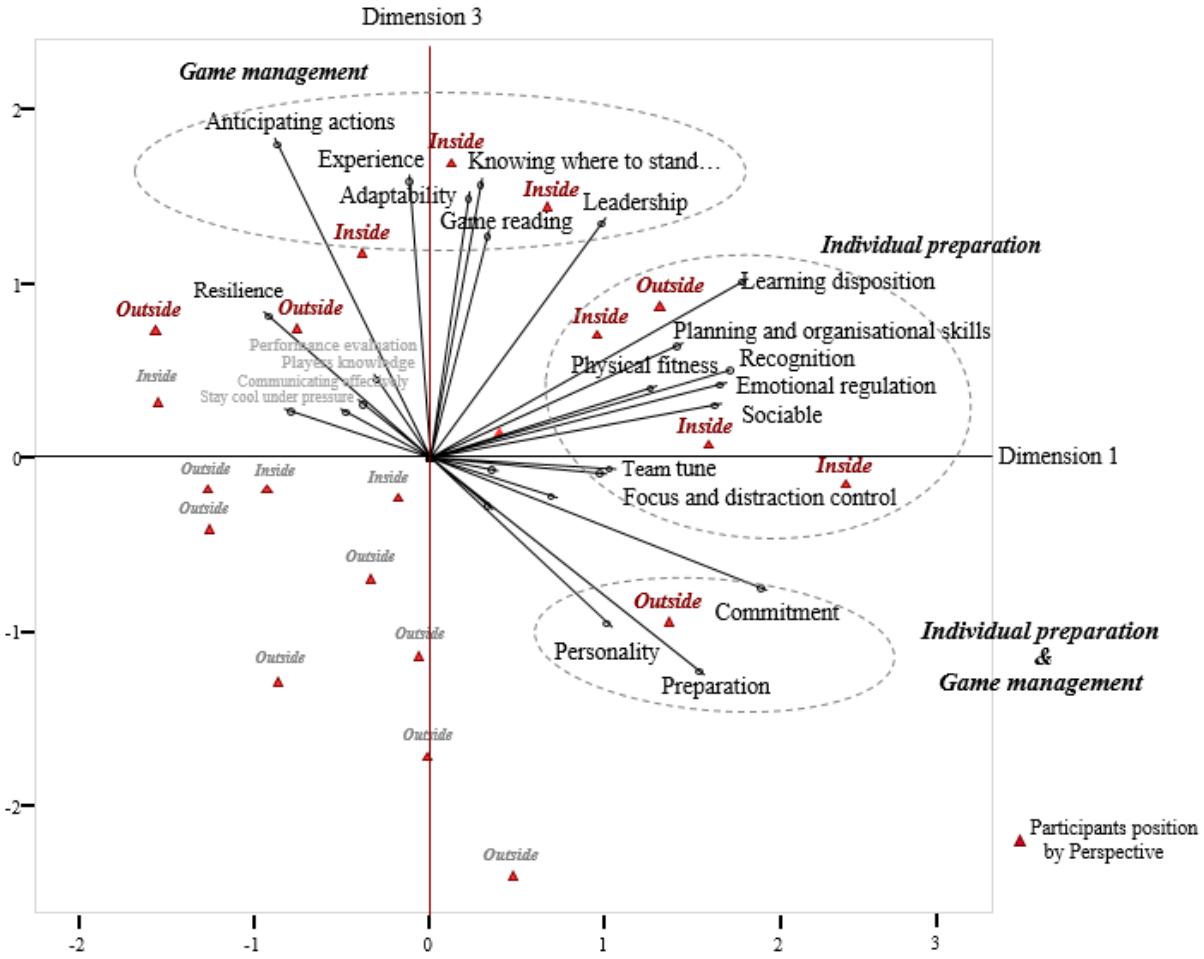

Figure 5. Perspective of the game in the dimensions 1 and 3

Discussion

Given the importance of professional football throughout the world, it is surprising that there is a great discrepancy in terms of the training and resources that football referees are provided with around the globe (Aragão e Pina et al., 2018). Nevertheless, football demands excellent referees' performances given the central role they play in games (Cuskelly & Hoye, 2013), and they are under the scrutiny of clubs, media and fans (Johansen & Haugen, 2013). To contribute to football referee excellence research, and in particular to understand what distinguishes an excellent from a satisfactory referee, our study had two objectives: (i) to explore the multidimensionality that characterises excellent referees, through the identification

of the latent dimensions that structures the performance excellence; and (ii) to identify the position of the referees according dimensions of football refereeing performance by analysing both perspectives from within football referees as well as from those with a more "outside" perspective of the game.

The 24 (sub)categories (out of 93) mentioned by 50% or more of the respondents, show the multidimensionality that characterises refereeing excellence and demonstrate the need for more research on this topic, since little is known about some categories' influence on referees' performance (e.g., leadership, personality, adaptability). Concerning major conceptual categories (Individual, Group and Organisational) it is interesting to reflect on the importance assigned to group categories (4 out of 24), which contrasts with the attention that has been given by researchers on this topic (Aragão e Pina et al., 2018). We must also question why so little attention (1 category out of 24) is given by participants to Organisational issues. Also, researchers, with few exceptions (e.g., Svantesson, 2014), dedicated little consideration to this topic, which we believe is of major importance because Organisations define policies and regulations that have an impact on the path to excellence. In particular, relegations and promotions, support provided to referees, training programmes, among others, are important factors that may have an impact on referees and their performance.

As seen, the results of the CatPCA analysis suggested a three-dimension model to fit the data that characterises referee performance excellence. We named those three dimensions individual preparation, game preparation and game management (respectively). In fact, these labels are in line with the "real life" experience because an excellent referee must commit to individual preparation and must prepare and manage the game. While topics of individual preparation such as physical fitness or staying cool and demonstrating poise under pressure were studied by several authors (Weston, Castagna, Helsen, & Impellizzeri, 2009), others such as anticipating actions, emotional regulation, learning disposition, have received very little

academic attention (Guillén & L.Feltz, 2011; Louvet, Campo, & André, 2015). Hence, as shown by Aragão e Pina et al. (2018), game preparation and game management did not trigger researchers interest, except on rare occasions (Plessner, Schweizer, Brand, & O'Hare, 2009).

Among the 24 variables (sub)categories, resilience is the only one with cross-loadings in all the three dimensions, being negatively correlated with dimensions 1 (individual preparation) and 2 (game preparation) and positively correlated with the third dimension (game management). Trying to understand these results, we could argue that participants feel that since individual and team preparation are pleasant activities, referees do not need to be resilient because they are doing what they love to do, in a controlled atmosphere. Conversely, when managing the game, stressful situations can occur, and resilience may be important to the referee. Nevertheless, authors such as Sarkar and Fletcher (2014) suggest resilience (an association between stressors and protective factors) may be classified under three categories (competitive performance, the sport organisation within which the athletes operate, and personal "nonsporting" life events). This mismatch between the literature and the participants' opinions (Secades, Molinero, & Salguero, 2016) may suggest that the relevance of resilience on refereeing performance may be underestimated and, therefore, should be further studied.

In conclusion, within our study we demonstrated the multidimensionality of performance excellence within the context of football refereeing. In particular, based on the insights provided by 24 experts in the field, we were able to pinpoint that football referee excellence is shaped by three distinct dimensions: Individual preparation, game preparation and game management. Additionally, we used CatPCA to graphically display the relationships that exist between the latent dimensions of football refereeing performance and investigated how these relationships differed for those "inside" versus those "outside" the game. Finally, as a result of our work, we believe that we have contributed to the knowledge base of factors that

shape football referee excellence while also highlighting areas in need of additional research attention.

Study 4: Self-efficacy, Mental Models, Team Adaptation and Team Performance: A First Approach on Football Refereeing

Abstract

Objective: Within the football refereeing context, where research about teams is almost nonexistent, this study investigates the moderating effect of mental models on the relationship between self-efficacy and team adaptation. Likewise, within this study, we investigate the mediating mechanism of team adaptation in the relationship between self-efficacy and team performance within the football refereeing context

Design: 376 active national referees, out of 425, filled two online questionnaires, at two different moments (April and May).

Results: Self-efficacy is positively associated with team adaption, which in turn is positively associated with team performance. Accordingly, our results are supportive of an indirect effect of self-efficacy on football referee team performance. Likewise, mental models moderated the relationship between self-efficacy and team adaptation such that as mental models increased within referee teams, the relationship between self-efficacy and team adaptation was enhanced.

Conclusion: In order to deal with the unpredictable situations they face, refereeing teams must adapt to increase team performance. This study emphasizes the importance of mental models on team adaptation and the importance of self-efficacy in predicting team performance, through team adaptation. These results should trigger researchers' attention to further explore teams in the refereeing context.

Keywords: football referees, self-efficacy, team adaptation, mental models, performance

Introduction

Football (or "soccer", or association football) is no longer just the most popular sport in the world (Alarcon, Duran, & Guajardo, 2014; Giulianotti & Robertson, 2004), but an industry or a business (Baroncelli, & Lago, 2006; Dobson & Goddard, 2011; Rickman & Witt, 2008) that generates massive financial rewards (e.g., KPMG, 2016; Nevill, Webb, & Watts, 2013; Svantesson, 2014). For example, the 2014 World Cup FIFA revenue was estimated at 4 billion dollars (AFP, 2013).

The difference between success and failure in football is often quite narrow and therefore the actions of players as well as managers often is highlighted. However, in addition to the roles that these groups play, the decisions of referees may also have a relevant financial and social impact on clubs or national teams (Buraimo, Forrest, & Simmons, 2007; Dawson, Dobson, Goddard, & Wilson, 2007). In fact, since referees' decisions often have such a profound impact on the outcomes of games and seasons (Can, Bayansalduz, Soyer, & Pacali, 2014; Helsen, Gilis, & Weston, 2006; Webb, Wagstaff, Rayner, & Thelwell, 2016), the performance of professional football referees must be excellent (Catteeuw, Gilis, Wagemans, & Helsen, 2010; Slack, Maynard, Butt, & Olusoga, 2013).

Although the laws of the game should be applied impartially (Dawson et al., 2007; Nevill et al., 2013), in order to ensure the safety of players and the integrity of matches (Catteeuw, Helsen, Gilis, & Wagemans, 2009; Helsen & Bultynck, 2004), referees have discretion in terms of their decisions regarding technical and disciplinary sanctions that may influence the match result (Dawson & Dobson, 2009; Lago-Peñas & Gómez-López, 2016). Hence, the application of some laws of the game are ambiguous (Plessner, Schweizer, Brand, & O'Hare, 2009; Souchon, Cabagno, Traclet, Trouilloud, & Maio, 2009) and referees' errors are inevitable (Balmer et al., 2007; Nevill, Balmer, & Williams, 2002) due to internal and external factors, such as perceptual errors (Gilis, Helsen, Catteeuw, Van Roie, & Wagemans,

2009; Oudejans et al., 2000)), visual errors (Ghasemi, Momeni, Jafarzadehpur, Rezaee, & Taheri, 2011), positioning (Catteeuw, Gilis, García-Aranda, et al., 2010; Mallo, Frutos, Juárez, & Navarro, 2012), prior decisions (Plessner & Betsch, 2001; Schwarz, 2011), players' vocalisations (Lex, Pizzera, Kurtes, & Schack, 2014) or stadium characteristics (Unkelbach & Memmert, 2010), among others.

Accordingly, football referees' role and performance have increasingly come under strong criticism and scrutiny (Hacicaferoğlu & Gündoğdu, 2014; Helsen et al., 2006; Johansen, 2015; Webb, 2016) given the social and financial importance of football as suggested previously, as well as the increasing number of games broadcasted (FIFA.com, 2006), the improvements in video technology (which allows for replay analysis of split-second decisions) (Dawson et al., 2007; Parsons & Bairner, 2015; Webb, Dicks, Thelwell, & Nevill, 2016), and the desire to win at all costs (Cleland, O'Gorman, & Bond, 2015). Therefore, controversy and hot debates about refereeing are guaranteed (Hacicaferoğlu & Gündoğdu, 2014; Scoppa, 2008; Svantesson, 2014), increasing the pressure placed on referees which may affect referees' performance, wellbeing and personal life (Pedrosa & García-Cueto, 2015; Perreau-Niel & Erard, 2015; Samuel, 2015).

As a result of the increasing awareness regarding the important role of football referees (Gulec & Yilmaz, 2016; Wicker & Frick, 2016), research on football refereeing has become more prevalent in the literature over the past two decades. In fact, according to (Aragão e Pina et al., 2018), 95.88% of the peer-reviewed publications (i.e., 261 articles) focused on football refereeing were published after 2001. These articles explore topics such as referees' bias (n = 53), physical (n = 74), and technical performance (n = 90). Additionally, research on football refereeing conducted thus far has predominantly focused on factors that shape the individual physical and technical performance of referees (e.g., MacMahon, Helsen, Starkes, & Weston, 2007; Mathers & Brodie, 2011; Webb, 2017). However, research conducted thus

far has neglecting other individual topics such as referee's emotions, communication, leadership, nutrition (Aragão e Pina et al., 2018). Likewise, an important finding of the integrative review performed by Aragão e Pina et al., (2018) was that to date, there has only been one study that has addressed the entire refereeing team (Boyer, Rix-Lièvre, & Récopé, 2015).

Accordingly, even though referees perform within the context of teams and their decisions are based on teamwork – in fact, Helsen and Bultynch (2004) reported that teamwork accounted for 64% of all football referee decisions, the literature addressing football refereeing has dedicated limited academic attention to the topics of teams and teamwork. This fact is intriguing given several trends within the football referee practices. For instance, referee teams have been enlarged from three members to up to six individuals, or even more, in certain competitions (Aragão e Pina et al., 2018; Webb, Wagstaff, et al., 2016). Likewise, technology adoption such as those surrounding video assistant referees (VAR) now link referee teams on the field to referees viewing the game and providing advice from afar (Aragão e Pina et al., 2018; Dohmen & Sauermann, 2015). However, when looking at other literatures, the importance attributed to team dynamics has a strong heritage (e.g., Mathieu, Maynard, Rapp, & Gilson, 2008). In fact, as stated by Martin, & Loughead (2012, p. 323), 'Although some progress seems to be happening in business and the military, so far the nature of teamwork has not aroused much interest in sport' or even within the field of sport psychology (McEwan & Beauchamp, 2014).

Accordingly, the current study takes place at a time when the importance of football is increasing and as a result there is increased urgency to improve refereeing performance. However, given the lack of research on the topic, there is a need to better understand how to improve referees' performance as well as the role of the overall referee team in shaping such performance (Aragão e Pina et al., 2018). In response, within the current study, we leverage

both individual- and team-level factors to gain a more detailed understanding of the factors that shape referee team performance. Specifically, we investigate how an individual-level cognitive factor (self-efficacy) shapes team adaptation and how this relationship is shaped by a team-level cognitive factor (mental models) and how team adaptation in turn shapes team performance within the football refereeing context (Figure 6).

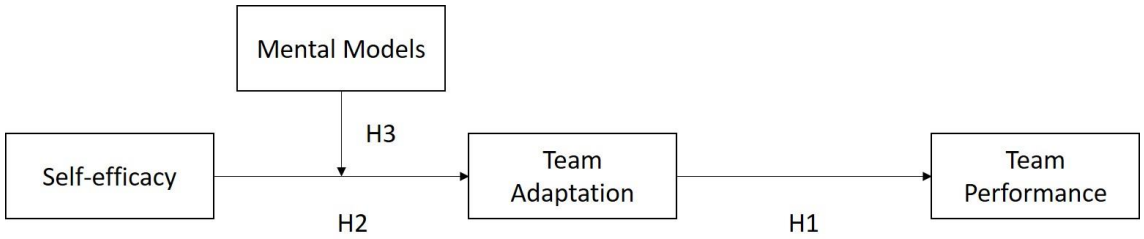

Figure 6. Research model and hypotheses.

High performance in difficult settings: team adaptation and team performance

Research has provided evidence that referee performance is shaped by whether they are prepared as well as based on their physical, psychological, and technical characteristics (MacMahon et al., 2007; Pietraszewski, Maszczyk, Roczniok, Golas, & Stanula, 2014; Slack et al., 2013). However, in addition to these individual-level characteristics, it is important to point out that professional football is highly dynamic and unpredictable (Praschinger, Pomikal, & Stieger, 2011), where environmental and external circumstances may influence referees' performance and behaviour (Diotaiuti, Falese, Mancone, & Purromuto, 2017; Watkins et al., 2014; Webb, Wagstaff, et al., 2016). In order to deal with all these issues, referees have to make observable and non-observable decisions under extreme time pressure (Helsen & Bultynck, 2004), forcing them to be made within split seconds (Hancock, 2011). Therefore, officiating is considered one of the most challenging task in sport and it is compared to high-profile jobs such as surgeons, firefighters, law enforcement officers or pilots (Dawson, 2012; Mascarenhas, O' Hare, & Plessner, 2006).

Given the complexity and demands faced by referees in professional football, and the fact that referees conduct their activities in teams, we contend that the topic of team adaptation is salient. In particular, within this context, referee teams need to adapt quickly and appropriately to dynamic changes and adjust their cognitive and behavioural processes and evaluate and analyse the situations in short periods of time (see, Burke, Stagl, Salas, Pierce, & Kendall, 2006; Rosen et al., 2011). In organizational settings, the topic of team adaptation has recently received more interest (e.g., Burke et al., 2006; LePine, 2005; Rosen et al., 2011), but team adaptation has not yet been considered within the football referee literature. However, given the dynamic nature of refereeing within football, we envision that the positive relationship that has been noted between team adaptation and performance in other contexts (Maynard et al., 2015), is likely consistent within the context of football refereeing.

Hypothesis 1: Team adaptation will be positively associated with referee team performance.

Self-efficacy and team adaptation

While we posit that team adaptation will be salient for referee team performance, it begs the question of what factors will predict team adaptation within football refereeing. There is support that individual, team, and organisational factors, as well as external factors, influence team effectiveness (Burke et al., 2006; Mathieu et al., 2008). At the individual-level, research has explored a myriad of factors that impact football referees' performance including physiological (da Silva, de los Santos, & Cabrera, 2012; Caballero et al., 2011; Ghasemi, Momeni, Rezaee, & Gholami, 2009), physical (Barberó-Álvarez, Boullosa, Nakamura, Andrín, & Weston, 2014; Castillo, Yanci, Cámara, & Weston, 2016; Weston et al., 2011), psychological (Kruger, Ekmekci, Strydom, & Ellis, 2012; Mathers & Brodie, 2011; Pietraszewski et al., 2014), and technical factors (Adnan, Muzayin, & Sulaiman, 2013; Gilis, Weston, Helsen, Junge, & Dvorak, 2006; Mellick, Flemming, Bull, & Laugharne, 2005). That

said; there has been a gap in research addressing how cognitive factors shape referee performance. Here, we investigate the cognitive factor of efficacy.

Efficacy expectation was defined by Bandura (1977, p. 193) as "the conviction that one can successfully execute the behaviour required to produce the outcomes." In 1993, Bandura (1993, p. 144), mentioned several examples of the utility of having a strong sense of efficacy as approaching difficult tasks as challenges, setting challenging goals, commitment to achieve goals or quickly recover from failure or setbacks. Each of these behaviours have been noted by several authors as being associated with football refereeing excellence (e.g., Samuel, 2015; Schnyder & Hossner, 2016; Slack et al., 2013). Nevertheless, while self-efficacy has been broadly studied within the domain of sport psychology (e.g., Diotaiuti et al., 2017; Feltz et al., 2008; Lirgg, Feltz, & Merrie, 2016) and organisational settings (e.g., Judge, Jackson, Shaw, Scott, & Rich, 2007; Katz-Navon & Erez, 2005; Rennesund & Saksvik, 2010) it has been largely ignored within the domain of football refereeing research (Guillén & Feltz, 2011).

Given the importance of the referee role on football, and the lack of research in this field, Guillén and Feltz (2011, p.1) proposed a conceptual model of referee self-efficacy and defined this construct as "the extent to which referees believe they have the capacity to perform successfully in their job." Referees' self-efficacy beliefs seem to have positive effects on confidence (Nazarudin et al., 2014; see also, Fothergill & Wolfson, 2015), satisfaction and stress (Diotaiuti et al., 2017). In contrast, a lack of efficacy may have negative impact on attention, reactions time, judgments and stress, increasing burnout (Guillén & Feltz, 2011).

The evidence that self-efficacy is an essential component of adaptation is provided by research within organisational settings (e.g., Kozlowski et al., 2001) which suggests that "adaptable behaviour is unlikely to occur unless one first has the confidence to perform such behaviour." (Griffin & Hesketh, 2003). Hence, individual-level factors that have been demonstrated to shape individual adaptation (as self-efficacy) may contribute to team's

adaptation (Maynard et al., 2015). Therefore, we argue that self-efficacy will affect team adaptation.

Hypothesis 2: Self-efficacy will be positively associated with team adaptation.

Mental models

While hypothesis 2 suggests that a team that is comprised of individuals with higher individual self-efficacy will result in enhanced levels of team adaptation, it begs the question of how team-level constructs may moderate such a relationship between self-efficacy and team adaptation. Prior work has suggested that constructs such as mental models, experience and collective efficacy (Maynard et al., 2015) are salient for team adaptation. Within the current study our focus is on mental models because such models are the basis for reasoning, decision-making and behavior (Jones, Ross, Lynam, Perez, & Leitch, 2011) – each of which is crucial to football referees' performance. Likewise, according to (Cannon-Bowers, Salas, & Converse, 1993), team mental models allow team members to anticipate other members' needs and actions and adapt their behaviours concerning the task demands and the other members. Likewise, from the organizational literature, there is evidence to suggest that mental models are important to enhance team effectiveness through team processes such as coordination and communication (e.g., Marks, Zaccaro, & Mathieu, 2000; Mathieu et al., 2000).

Within the context of the current study, before, during and after a football game, several types of interactions between individuals of the referee team are required, such as training, game preparation, travelling, the game itself, debrief and evaluation. To achieve excellent performance, the refereeing team must: i) coordinate several tasks (e.g., travelling, game preparation) according to the game that they were appointed to Samuel (2015); ii) understand the task they will perform and share technical and tactical knowledge (Button, Hare, & Mascarenhas, 2006; Mallo et al., 2012; McEwan & Beauchamp, 2014) to be able to have performance levels adequate to match game needs; iii) establish a communication protocol

during the game, to help the decision-making process (Samuel, 2015); iv) learn continuously as experience grows working with team members (Collina, 2004); among others.

Unfortunately, little is known about the effects of team-level constructs within football refereeing research (Aragão e Pina, et al., 2018; Slack et al., 2013). That said, we contend that the four content domains underlying team mental models proposed by (Cannon-Bowers et al., 1993), (i.e., equipment model, task model, member model and teamwork model) deserve research attention. The context of football refereeing is an interesting one to examine team-level constructs because football referees rarely train with the exact team members that they actually perform their tasks on the pitch with players. Instead, even at the elite level, such interactions mainly occur in training events or technical seminars (see, Webb, Wagstaff, et al., 2016; Webb & Thelwell, 2015). Accordingly, even though it has yet to receive much research attention, we think it important to explore the moderating impact of mental models.

We expect that the relationship between self-efficacy and team adaptation will be positively moderated by mental models. Namely, while self-efficacy should benefit the process of team adaption, this relationship should be even more pronounced when the team is on a similar page as the result of overlapping mental models. Therefore, in teams where individuals have overlapping cognitive structures (i.e. mental models), the salience of being confident as individuals (i.e. self-efficacy) should be even more important for team adaptation (see, (Marques-Quinteiro, Curral, Passos, & Lewis, 2013; Santos, Passos, & Uitdewilligen, 2016). Namely, having team members who have higher levels of self-efficacy and see the situation in a similar way (i.e. mental models) should be better able to adapt to changing situations (see, Judge et al., 2007; Pulakos et al., 2010). Accordingly, we posit that:

Hypothesis 3: Mental models will moderate the relationship between self-efficacy and team adaptation such that as mental model agreement increases, the relationship between self-efficacy and team adaptation should be enhanced.

Methods

Participants

In this study, out of 425 active national referees contacted for this study, 376 completed the first questionnaire - a very good response rate (84.47%) when compared to others (e.g., Cuskelly & Hoye, 2013; Praschinger et al., 2011; Perreau-Niel & Erard, 2015). Of the 376 surveys, 26 did not provide gender information; however, of those that did, our sample includes 316 men and 34 women who are part of the Portuguese Football Federation. Likewise, these referees work at the national or professional level, have experience levels that range from 1 season to 27 seasons ($\chi = 12.76$, SD = 5.20).

Procedures

Informed consent was obtained from all participants and confidentiality for their responses was assured. Data was collected at two different time moments to reinforce causality inferences (Mathieu & Taylor, 2006) and to reduce common-method variance (Brannick, Chan, Conway, Lance, & Spector, 2010). The first online questionnaire was sent to the participants by e-mail in April 2016. One month later (i.e. May 2016), which happened to be prior to the publication of the season overall referees' performance, the second questionnaire was also sent by email. Self-efficacy and perception of team mental models were measured in the first questionnaire, and perception of team adaptation and team performance were included in the second questionnaire.

Measures

Self-efficacy. Self-efficacy (survey 1) was measured with five items adapted from the Generalized Self-Efficacy Scale (Nunes, Schwarzer, & Jerusalem, 1999). Example items are

"I have the necessary skills to perform well as a referee / assistant referee." and "I do not have any problems adjusting to the different refereeing teams." (1 = I totally disagree to 7 = I totally agree). The internal consistency of the scale was good (see, (DeVellis, 2003); (Kline, 2005), Cronbach's α = .72.

Mental models. Mental models have been measured through a variety of techniques (Mohammed, Klimoski, & Rentsch, 2000). However, in the current study, we worked with three refereeing experts (i.e., international referees with vast experience) to create items that could operationalize mental models in the context of football refereeing. Specifically, we created 13 items to operationalize the mental models (see, Resick et al., 2010; Santos et al., 2016) which were administered in survey 1 with example items including: "On my team, members have a similar understanding of the features that are needed to make decisions during a game." and "On my team, members have a similar understanding of the technology and tools needed to make decisions during a game." (1 = I totally disagree to 7 = I totally agree). Cronbach's α = .95.

Team adaptation. Team adaptation was measured in survey 2 with 10 items adapted from (Pulakos et al., 2002; see, Marques-Quinteiro, et al., 2015). Example items are "My team was effective in solving problems for which there were no easy or direct answers." and "My team was effective in finding innovative ways to deal with unexpected situations." (1 = I totally disagree to 7 = I totally agree). The internal consistency of the scale was good, Cronbach's α = .93.

Team performance. Team performance was measured in survey 2 with four items: two adapted from González-Romá, Fortes-Ferreira, & Peiró (2009); one adapted from Hackman (1990) and one adapted from Cook, Hepworth, Wall, & Warr (1981). Example items are "My team was effective." and "My team had an excellent performance." (1 = I totally disagree to 7 = I totally agree). The internal consistency of the scale was good, Cronbach's α = .87.

Control variables. Individual experience as a referee, gender and role variables were included as control variables in our analysis because they may impact team performance (e.g., Passos & Caetano, 2005; Apesteguia, Azmat, & Iriberri, 2012; Judge et al., 2007).

Data Analysis

To test our model, a linear regression was performed and the results showed: i) an independence of residuals, as assessed by a Durbin-Watson statistic of 1.997; ii) all the Tolerance values were greater than 0.1 (the lowest was 0.765), which means that there was not a problem with collinearity in this particular data set; iii) leverage points were all above the "safe" value of 0.2; iv) normality was observed; v) The R^2 for the overall model was 49.8%, with an adjusted R^2 of 49.3%, a large effect size according to Cohen (1988); v) team adaptation, self-efficacy and mental models statistically significantly predicted team performance, F(3, 269) = 89,129, $p < .0005$. Given the good fit of the model, the indirect effect of self-efficacy on team performance was tested with the PROCESS macro (Model 7) developed by Hayes (2013).

Results

Table 15 provides the means, standard deviations, and the correlations for all variables. As detailed in this table, it appears that role variables are positively related with years of activity. Additionally, gender appears to be negatively related to years of activity and self-efficacy. While these relationships with the covariates are interesting, the focus of our study is on the relationships between self-efficacy, team adaptation, and team performance. To this end, it is evident from table 15 that self-efficacy is positively related with mental models, team adaptation, and team performance. Additionally, team adaptation is positively related to team performance.

Table 15. Means, standard deviations, and variables correlations

	M	SD	1	2	3	4	5	6
Role[a]								
Gender[a]			-.26**					
Years of Activity[a]	12.68	5.23	.20**	-.12**				
Self-efficacy[a]	6.29	0.53	.10	-.12**	.07			
Mental models[a]	6.03	0.69	-.11**	.00	-.02	.40**		
Team adaptation[b]	4.83	0.66	.02	-.04	.00	.42**	.62**	
Team performance[b]	5.83	0.81	-.01	-.08	.00	.32**	.53**	.65*

Notes: N = 276. ** $p < .01$. [a] variables collected at time 1 [b] variables collected at time 2

Tests of Mediation

Hypothesis 1 and 2 were tested with the PROCESS macro (Model 4) developed by Hayes (2013) with 5,000 bootstraps. Supporting Hypothesis 1, team adaptation was positively associated with team performance (B = .77, t(270) = 12.45, $p < .01$; 95% CI: 0.652, 0.896). Also, in support of Hypothesis 2, self-efficacy was positively associated with team adaptation (B = .77, t(270) = 12.45, $p < .01$; 95% CI: 0.000, 0.652). Next, we looked at the relationship between self-efficacy and team performance. While the direct effect was not significant (B = .08, t(271) = 1.07, $p > .05$; 95% CI: -0.071, 0.239), there was a significant indirect effect of self-efficacy on team performance through team adaptation (B = .41, t(271) = 1.07, $p < .01$; 95% BootCI: 0.277, 0.570). Therefore, our data supported the mediator role of team adaptation between self-efficacy and team performance.

Tests of Moderator

Table 16 present the results of Hypothesis 3, which predicted that as mental model increase within teams, the relationship between self-efficacy and team adaptation will be enhanced. This relationship was tested with the PROCESS macro (Model 7) developed by Hayes (2013) with 5,000 bootstraps. The results showed a moderating effect of mental models on the relationship between self-efficacy and team adaptation (B = .11, t(275) = 2.47, $p < .05$).

Considering the significant interaction effect, and according to Aiken & West (1991) and Dawson (2013), simple slopes were graphed. Figure 7 shows the effect of high and low

mental models on team adaptation under low and high self-efficacy (+/- 1 SD above and below the mean, respectively). Consistent with our expectations (and supporting Hypothesis 3), while the relationship between team self-efficacy and team adaptation is generally positive, this relationship is enhanced to the extent that mental models have more agreement within the team.

Table 16. Results of Moderated Mediation Analysis (*Hypothesis* 3)

Predictor variable	B	SE	t	*p*
DV: Team adaptation (Mediator variable model) $R^2 = .41$; $p < .001$				
Constant	4.81	.03	152.00	.00
Self-efficacy	.24	.06	3.88	.00
Mental models	.52	.05	10.63	.00
Self-efficacy * Mental models	.11	.05	2.47	.01
DV: Team performance (DV model) $R^2 = .43$; $p < .001$				
Constant	2.07	.30	6.93	.00
Team adaptation	.78	.06	12.65	.22
Self-efficacy	.09	.07	1.22	.00
Mental models Conditional Indirect Effect	Unstandardized boot indirect effects	Boot SE	Boot LLCI	Boot ULCI
-1 SD (-0.71)	0.13	0.08	0.04	0.29
M (0.00)	0.19	0.06	0.12	0.37
+1 SD (0.71)	0.25	0.07	0.17	0.48

Notes: N = 279; DV = Dependent Variable. Bootstrap sample size = 5000. All predictor variables were mean-centered. LL = lower limit; CI = confidence interval; UL = upper limit

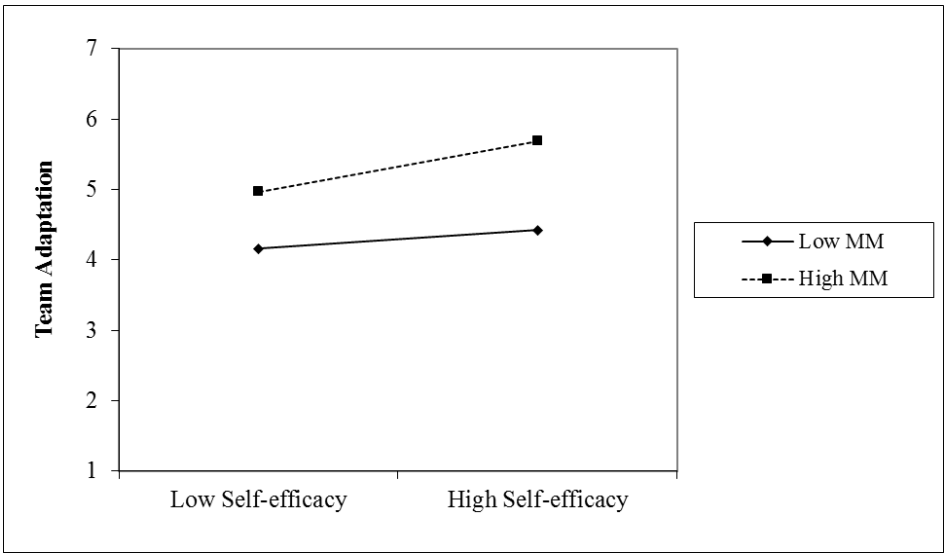

Figure 7. Moderation effect of mental models (MM) between self-efficacy and team performance

Discussion

Football refereeing is highly demanding and takes place within dynamic contexts. Under these circumstances, beliefs of self-efficacy (an individual-level cognitive factor) are important to reduce stress, enhance confidence and performance (Myers, Feltz, Guillén, & Dithurbide, 2012; Nazarudin et al., 2014). Hence, it is known from organisational literature that this kind of context requires team adaptation to improve performance and, therefore, it is essential that teams share mental models (Maynard et al., 2015). Nevertheless, competencies and responsibilities, once centralized on the main referee, are evolving to the refereeing team, which have particular characteristics, such as, training (usually the whole team does not train together) and composition (the team composition may depend on the type of the game and the competition they are assigned to, i.e., national leagues, national cups or international games) (Aragão e Pina et al., 2018).

The football refereeing literature reveals a lack of research on the refereeing team and, therefore, this study is a first contribution to understand how individual factors contribute to team performance. In particular, it was investigated how an individual-level cognitive factor (self-efficacy) shapes team adaptation and how this relationship is shaped by a team-level cognitive factor (mental models) and how team adaptation, in turn, shapes team performance within the football refereeing context.

Empirically, it is easy to envision several situations where refereeing teams may need do adapt in order to have an excellent performance. In fact, weather, culture, type and moment of the competition, club's rivalry, broadcasting, number of spectators, stadium type, game pace, score progress, kind of players, coaches and refereeing team composition are just some factors that may increase the salience of team adaptation. While there is a positive relationship between team adaptation and performance in other contexts (Maynard et al., 2015), such evidence in the

football refereeing context was non-existent until now. This study shows that team adaptation was positively associated with football referee team performance.

Likewise, we found support for our hypothesized positive relationship between self-efficacy and team adaptation, which we hope will trigger the attention of researchers to further explore this topic (see, Guillén & Feltz, 2011). Hence, refereeing organisations should include self-efficacy in refereeing training programmes in order to improve team adaptation, as supported by the results of this study, and to enhance referees' confidence (Nazarudin et al., 2014) and satisfaction (Diotaiuti et al., 2017) and prevent the negative impact on attention, reactions time, judgments and stress that a lack of self-efficacy may cause (Guillén & Feltz, 2011).

Finally, our findings further demonstrate the need for more research on team phenomenon within the context of football refereeing as we found evidence that as mental model agreement increases, the relationship between self-efficacy and team adaptation is enhanced. Considering this result, not only do practitioners and academics need to more fully examine individual-level factors that may shape team adaptation and performance within this context but also team-level factors. In terms of mental models, given the research that has highlighted the importance of mental models for reasoning, decision-making and behaviour (Jones et al., 2011) as well as the work which has examined their role in enhancing team effectiveness (e.g., Marks et al., 2000; Mathieu et al., 2000), it is crucial that mental models be given more attention within the governing bodies and their training programs focused on football referees but also researchers interested in this context (see, also Aragão e Pina et al., 2018).

Limitations

While we feel that the current study has several strengths (interesting sample, good response rate, multiple time periods over which data was collected, etc.), we cannot ignore the

fact that this study has its limitations and here we mention two of them. First, data was collected using self-reports and, even for team performance, we could not access objective performance indicators such as the final raking of each team. Accordingly, future research should consider trying to obtain such data to reduce the concern of self-report data.

The second limitation is also related to data collection. Namely, while the focus of our study was on team dynamics (i.e., team adaptation), team cognition (i.e. mental model), and team performance, we collected our data from individual referees and thus could not connect the responses to particular teams of referees. As such, we have individual-level perceptions about the teams that they worked on during the season. We think this is a nice first step to the conversation centred on team phenomenon within the context of football refereeing but call on future research to build on this work and actually examine intact referee teams and how they perform in a single game. As such, we hope that the work conducted here will be a starting point for research on football refereeing and set the stage for more work examining team-level constructs within this context given the salience of teamwork within football refereeing.

Section IV: General Conclusions

Introduction

Football (or soccer), as the most popular sport in the world, triggers passions and moves crowds all over the world (e.g., Alarcon, Duran, & Guajardo, 2014). In 2014, according to (FIFA.com, 2015), the estimated TV audience for the 2014 FIFA World Cup was 3.2 billion people (almost half of the world population), which illustrates the global involvement with football. This sport is played with the same intensity and fervour, from the narrowest alley in the Medina in Marrakech, in the favela (shanty town) of Rocinha in Rio de Janeiro or even at the mythical Wembley Stadium in London. In many countries, this is a sport that initiates newscasts, is the main topic of television programmes and fills the pages of newspapers that are almost exclusively devoted to this sport. The players are honoured by many fans and often become authentic ambassadors of their clubs and respective countries (e.g., Cristiano Ronaldo; Messi). The same applies to some coaches (e.g., Mourinho; Alex Fergunson) and even to referees (e.g., Pedro Proença; Pierluigi Collina).

The football' economic value is unquestionable (KPMG, 2016; Rickman & Witt, 2008; Scoppa, 2008). For instance, the total investment budget for the 2018 FIFA World Cup Russia amounts to over 1.9 billion U.S. dollars and the total revenue of the top European professional soccer leagues (Big Five) in the 2018/19 season was estimated at 16.97 billion euros (Statista, 2018). The football' political interest is also incontestable. For instance, the Chinese President Xi Jinping wants to transform the country into a great soccer power (Buckley, 2017).

Nevertheless, football is facing challenges such as corruption (Boeri & Severgnini, 2008), match fixing (Hill, 2009), violence (Van Der Meij et al., 2015) and racism (Wagner-Egger, Gygax, & Ribordy, 2012). Although it is recognized that refereeing a football match is a highly complex activity (Dell, Gervis, & Rhind, 2014; Mascarenhas, O'Hare & Plessner, 2006; Weston et al. 2012), referees' performance is under strong scrutiny (Johansen, 2015; Parsons & Bairner, 2015; Webb, 2016) because their decisions may influence the course and

outcome of a football match (Fruchart & Carton, 2012), and may have a vital impact on promotions, relegations or qualifications to tournaments, which may represent millions of dollars (Helsen, Gilis, & Weston, 2006). For instance, the 2014 World Cup was controversial due to a number of refereeing errors that impacted the results of several matches (Svantesson, 2014).

Considering the football' social and economic importance previous stated, the complexity and importance of the referee' role (Helsen & Bultynck, 2004; Mascarenhas, O' Hare, & Plessner, 2006; Wicker & Frick, 2016; Wühr, Fasold, & Memmert, 2015), the pressure on referees to perform better, to ensure justice and/or fairness (Johansen, 2015; Slack, Maynard, Butt, & Olusoga, 2013; Webb, 2016), the changes recently introduced (e.g., the increased number of the elements that make up a refereeing team; audio communication systems; the goal line technology; the video assistant referee) (D' Orazio et al., 2009; Solomon, Paik, Alhauli, & Phan, 2011), the scattered research on football refereeing and the scarcity of research on several football refereeing areas (Catteeuw, Helsen, Gilis, & Wagemans, 2009; Mascarenhas at al., 2006), we believe that this thesis may contribute to football refereeing, theoretically and in practice.

Specifically, the first study aimed to provide an updated integrative review of studies addressing football refereeing in order to (1) Organise the football refereeing research by categorising the published articles; (2) Create a comprehensive panorama of football refereeing research, by highlighting the researched topics, their evolution, methodological approaches and geographical contexts; and (3) Provide a research agenda on football refereeing, by identifying research topics that need to be further studied. While providing a broad understanding of the phenomenon under study and a solid theoretical structure for the all work of this thesis, this integrative review helped us to clearly identify gaps on the literature and to delineate adequately the next steps.

Considering the practical need to enhance the referees' performance (Johansen, 2015; Slack, Maynard, Butt, & Olusoga, 2013; Webb, 2016) and the little attention that research devoted to study football referees' excellence (Aragão e Pina, et a., 2018; Gilis, Helsen, Catteeuw, Van Roie, & Wagemans, 2009), the second study aimed to identify, categorise and analyse the distinctive characteristics of top-level referees that excel, compared to those that (under similar circumstances) do not achieve excellent results. It must be stressed out that our work is different from others that tried to understand the factors that may enable a referee to reach the elite levels (e.g., Dosil & González-Oya, 2003; García-Más, 2002; MacMahon, Helsen, Starkes, & Weston, 2007; Mathers & Brodie, 2011; Schnyder & Hossner, 2016; Slack et al., 2013). In fact, the focus of the current work is to provide insight regarding the factors that impact whether a referee within this upper echelon of referees is excellent, i.e., super-elite-level soccer referee, or whether a referee within this upper echelon of referees is 'merely' good.

By interviewing 24 experts in football and football refereeing that provided both an 'inside' (i.e. referees, assistant referees and coach/managers) and an 'outside' (i.e., technical and physical coach, observers, journalists) perspective of the game, we were able to identify several characteristics that appear to shape a referee's performance level (and distinguish them as either good or excellent). Hence, the results of the current study highlight whether the characteristics emerge from the individual referee themselves, or are attributable to team or organisational factors.

To ensure the consistency and accuracy of the referees' decisions and the integrity of matches (Dawson, Dobson, Goddard, & Wilson, 2007; Helsen & Bultynck, 2004), UEFA, FIFA and IFAB implemented several measures such as, the goal line technology, the Video Assistant Referees (VAR) or increasing the number of referees per game (Aragão e Pina et al., 2018). While such measures may contribute to decrease the number of referees' errors, new challenges may also occur. For instance, competencies and responsibilities, once centralized

on the main referee, are now shared with the refereeing team that have particular characteristics (usually the whole team does not train together, the team composition may depend on the type of the game and the competition they are assigned to, i.e., national leagues, national cups or international games, among other factors) (Aragão e Pina et al., 2018).

Under a task highly demanding that takes place within dynamic contexts, the refereeing team' performance depends on several factors such as the team ability to adapt, the shared cognitions, the coordination processes or the communication processes (Araújo, Davids, & Hristovski, 2006; Burke et al., 2006; Marques-Quinteiro et al., 2015; Maynard et al., 2015). Nevertheless, within the football refereeing literature and according to Aragão e Pina et al. (2018), there has only been one study that has addressed the entire refereeing team (Boyer, Rix-Lièvre, & Récopé, 2015). Therefore, this 4th study is a first contribution to understand how individual factors may contribute to team performance. Specifically, we aimed to investigate how an individual-level cognitive factor (self-efficacy) shapes team adaptation and how this relationship is shaped by a team-level cognitive factor (mental models) and how team adaptation in turn shapes team performance within the football refereeing context

Following, we will discuss the theoretical and practical implications, as well the limitations of this thesis, and directions for future research. Finally, we will present a brief conclusion about the main contribution of this work.

Implications and Suggestions for Future Research

The complexity of the football refereeing is evident throughout the previous sections of this thesis. Under these circumstances, and according to Hancock et al. (2015), researchers must understand the state of the art of the football refereeing literature, if they want to meaningfully contribute to this research field.

A comprehensive panorama of football refereeing research is now available, i.e., all the articles published in Web of Knowledge and Scopus databases, through September 2016, were organised and categorised, and researched topics, their evolution, methodological approaches and geographical contexts were highlighted. This literature "roadmap" and the provided research agenda on football refereeing is a new starting point for researchers. It can, also, be valuable to football organisations that may take advantage of practical suggestions that were presented or other organisations that may wish to contribute to football refereeing development, supporting research projects.

Among many suggestions that may contribute to theoretical and practical develop refereeing, we would like to stress out nine topics:

(i) The need to understand the refereeing team (4th referee, assistant referees, and additional referees), their communication and coordination process, their collective decision making, their individual and collective objectives, among many other aspects.

(ii) Considering the urgency to improve refereeing decisions, it would be important to understand the effect of the video assistant referee (VAR) on the team' decision-making process. Further, it would be also important to understand the consequences of not having the VAR, since there are competitions where the technology is not available.

(iii) Explore how to improve decision-making training, at different refereeing levels, considering different theories, as claimed, for example, by Araújo (2013).

(iv) Understand the referees' and assistant referees' training process across gender, level, and age (see, Castillo, Yanci, Cámara, & Weston, 2016; Weston, Helsen, Macmahon, & Kirkendall, 2004). Should referees from different levels and age groups train together, and should they have different training session designs? Is

it possible to differentiate training, considering facilities and technical assistance? By examining these questions, the various governing bodies that are responsible for training referees will have a better understanding of factors that may impact the efficacy of training programs (see, Oliveira et al., 2016).

(v) Explore nutrition's effect on fitness tests, training, and match performance (see, Reilly & Gregson, 2006; Reñón & Collado, 2014; Teixeira, Gonçalves, Meneses, & Moreira, 2014).

(vi) Characterise refereeing organisations. With few exceptions (e.g., Webb, 2014a), little is known about National and Regional refereeing structures or about people who work there and manage a significant number of referees, assistant referees, trainers, and observers from football, futsal and/or beach football. We believe this knowledge could be very informative to National Federations and Regional Associations.

(vii) Promote a recruitment and development model in order to help regional associations to better recruit and maintain referees. This is important in a variety of countries where recruiting and retaining referees is problematic. It may also shed light on whether recruiting and retaining practices need to be changed, according to the different levels of referees (see, Brackenridge et al., 2011; Wicker & Frick, 2016);

(viii) Team cognitive factors (see, MacMahon et al., 2014, pg. 137; Mohammed, Ferzandi, & Hamilton, 2010), communication (see, Cunningham, Simmons, Mascarenhas, & Redhead, 2014; MacMahon et al., 2014; Mascarenhas et al., 2005) and team communication (De Vries, Van den Hooff, and de Ridder, 2006) and team leadership (see, McEwan & Beauchamp, 2014; Zaccaro, Rittman, & Marks, 2002) and self-leadership (Manz & Sims, 1987).

(ix) Considering research projects, to adopt a consistent refereeing sample level such as Top (international and professional leagues), National and Regional (see, Hancock et al., 2015; MacMahon et al., 2007) and include, as much as possible, referees and assistant referees across levels (Top, National, and Regional) in order to compare results and draw conclusions that can help each level develop (see, Alonso-Arbiol et al., 2005; Louvet et al., 2015).

The results from Study 2 revealed 93 football refereeing excellence characteristics, which by itself is already a theoretical and practical contribution. In fact, given the lack of research on this field, several areas were identified where future research is needed. For example, understanding the game is one characteristic that may contribute to excellence, but as far as we know, refereeing organisations do not integrate this subject in refereeing programmes or provide study materials so that referees could study autonomously. As another example and considering that referees are frequently exposed to TV and other media (Webb, 2016), the referee' image may be a differentiating characteristic. Knowing this, several measures can be taken by the refereeing organisations, or the referees itself (e.g., training programmes, image consultancy), in order to take advantage of this public exhibition.

Study 2 and 3 includes a diverse sample of participants, which provides an "inside" (e.g., referees, coaches) and "outside" perspective of the game (e.g., referees' observers, trainers, journalists). Most of studies thus far have only considered the inside perspective (Durand-Bush & Salmela, 2010; Schnyder & Hossner, 2016), which may not provide a full picture of the topic. This triangulation of perspectives will further enhance our understanding of performance excellence in football refereeing (Slack et al., 2013).

Study 3 also emphasise the multidimensionality of performance excellence within the context of football refereeing. In particular, we were able to pinpoint that football referee excellence is shaped by three distinct dimensions: Individual preparation, game preparation

and game management. Additionally, we used a relatively novel methodology in this field by combining qualitative and quantitative data analysis. Specifically, we used CatPCA to graphically display the relationships that exist between the latent dimensions of football refereeing performance and investigated how these relationships differed for those "inside" versus those "outside" the game.

Finally, study 4 study is a first contribution to understand how individual factors contribute to team performance. In particular, it was investigated how an individual-level cognitive factor (self-efficacy) shapes team adaptation and how this relationship is shaped by a team-level cognitive factor (mental models) and how team adaptation, in turn, shapes team performance within the football refereeing context.

The results show that team adaptation was positively associated with football referee team performance. Likewise, we found support for our hypothesized positive relationship between self-efficacy and team adaptation, which we hope will trigger the attention of researchers to further explore this topic (see, Guillén & Feltz, 2011). Hence, refereeing organisations should include self-efficacy in refereeing training programmes in order to improve team adaptation, as supported by the results of this study.

Finally, our findings further demonstrate the need for more research on team phenomenon within the context of football refereeing as we found evidence that as mental model agreement increases, the relationship between self-efficacy and team adaptation is enhanced.

Limitations

A recent integrative review on football refereeing revealed that 220 peer-reviewed publications (out of 267; i.e., 82.41%) were published in the last decade (Aragão e Pina, Passos, Araújo, & Maynard, 2018). These figures, while revealing a flourishing field of research, may undercover some weaknesses, such as contradictory results that need further explanations (e.g., Castagna, Abt, & D'Ottavio, 2004; Louvet, Campo, & André, 2015; Mascarenhas et al., 2009) and lack of research in some topics (e.g., refereeing professionalism).

Despite the significant amount of peer-reviewed publications that were analysed in study 1, the inclusion criteria could have included other criteria to expand the categorisation that was done and provide an even broader perspective of the refereeing research literature. Hence, the data collection and data analysis, while based on qualitative research authors, in order to have the best quality data, it will not be exempt from criticism. Nonetheless, the themes and subthemes, as the categorisation system that support the integrative review were validated by independent researchers.

Studies 2 and 3 have two main limitations. First, while our data includes subject matter experts (SMEs) in the area of football refereeing and do so from both an "inside" and "outside" perspective, if we had obtained more individuals to participate in our data collection, perhaps we could have further divided our sample in other ways such as "outside" within a team and "outside" from a regulatory body such as FIFA. Nevertheless, the sample favourably compares to other qualitative studies (Dell, Gervis, & Rhind, 2014; Macnamara, Button, & Collins, 2010; Mellalieu, Neil, Hanton, & Fletcher, 2009), especially considering the stature of the individuals interviewed (see, Biddle, Markland, Gilbourne, Chatzisarantis, & Sparkes, 2001) – i.e., most of them were either current or prior referees or coaches at the international level. Second, we should have followed one mode procedure outlined by Lincoln and Guba (1985). Specifically,

each participant should have received an electronic transcribed copy of his interview to confirm that the information contained was precise in content and meaning. In fact, to ensure that the transcripts accurately captured the interview (McLellan, MacQueen, & Neidig, 2003), five random interviews were completely reviewed. In addition, the three initial and final minutes, as well as minutes 23 and 32 (when applicable) of all interviews were also checked by an external expert who compared the transcription with the relevant audio file. Anyway, the transcriptions should have been sent to each participant.

Considering study 3, and given the lack of research on this field, we could also have done a focus group with subject matter experts in the area of football refereeing in order to further explore the study' results. Therefore, future research should try to use complementary methodologies to help to strengthen the study outcomes.

Finally, while we feel that study 4 has several strengths (interesting sample, good response rate, multiple time periods over which data was collected, etc.), we cannot ignore the fact that this study has its limitations and here we mention two of them. First, data was collected using self-reports and, even for team performance, we could not access objective performance indicators such as the final raking of each team. Accordingly, future research should consider trying to obtain such data to reduce the concern of self-report data.

The second limitation is also related to data collection. Namely, while the focus of our study was on team dynamics (i.e., team adaptation), team cognition (i.e. mental model), and team performance, we collected our data from individual referees and thus could not connect the responses to particular teams of referees. As such, we have individual-level perceptions about the teams that they worked on during the season. We think this is a nice first step to the conversation centred on team phenomenon within the context of football refereeing but call on future research to build on this work and actually examine intact referee teams and how they perform in a single game.

Final Conclusions

The main goal of the present thesis was to contribute to football refereeing development, theoretically and in practice. The thesis included one theoretical and three empirical studies. Study 1 provided a comprehensive panorama of football refereeing research. Through an integrative review, 267 full text articles, published in peer-review journals, were grouped into seven themes and 54 sub-themes. In addition to summarising the current state of the literature, possible paths for future research on the topic of football refereeing were outlined.

Study 2 aimed to identify, categorise and analyse the distinctive characteristics of top level referees that excel. Ninety-three subcategories (e.g., leadership, resilience, game reading) and 1833 units emerged from the data analysis process and were grouped into seven themes. Participants' responses concerned Individual characteristics (82.00%), Group characteristics (14.02%), and Organisational characteristics (3.98%).

Study 3, expanded the results of the study 2, emphasising the multidimensionality of excellence in the performance of football referees. We were able to pinpoint that football referee excellence is shaped by three distinct dimensions: Individual preparation, game preparation and game management. We used CatPCA to graphically display the relationships that exist between the latent dimensions of football refereeing performance.

Finally, concerning the lack of research on football refereeing teams, Study 4 tested how individual and team cognitions promote team adaptation and team performance within the football refereeing context. Results supported our three hypotheses: (i) team adaptation was positively associated with team performance; (ii) self-efficacy affects positively team adaptation; and (iii) as mental model increase within teams, the relationship between self-efficacy and team adaptation will be enhanced. Hence, it was found a mediation indirect effect of self-efficacy on performance through team adaptation.

We believe that this thesis summarises the current state of literature on football refereeing and outlines possible paths for future research, not only at the individual level but also at the group / team and organisational level. It also contributes to the identification of the characteristics of high level football referees, aiming to promote the growth of competency development models of different areas (e.g., technical, tactical, psychological) and levels (e.g., individual, team), that allow the referee, the refereeing and the football evolution.

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