

Football refereeing: a systematic review and literature mapping

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Abstract

The main objective of this article is related to the mapping and systematic review of the literature on referees and soccer referees. An article search was performed using the following inclusion criteria: articles that addressed the theme of referees and football referees ("Football Referees", "Soccer Referees", "Football Refereeing" and "Soccer Refereeing") between 1971 and 2020. The collected data were downloaded in BibTeX format from Scopus and WOS. Later, R Studio software version 1.2.5042 was used to eliminate duplicates and create a unified database. After reading all abstracts, a filter was applied according to the defined criteria. After reading abstracts and/or full articles published between 1971 and 2020, 381 articles (WOS + Scopus) were included, which is the final result and object of our qualitative and quantitative analysis. The result of the analysis of 381 articles is a systematic review of the main literature, addressed in the context of refereeing in football and the respective mapping of the main studies (Top 25), according to their degree of academic importance based on the index of citation volume. With regard to the general conclusions of the performed systematic review and literature mapping, we can state that the study on soccer referees is still at a level of growth, largely because it is an activity that only in the last decade has been professionalized and only in some countries, compared to playing and coaching careers. However, it is currently a fundamental area, which is confirmed by the increasing attention that researchers have paid to the subject, producing more investigations with considerable academic impact in this area of knowledge. Finally, this study, mapping, and content analysis represent added value in relation to the existing knowledge in the field of refereeing in football, because systematization and identification of the main authors and trends result in better knowledge in relation to the theme and pave the way for future investigations.

Keywords: football referees, soccer referees, laws of the game, competition rules

Introduction

Over the years, football has been unanimously recognized as the most popular sport in the world (Guilianotti, 2012), where beyond the attention given to players and coaches, it seems to increase the role played by referees plays in this game (Gulec & Yilmaz, 2016) along with the acceptance that their task is complex (Casajús, Matute-Llorente, Herrero, Vicente-Rodríguez, & González-Agüero, 2016). Once football has become a multimillion business, referees' activity is highly analyzed and criticized because everyone expects and depends on indisputable decisions (Wühr, Fasold, & Memmert, 2015; Webb, 2016).

As referees oversee every all matches, football on a global scale, is under the purview of the Federation International Football Association (FIFA) which is constituted by 211 affiliated associations, distributed by 6 Confederations: The AFC in Asia, CAF in Africa, the Football Confederation (CONCACAF) in North and Central America and the Caribbean, CONMEBOL in South America, UEFA in Europe and the OFC in Oceania (FIFA.com, 2020). In general terms, the main goal of FIFA is "the constant improvement of football", and when refereeing is the matter, the vision of this worldwide organism is that "match officials must have excellent football understanding and need to evolve with the game to stay effective and relevant, having a consistent and uniform application of the Laws of the Game" (FIFA.com, 2020). On the other hand, the football organization that governs this sport on European territory, the Union of European Football Association (UEFA), has the same point of view in relation to FIFA's goals, having the same general objectives of dealing with all the issues and improve European football (EUFA.com, 2020). Thus, FIFA, UEFA and even the International Football Association Board (IFAB), which is the organization that determines the Laws of Game, are working to develop and improve the quality of referees' decisions (Catteeuw, Gilis, García-Aranda, et al., 2010).

Over time, the institutions that organize the game, its dynamics and laws, introduced several human and technological changes in order to improve the quality and consistency of referee decisions: appearance of the figure of the Fourth Official in 1991, after the Italia 90 World Cup (Tenèze, Joncheray, & Arnal, 2015) with the mission of assist the referee. Trials was carried out in the group stage of the Europa League Group Stage in 2009/2010 to make place for an additional two assistant referees, positioned behind the goal lines, aiming to inform the referees about any missed incidents, particularly in the penalty area and surroundings and also to supervise the goal line for any ghost-goal incident (Tenèze, Joncheray, & Arnal, 2015). The use of additional assistant referees was approved in 2012 by the IFAB. On the other hand, technological advances have been made to help referees' performance, such as the audio communication system, tested in 2003, which allows all the members of the referee team to be in constant contact during the game and has been widely used from the amateur leagues to the top context. In addition, in 2012 the IFAB allowed the use of the goal-line technology, which checks if the ball completely crosses the goal line (Tenèze, Joncheray, & Arnal, 2015). Lately, the use of video assistant referees (VAR) (Dohmen & Sauermann, 2015) is widespread in the main European leagues and also in other countries outside Europe with important championships such as Brazil (Brasileirão) or United States of America (Major Soccer League). According to the VAR protocol (Laws of the Game 2020/2021), this refereeing tool is used to review the referees' field decisions, with the use of video footage and headset for communication, with the main objective of minimizing human errors that could cause important influence in the result of a game (i.e., goals, penalties, red cards and wrong identity in awarding a card). This technology is manipulated from a video operation room where the VAR has access to multiple camera angles to analyze gameplay situations and then provide feedback about them. The 2018 FIFA World Cup was a big step for the VAR, being the first worldwide scale tournament to use it in entirety, at all matches and all locations.

However, these technological aids do not contribute by themselves to the development of the referee's skills, despite being an invaluable help in reducing or eliminating some mistakes that occur during football matches. In order to improve referee performance, they must be integrated into a formalized error/no error analysis process that inputs into a feedback system available to referees (Slack, Maynard, Butt & Olusoga, 2013).

Therefore, many studies have been carried out over time with the aim of understanding how referee performance is affected by constraints such as activity profiles (i.e., total covered distance, running speed, accelerations, etc.) and physical ability (Mallo, Navarro, Aranda & Helsen, 2009), biases in referee's decision-making (Dawson, 2012), training referees (Mascarenhas, O'Hare & Plessner, 2006) and assistant referees (Put et al., 2014). On other hand, literature on football referee lacks research on topics such as conflict management (Mascarenhas, O'Hare & Plessner, 2006), recruitment and retention (Johansen, 2015), body composition (Casajús et al., 2016), injuries (Oliveira, Reis & Inácio, 2016), refereeing team (Samuel, 2015), nutrition (Paes & Fernandez, 2016) among others (Vasilica, Silva, Costa, Figueira, & Vaz, 2020, 2022).

Reviews made with the aim of football referees' topics are few and mostly focused on a specific field within the context of refereeing (e.g., Plessner & Haar, 2006; Weston et al., 2012). However, it is vital to understand all topics linked to football refereeing from a general and wide perspective as this is a complex context as Aragão e Pina, Passos, Araújo and Maynard (2018) described in their integrative review. Thus, it would be possible to clarify the current state of the literature and bring significant contributions to the refereeing development literature.

Therefore, our aim was to build a systematic review and literature mapping until 2020, as no similar work has been carried out and, on the other hand, to understand the panorama of football refereeing research and identify research topics that need to be further explored.

Material and Methods

A general search made in any academic search engine, or database of articles on "Soccer referees (English)" and "Soccer referees (English)", shows a number of published studies, as well as the existence of works in various contexts and areas of research applied to football reports. In this study, we will take a quantitative approach, leaving open the possibility of further qualitative studies that this bibliometric database will allow.

Data were collected in January 2021 in the Web of ScienceTM Core Collection and Scopus databases applying four search topics using the keywords "Football Referees", "Soccer Referees", "Football Refereeing" and "Soccer Refereeing". In fact, we used two databases, Web of ScienceTM Core Collection and Scopus, in order to collect as many articles as possible covering the topic under study. The outputs were filtered by choosing only "Articles" in the types of documents to be included, excluding books, proceedings and other documents that were not scientific articles and whose articles were not written in English. The initial search allowed us to obtain 282 articles in the WOS search and 270 articles in the Scopus search, making a total of 552 articles before the removal of duplicates. After crossing the outputs of the two researches, the duplicates were removed and the inclusion criteria were established: articles that addressed the theme football referees and referees ("Football Referees", "Soccer Referees", "Football Refereeing" and "Soccer Refereeing") between 1971 and 2020.

Articles whose theme was not the one mentioned above were outright excluded. After reading all the abstracts, the filter was performed according to the defined criteria. After all the work of reading abstracts and/or full

articles published between 1971 and 2020, 381 articles (WOS + Scopus) were included, which is the final result and object of our qualitative and quantitative analysis.

The collected data were downloaded in Bibtex format from Scopus and WOS. Later, R Studio software version 1.2.5042 was used to eliminate duplicates and create a unified database. Then, following the example of Aria and Cuccurullo (2017), the data were submitted to a Network analysis, which was performed with the R Bibliometrix 3.0. The next step was a categorical content analysis. However, before performing this analysis, the data had to be homogenized, as there are differences in the presentation of data between journals (including details such as full stops, commas, spaces between words, numbering in authors' affiliations, etc.). Table 1 presents the description of the data collection process:

Table 1. Description of Data collection process.

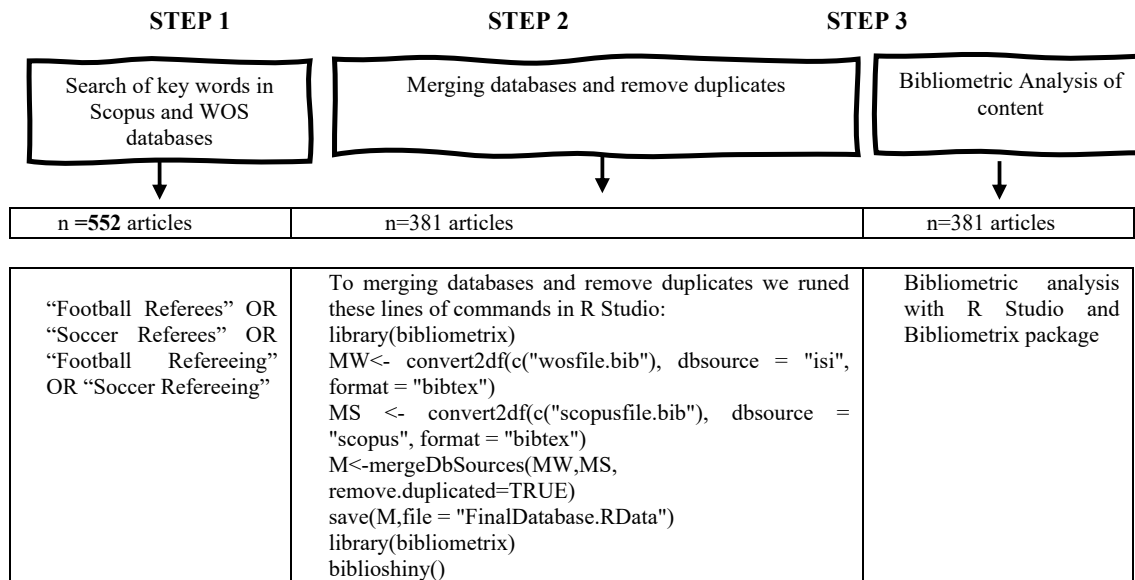


Table 2 – Database description

Description	Results	Description	Results
Main information about data		Main information about data	
Timespan	1971:2020	AUTHORS	
Sources (Journals, Books, etc)	167	Authors	949
Documents	381	Author Appearances	1362
Average years from publication	7,1	Authors of single-authored documents	24
Average citations per documents	13,3	Authors of multi-authored documents	925
Average citations per year per doc	1,2	AUTHORS COLLABORATION	
References	9021	Single-authored documents	27
DOCUMENT TYPES		Documents per Author	0,4
Article	381	Authors per Document	2,5
DOCUMENT CONTENTS		Co-Authors per Documents	3,6
Keywords Plus (ID)	867	Collaboration Index	2,6
Author’s Keywords (DE)	813		

Results

Publications per year

According to the database used in this study, with a period between 1971 and 2020, which made up a total of 381 articles, the number of publications varied, with 1971, 1994 and 1998 being those with the lowest number of publications (1), and the year 2020 reached the highest number (51) followed by 2018 with 43 and 2019 with 37 articles published. On the other hand, the years between 1972 and 1992, as well as 1995, 1997 and 2000, did not have any articles published about referees and refereeing in football. Analyzing in a general way the output of this research, between 1971 and 2006 it is noted that the volume of work on referees and refereeing in football is

small and without great expression, with an average of 3 ± 1.7 articles per year. However, this trend is contradicted from 2007 onwards, with a gradual and steady growth over time, with setbacks being observed in some years but without having significantly interfered in the ascending of the production curve, with an average of 21.5 ± 13.3 published annual articles (Figure 2).

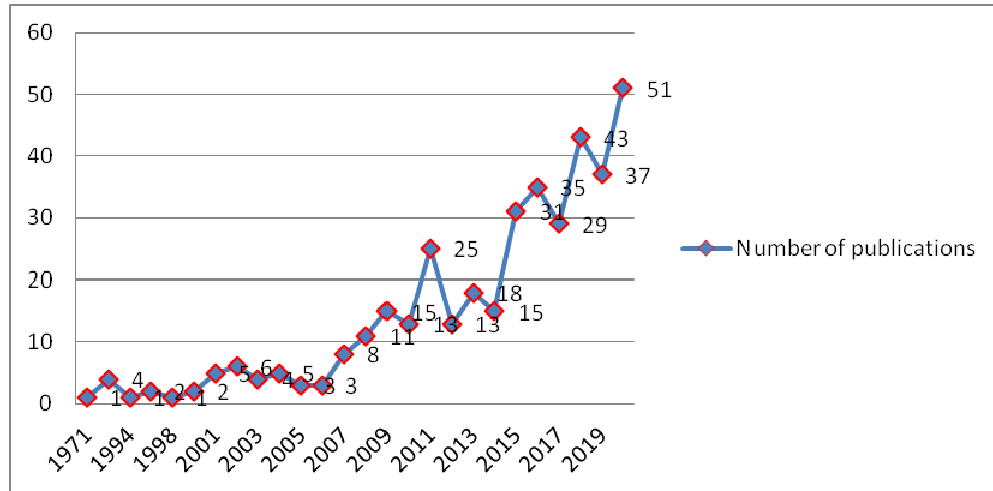


Figure 1 - Evolution of the number of publications on football referees and referees (1971-2020).

Publications by Journal

Regarding the journals where the 381 articles in our database were published, we can see that there are 36 of which have 3 or more works published, which corresponds to 227 publications (59.6% of the total) and 124 journals, all the others, with only 1 or 2 articles published each (40.4% of the total). It appears that 2 journals clearly stand out with regard to the number of publications, namely the Journal of Strength and Conditioning Research (Q1/SJR: 1.22/HIndex:121) with 25 published articles and the Journal of Sports Sciences (Q1/SJR:1.2/HIndex:128) with 21 published articles. The top 3 of publications per journal is completed by Revista de Psicologia del Deporte (Q3/SJR:0.29/HIndex:23) with 13 published works. This podium of the magazines with the highest number of publications corresponds to 15.5% of the total of all articles published on referees and referees in football between 1971 and 2020 and, as expected, two of them fall into the top quartile (Q1) the result of a predictable search by authors for higher ranking and important journals.

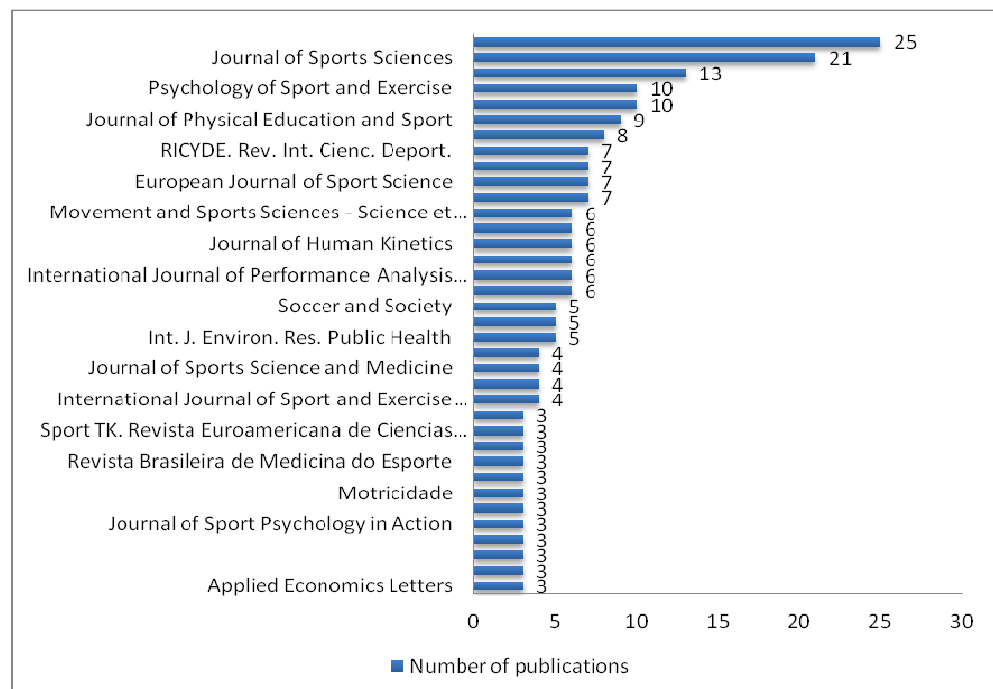


Figure 2 – Journals with 3 or more publications on soccer referees and referees (1971-2020)

Most relevant authors

Regarding the number of publications by the most relevant authors (Figure 4), both in the position of main author and co-author, the analysis of the 381 articles in our database allows us to verify that Castagna, C. is the most relevant author with approx. of 30 publications, followed by Helsen, W. and Castillo, D., with about 20 publications both. Finally, we also observe that, from the table of most relevant authors, none of them has less than 5 publications.

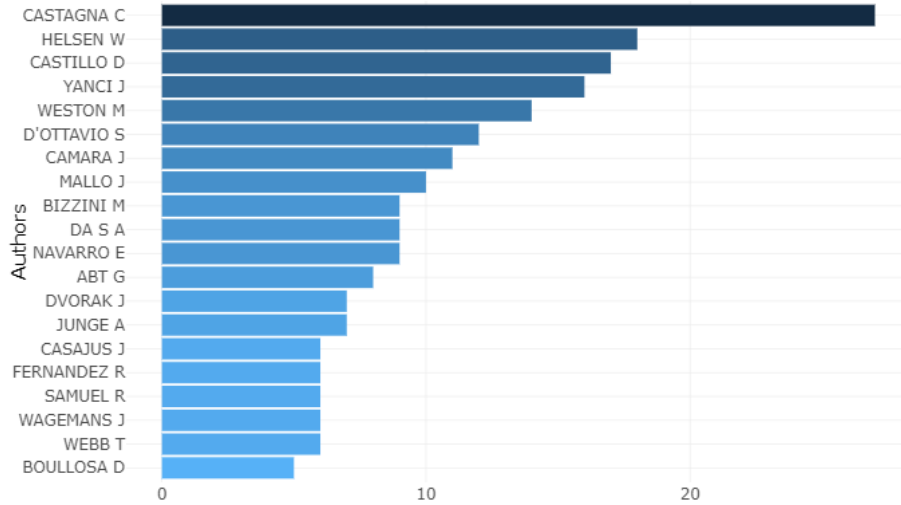


Figure 3 – Authors with the highest number of publications on football referees and referees (1971-2020)

Total Citations

Analyzing the set of citations per year of the Top 381, we verified that the first article to be cited dates from 1971 (Durusoy, F. & Ozgonul, H., 1971), currently having only one citation. The year with the highest number of citations was 2004 (457 citations), followed by 2001 (415 citations) and 2007 (398 citations).

On the other hand, the years with the lowest number of citations, only one, were 1971 and 1996. In general, we can see that although there are several citations peaks, from 2007 onwards, articles follow a decreasing trend over the years and with regard to this indicator (Figure 5).

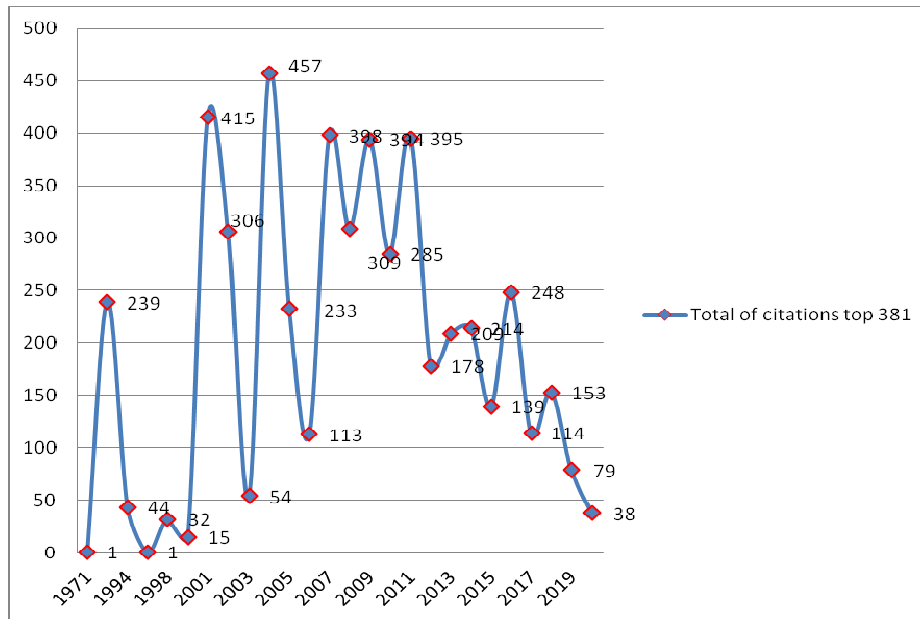


Figure 4 - Total citations per year (Top 381)

Most Cited Sources

With regard to the most relevant sources in the database in terms of total citations, we found that the Journal of Sports Sciences and the Journal of Strength and Conditioning Research stand out, with approximately 900 and

500 citations respectively, which corresponds to approximately 18% and 10% of total citations. In other words, approximately 28% of citations were registered only by these journals, followed by Sports Medicine, the Journal of Science and Medicine in Sport and the Journal of Sport and Exercise Psychology, closing the Top 5 (Figure 6). These results demonstrate a clear prominence and prominence that the Journal of Sports Sciences has in relation to other magazines and with regard to publications on the subject of football referees and referees. It should also be noted that in the top 20 of sources with the highest number of citations, Castagna, C. appears, being the only author present and thus proving his importance in the production of works in the scope of football referees and referees.

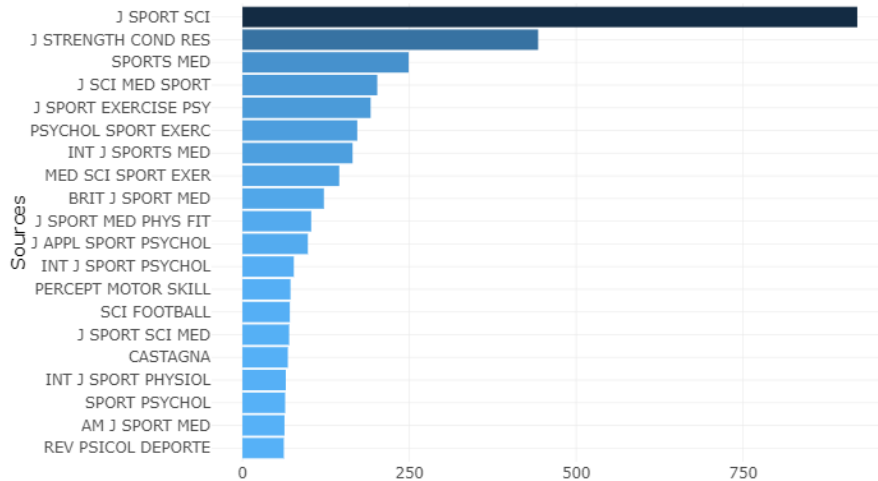


Figure 5 – Most cited sources about football referees and referees (1971-2020)

Top 25 Authors and Articles

The criteria for presenting results that will be used from now on will be based on the 25 most cited articles. For that, it was necessary to count the citations that occurred in our database and thus arrive at these. Table 2 shows the 25 most cited articles, as well as the percentage of citations in relation to their total. The 381 articles resulting from the search have 5063 citations in total and this Top 25 has 2204 citations which correspond to about 43.5% of the total citations of the research carried out. This detail demonstrates the great preponderance of this Top 25 for the scientific community that addresses the issue of football referees and referees. The analysis of Table 3 also allows us to observe that the overwhelming majority of journals (22) where the articles were published belong to Q1 (88%), with only 3 in lower quartiles, namely the Journal of Sports Medicine and Physical Fitness (Q2), where the 15th most cited article is found, the Journal of Applied Sport Psychology (Q2), where the 19th most cited article is included, and the International Journal of Sport Psychology (Q3) where the 24th most cited work is included. The SCImago Journal Rank average (last update 2019) for Q1 journals is 1.75 with an overall average of 1.62. Regarding the journals that dominate the number of publications, we have the Journal of Sports Sciences with 10 articles, followed by the Journal of Strength and Conditioning Research with 3 articles and the British Journal of Sports Medicine and Journal of the Royal Statistical Society: Series A (Statistics in Society) with 2 articles each, with the remaining 8 articles divided into 8 journals respectively. These journals have, for the most part, a high H Index (128 ± 30.4) which corresponds to a ranking of the importance of this source for the scientific community, as it assesses its impact based on the most cited articles.

Table 3 - Authors and respective citations (Top 25)

Position	Authors	Journal	SJR 2019	H Index	Quartile	Total of Citations	% of citations	total
1º	(Krustrup & Bangsbo, 2001)	Journal of Sports Sciences	1,2	H index 128	Q1	233	10,6%	
2º	(Helsen & Bultynck, 2004)	Journal of Sports Sciences	1,2	H index 128	Q1	173	7,8%	
3º	(Garicano, Palacios-Huerta & Prendergast, 2005)	Review of Economics and Statistics	7,54	H index 153	Q1	160	7,3%	

4°	(Sutter & Kocher, 2004)	Journal of Economic Psychology	1,14	H index 90	Q1	139	6,3%
5°	(Dohmen, 2008)	Economic Inquiry	1,22	H index 68	Q1	100	4,5%
6°	(Krustrup, Mohr & Bangsbo, 2002)	Journal of Sports Sciences	1,2	H index 128	Q1	99	4,5%
7°	(MacMahon, Helsen, Starkes & Weston, 2007)	Journal of Sports Sciences	1,2	H index 128	Q1	87	3,9%
8°	(Catterall, Reilly, Atkinson & Coldwells, 1993)	British Journal of Sports Medicine	3,71	H index 156	Q1	87	3,9%
9°	(Jones, Paull & Erskine, 2002)	Journal of Sports Sciences	1,2	H index 128	Q1	86	3,9%
10°	(Weston, Castagna, Impellizzeri, Rampinini & Abt, 2007)	Journal of Science and Medicine in Sport	1,46	H index 93	Q1	84	3,8%
11°	(Castagna, Abt, Manzi, Annino, Padua & D'Ottavio, 2008)	Journal of Strength and Conditioning Research	1,22	H index 121	Q1	82	3,7%
12°	(Dawson, Dobson, Goddard & Wilson, 2007)	Journal of the Royal Statistical Society: Series A (Statistics in Society)	1,53	H index 77	Q1	77	3,5%
13°	(Buraimo, Forrest & Simmons, 2010)	Journal of the Royal Statistical Society: Series A (Statistics in Society)	1,53	H index 77	Q1	74	3,4%
14°	(Krustrup, Helsen, Randers, Christensen, MacDonald, Rebelo & Bangsbo, 2009)	Journal of Sports Sciences	1,2	H index 128	Q1	71	3,2%
15°	(D'Ottavio & Castagna, 2001)	Journal of Sports Medicine and Physical Fitness	0,53	H index 63	Q2	69	3,1%
16°	(Catteeuw, Helsen, Gilis & Wagemans, 2009)	Journal of Sports Sciences	1,2	H index 128	Q1	68	3,1%
17°	(Catterall, Reilly, Atkinson & Coldwells, 1993)	British Journal of Sports Medicine	3,71	H index 156	Q1	68	3,1%
18°	(Mallo, Frutos, Juárez & Navarro, 2012)	Journal of Sports Sciences	1,2	H index 128	Q1	60	2,7%
19°	(Schweizer, Plessner, Kahlert & Brand, 2011)	Journal of Applied Sport Psychology	0,96	H index 72	Q2	59	2,7%
20°	(Mallo, Navarro, Aranda & Helsen, 2009)	Journal of Sports Sciences	1,2	H index 128	Q1	58	2,6%
21°	(Weston, Drust & Gregson, 2011)	Journal of Sports Sciences	1,2	H index 128	Q1	58	2,6%
22°	(Castagna & D'Ottavio, 2001)	Journal of Strength and Conditioning Research	1,22	H index 121	Q1	57	2,6%
23°	(Castagna, Abt & D'Ottavio, 2002)	Journal of Strength and Conditioning Research	1,22	H index 121	Q1	53	2,4%

Lexical Analysis and Linking Networks Between Authors



The analysis of Figure 7 clearly allows to verify the incidence of the keywords that guided the research on the topic under analysis, as well as the relevance of the selected final documents, according to the defined search terms and the chosen inclusion criteria. In fact, we verified the existence of a set of words that are recurrently used in research articles, and that are the target of empirical investigations in several scientific works. The vast majority of terms are used as constructs in several studies or are used as research variables, and eventually in the themes addressed in the few literature reviews on each specific topic that is being studied in the scope of referees and referees in football.

Figure 7 - Frequency of keywords

In Figure 8, we can see the evolution of the themes studied over the years. We found that from 2008 onwards the content began to be more concrete and directed towards the study of elite soccer referees and cardiac demand, and in the following 6 years the themes diverged mainly between works on the performance of referees in the context of a game, physiological demands, yo-yo intermittent recovery test, activity profile, test validation, and offside. Finally, in the last 4 years (2016-2020), we have the works in general directed to the themes of decision making, behavior, assistant referees, physiology, game context, errors and referee retention. By exporting the final version of the file, which contains all 381 selected documents, it was possible to obtain outputs referring to the co-citation network and the corresponding density, proceeding to the identification of the composed networks through the level of analogy of the references bibliographic references included in the final version of the database. In this way, the so-called bibliographic connection of the referred documents was operated, obtaining the outputs that can be seen in Figures 9 and 10.

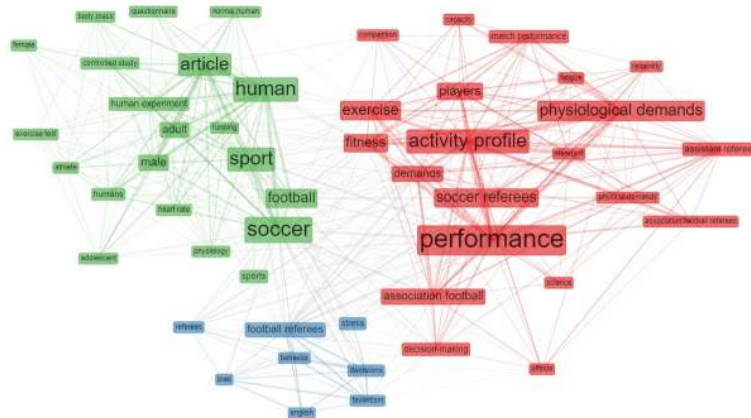


Figure 8 – Thematic Network

In Figure 9, we can see which are the main topics covered and their relationship to each other. We can see that soccer, football, football referees, performance, activity profile and physiological demands are at the center of the most discussed themes. It is worth mentioning the division of themes into three large groups, with the dominant themes in each of them: studies on the demands of football in general, especially physiological demands and body mass, then we have the themes of soccer referees and their mental demands, stress, tendency of favoritism in decision making, and finally the main themes of the third big group will be the soccer referee's physical performance, physiological demands, activity profile, fitness, exercises, decision making, fatigue and assistant referees.

Figure 10 reveals the publications of the most relevant authors about football referees and referees over time, where we can highlight as main figures Castagna, C. and D'Ottavio, S. who publish from 2001 to the present day, followed by Helsen, W. which has publications since 2004, making these the Top 3. On the other hand, it is also notorious that the great concentration of publications is from 2009 onwards, being this very year the most productive for a good part of the authors, such as Halsen, W., Mallo, J, Bizzini, M., among others.

Top-Authors' Production over the Time

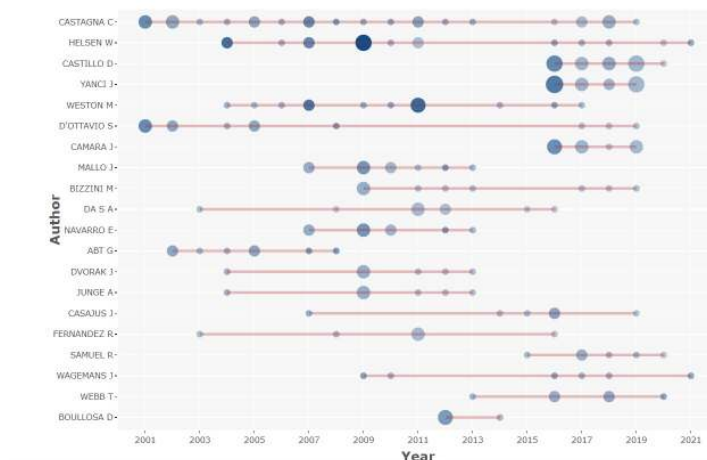


Figure 9 Publication over time by the most relevant authors

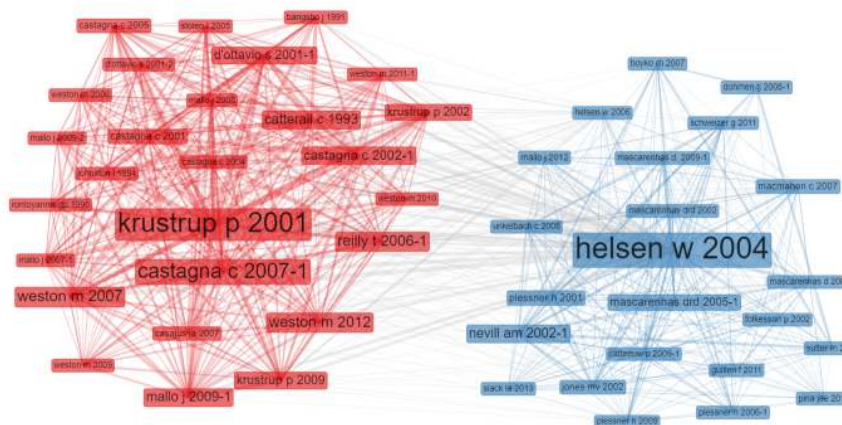


Figure 10 - Network of referrals

The rectangles that stand out the most in Figure 11 show the relative importance of the number of citations of each work, while the distance between authors/years of publication of scientific articles form a connection network between documents, which demonstrate the existing connection in relation to theme that concerns soccer referees and referees. The works that are most evident are that of Krustup, P., & Bangsbo, J. (2001), entitled: Physiological demands of top-class soccer refereeing in relation to physical capacity: effect of intense intermittent exercise training and that of Helsen, W., & Bultynck, J.-B. (2004), entitled: Physical and perceptual-cognitive demands of top-class refereeing in association football. The analysis of the network also allows us to highlight the most referenced authors in our research and the way in which they interconnect with each other, due to the fact that they address different themes, but with a common denominator: referees and referees in football, hence the protagonism is also evident. from the work of Weston, M., Castagna, C., Impellizzeri, F., Rampinini, E. & Abt, G. (2007), entitled: Analysis of physical match performance in English Premier League soccer referees with particular reference to first half and player work rates. of physical match performance in English Premier League soccer referees with particular reference to first half and player work rates. The Sankey diagram enables one to view the main items of the three fields plot and how they are related. In the three fields plot below, we can see networking between authors, their respective countries, and research areas. The most cited authors are Castagna, Helsen, Weston, Bizzini and Yanci, with connections to several countries like Spain, Italy, Switzerland, and the United Kingdom. Regarding the areas most approached as an investigation object, we have football/soccer/referees, performance, heart rate and match analysis (Figure 12).

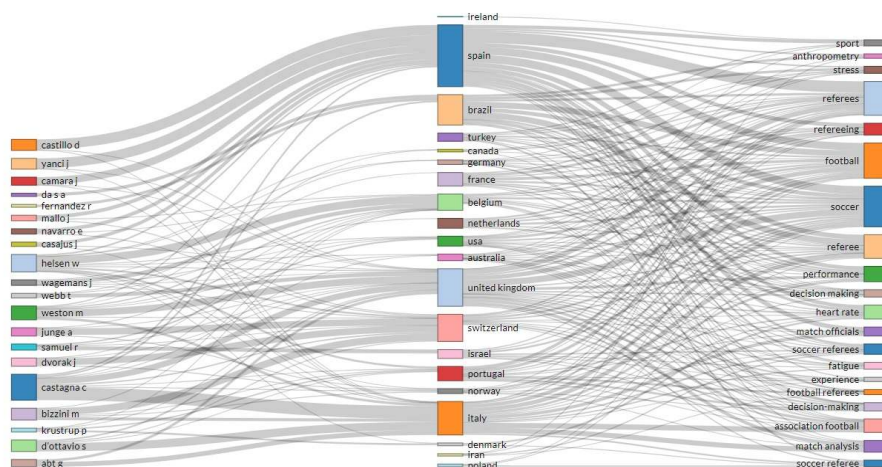


Figure 11 Tree field plot by author, country and research area

Discussion

Several studies, carried out over the years, have referred to the marginalization that football referees have suffered over time, so that any type of scientific work carried out in this area will always be an excellent contribution to growth and better understanding of this area. that, although it has seen the number of publications

increase significantly in recent years, it remains to be explored in many contexts (Aragão and Pina, Passos, Araújo & Maynard, 2018).

The studies carried out used different methodologies, whether empirical, quantitative, qualitative or literature review, however, the focus of this investigation was directed towards the elaboration of an original systematic review and mapping of the literature that allowed us to bring together, in a single document, the most relevant contributions made in this area, while providing an overview of the theme. This study extensively addresses soccer refereeing in a macro and micro dimension, thus contributing to the increase in knowledge of this area, illustrating in detail the literature found.

Simultaneously carrying out the mapping and literature review makes the work more complete, as one theme complements the other, thus creating a greater scope of investigation that allows us to show how the literature is organized, thus helping future investigations that intend to study this area, offering the opportunity to find in a single document the most discussed topics in the literature, the advances achieved, the results obtained, the main conclusions and the contributions and suggestions for future investigations.

Limitations

With regard to the main limitations of this type of study, we can highlight the fact that despite the research being carried out in two databases - Web of Science and Scopus - we only use keywords in the English language, which, from the outset, configures a conditioning character to the investigation. The keywords, "Football Referee* + Soccer Referee*" applied to Web of Science and Scopus, which after eliminating duplicates and applying defined exclusion criteria, resulted in a final database of 381 articles that can be placed in cause, as the use of only, and specifically, articles written in English, was an option that may not be agreed by all, claiming that instead of choosing this one, more languages were used and, consequently, more keywords, being possible to withdraw another type of results and therefore another type of final output, possibly more robust. However, the language used was where the results obtained reinforced the choice in relation to others, and it clearly gave rise to a larger output and thematic coverage. As research proposals, the continuous monitoring, development, consolidation and recording of literature is crucial, as well as the main themes that support football refereeing, as it is a fundamental basis to support future work and the understanding of all in relation to theme, whether researchers or professionals in the field, allowing us to understand the path that the scientific community is taking and the evolution of theoretical-practical knowledge in relation to referees.

The realization of this type of scientific work, which allows mapping and systematizing the state of the art, never hurts. Therefore, it is proposed that other analyzes be carried out on the existing literature, using this same methodology, but, however, using other languages and other keywords, both in the databases used here, as well as using others, all of this to allow a consolidation of all the knowledge produced so far on the subject. Still, without leaving the line of this article, there are pertinent investigations to be carried out, such as broadening the spectrum and, instead of contemplating only a Top 25 most cited article, being able to include a Top 100, or instead carry out a study only with the most recent articles and then carry out a comparison with the older articles and the evolution of the themes studied.

Furthermore, this was an article that only focused on peer-reviewed scientific articles published in indexed journals, so perhaps it might be relevant to broaden the spectrum and include proceedings and book chapters.

We believe that this theme is a fertile field for future investigations, as it still has a long way to go, in the sense of becoming increasingly effective and scientifically robust. First, because football studies are constantly being updated, and second, because football referees and referees continue to be a field of study with much to explore and evolve.

Conclusions

As a result of the importance that football referees increasingly have in the game itself and also as a result of this activity becoming more and more professional in recent years, it should justify a greater interest on the part of researchers, which over the past few years has been visible, as our study demonstrates, increased research production in this area, recognizing its due importance, which was largely neglected until around 2010.

The main objective of this article was related to the mapping and systematic review of the literature on soccer referees and referees. Thus, carrying out this work allowed us to describe how the field of investigation is organized in terms of authors, publications and journals.

The literature mapping allowed us to have an overview of what has been investigated so far, as far as football referees are concerned, and with this work we found 381 articles included in the time period between 1971 and 2020.

The result of the analysis of the 381 articles was the elaboration of a systematic review of the main literature, addressed in the context of refereeing in football and the respective mapping of the main studies (Top 25), according to their degree of academic importance based on the index of citation volume.

Regarding the main database (N=381), it was decided to work with the 25 most academically referenced articles, using the criterion of number of citations for this purpose.

Another of the evidence that this study showed us was in relation to the main themes addressed by the authors in the articles, highlighting the following themes: performance, activity profile and physiological demands, among others, and these were the ones that obtained the highest number of frequency.

This work allowed us to observe that, in fact, studies on football referees, in general, have been increasing interest in the scientific community and proof of this is the increase in publications over the years. In 1971 there was only one publication, a number that remained until 1993, in contrast, in 2020 alone, 51 articles were published, in the most diverse journals with different impact factors and H-index. The three magazines that take the lead in terms of publications referring to football referees and referees are: the Journal of Strength and Conditioning Research with 25 publications, the Journal of Sports Sciences with 21 and the Revista de Psicología del Deporte with 13. to N=381.

In terms of citations, the 381 articles resulting from the research have 5063 citations in total, and the Top 25 has 2204 citations, which corresponds to about 43.5% of the total citations of the research carried out. This is a detail that fully demonstrates the importance of this Top 25 for the scientific community that addresses the issue of refereeing and football referees.

Regarding publications by author, we found that among the most relevant authors, Castagna C. stands out with about 30 publications, followed by Helsen W. and Castillo D., with about 20 publications each. Regarding the most cited sources of N=381, the Journal of Sports Sciences, the Journal of Strength and Conditioning Research and Sports Medicine stand out, with approximately 900, 500 and 250 citations respectively.

With regard to the general conclusions of the systematic review and mapping of the literature carried out, we can say that the study of soccer referees is still at a level of growth, largely because it is an activity that only in the last decade has been professionalized and only in some countries, in contrast to playing and coaching careers. However, it is currently a fundamental area, and proof of this is the growing importance that researchers have demonstrated in relation to the subject, producing more and more investigations with considerable academic impact in this area of knowledge.

Finally, the study carried out, the mapping carried out and the content analysis carried out represent added value in relation to the existing knowledge in the field of refereeing in football, as through the systematization carried out and the identification of the main authors and trends, it allows for better knowledge in relation to the theme and opens the way for future investigations.

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