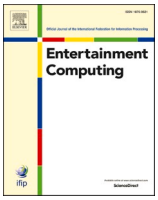
Entertainment Computing 49 (2024) 100628

Contents lists available at ScienceDirect

Entertainment Computing

journal homepage: www.elsevier.com/locate/entcom



The Intellectual Structure of Esports Research

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ARTICLE INFO

Keywords:
eSports
Intellectual structure
Bibliometric
Trends
Cocitation
Burst papers

ABSTRACT

We aim to map the intellectual structure of eSports research in social Science to understand its evolution and status. This article uses a cocitation analysis focused on eSports scientific literature, which identifies the main clusters, intellectual turning points, and burst papers, showing research priorities, trends, connections and dissemination paths in this research field. This methodology allows us to examine the dominant theories and expands the scientific knowledge of eSports, detecting the main research areas and sources of knowledge. The results show 1) how sportification can be the key to achieving the desired fit between traditional sport and eSports; 2) the existence of eleven different research areas that analyse eSports; and 3) the emerging research topics in this field linked to management, audiences and fan engagement, which are vital issues to be addressed by academia, such as the proposed research agenda outlines.

1. Introduction

Electronic sports (eSports) are a trend in the entertainment industry. The eSports market has boomed in recent years; in 2021, 465.1 million people tuned in to watch their favourite games being played by professional gamers [1]. The worldwide eSports market was valued at 1.08 billion USD in 2021, representing almost a 14.5 % annual increase [1]. Technology boom, gaming as an industry of reference [2], technology accessibility and access to top competition [3] and social distancing brought about by COVID-19 have contributed to the rise of eSports [4].

The aim of the paper is to analyse the eSports intellectual structure in social Science. The intellectual structure refers to the references cited by citing papers, in other words, in this article we will consider the sources of knowledge of the eSports field.

The term "eSports" is characterised by regional and international gaming events, online or face-to-face, where amateur and professional players compete [5] in "an organised and competitive approach to computer games" [6]. eSports, or electronic games, are organised online around different categories: MOBA (Multiplayer Online Battle Arena), where League of Legends stands out above all others, FPS (First-Person Shooter), where Valorant reigned supreme in 2021, PvP (Player versus Player) such as Street Fighter, RTS (Real-Time strategy) in evident decline and with StarCraft or Warcraft III as standard-bearers, or sports Games such as NBA 2 K or FIFA [2].

eSports have a historical evolution that dates back to the beginning of computers and the arcade era [7]. The rise of eSports is not merely the product of increased marketing, but instead an extension of a pattern recurring in sports and leisure [8]. The roots of Game Theory can be traced back to the eighteenth century, and it has since become an important discipline in relation to economic, political, and social issues. eSports have established themselves in the leisure and entertainment digital market, with similar followers, turnover, and advertising to traditional mass sports [9]. Video games have come a long way since their inception in the 1950 s, with advancements in technology and graphics allowing for increased content and quality. The professional gaming community has attracted the attention of wealthy businessmen, leading to the involvement of iconic sports names in eSports.

Although the birth of the industry and the definition of eSports has

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https://doi.org/10.1016/j.entcom.2023.100628
Received 1 December 2022; Received in revised form 1 December 2023; Accepted 20 December 2023
Available online 23 December 2023

been a subject of debate among academia [6,10,11], the most discussed aspect, in scientific terms, has been the fit between traditional sports and eSports [3,12]. On the one hand, there are some similarities, such as institutionalisation, the involvement of industry, broad following, the need to play, organisation, the existence of professional leagues and teams that involve competitive, game play, the role of fans and the development of some problems, for instance, gambling [3,13–16]. On the other hand, there are some differences, such as the preparation of the athletes and e-athletes, the risk for sponsors, the level of emotions experienced, the lack of financial possibilities in eSports, sexism, the adaptability to lockdowns due to pandemics, own eSports developed strategies and structures in contrast with traditional sports, in other words, the eSports industry is inherently digital and self-organizing, while the sports industry follows traditional business rules. Nevertheless, the one that provokes more controversy is the lack of physical activity without improving health [15–17]. The eSports industry has a young audience, a global approach, and operates in a digitized environment, which sets it apart from traditional sports. Additionally, the eSports industry has seen rapid growth in participation, media coverage, viewership, sponsorship, and commercialization, with a predicted market revenue of USD 1.79 billion by 2022. Conversely, the sports industry has a long history and established governance structures. The eSports industry also faces unique challenges, such as integrity issues related to match-fixing and doping [13,18,19]. All in all, while there are links between the sports industry and the eSports industry, the eSports industry has its own distinct characteristics and challenges. Despite the apparent differences between the two disciplines, authors such as Heere [20] found a common ground regarding management and marketing.

Research in eSports is a growing field. The last decade has been very prolific. The industry's quick development and parallel leap in research make it challenging to have a clear picture of the current situation of eSports from a scientific perspective. Until the turn of the century, eSports scientific production had only four papers indexed in the Web of Science (WoS). There had been no significant increase in scientific production until this last decade (2011–2021), when the total number of recorded publications is nearly 95 %, with half of these from 2020 and 2021 [21].

The accumulation of articlesmakes the work of scholars difficult. This is why some authors have already undertaken bibliographical or bibliometric reviews to order and structure the existing knowledge.

Literature reviews adopted different approaches in their relation to eSports. For example, we find papers that offer a comprehensive review of the literature, such as that of Reitman et al. [21], which analyses the period 2002–2018, determining that the existing publications can be structured around seven disciplines: sports science, business, media studies, computer science, cognitive Science, sociology and law. Carrillo Vera et al. [22] confirm the growing diversity of methodologies but indicate a strong dominance of computer science perspectives. Hallmann and Giel [11] address a literature review of one of the most popular topics: the inclusion or not of eSports as a sport. This paper concludes that although they cannot be considered sports, they could become sports. Bousquet and Ertz [23] highlight that eSports and professional sports combined seem to be ready for a promising future with several dots to be connected. Sport Management appears as a common field between traditional sports and eSports. For example, eSports represents a form of sportification [24], an idea that connects both disciplines due to the symmetry in managing the two ecosystems.

Furthermore, Gawrysiak et al. [25] provide a specific marketing overview from the perspective of non-endemic companies and the evolution of brand utilisation in eSports. Interest in psychological impact also appears in studies such as Bányai et al. [26] or Conroy et al. [27], which analyse the similarities of eSports with professional sports and problem gambling and cheating. Likewise, Pedraza - Ramirez et al. [28] or Wang et al. [29] review work addressing both cognitive and performance psychological characteristics of eSports play integrate eSports into the field of sports psychology.

In contrast to traditional, qualitative literature reviews, reviews based on bibliometric methods use quantitative criteria to find intellectual connections and links. Identifying the theoretical foundations of an area of knowledge and the connections between authors and articles is one of the consequences of applying this methodology [30].

This article enhances previous bibliometric analysis on eSports [31,32] using a, more profound, more specific methodology, namely, cocitation analysis of papers. A difference lies in the number ofanalysed: compared to Guorui [32] with 151 papers and Chiu et al. [31] with 260 papers, our study has considered 488 citing papers and 19,765 cited papers. From the temporal spectrum, we cover from 2011 to 2020, in contrast to Guorui [32], which analyses through to 2010. Another differential element is the database used: our study draws on papers written in different countries and 11 languages (88.45 % in English and 11.55 % in ten other languages) from the Social Science Citation Index (SSCI) and Emerging Sources Citation Index (ESCI) of WoS (given that the title, abstract and keywords of non-English journals are translated into English) while Guorui's [32] draws only on Chinese papers from CNKI (China National Knowledge Infrastructure). All in all, our contribution to the field is not only expanding the previous clustering on eSports literature–both Guorui [32] and Chiu et al. [31] obtain only 3 clusters–into a wider scope, with eleven different clusters, but also identifying the intellectual turning points, as well as the most influential burst paper.

After the introduction, section 2 describes the methodology and the data. The results are presented in section 3, detailing the analysis of the most important clusters, the intellectual turning points and dissecting the burst article and its impact. Finally, section 4 concludes with the implications of these findings and a research agenda is also suggested.

2. Methodology

The progress of Science is the result of the accumulation of the research that preceded it and whose general resultshave been made known through innumerable scientific publications. Such is the enormous quantity of these publications that it is practically impossible to proceed to a systematic reading and review of every one of them. However, sspecialised our field of interest may be. For this reason, although it is still essential to have as much knowledge as possible of these publications, to obtain a qualitative approach [33], it is necessary to resort to bibliometric methods that facilitate the broadest possible quantitative analysis [34].

Bibliographic citations reflect some relationship between a citing author and the cited authors. The bibliometric analysis of these citations becomes a helpful tool that complements the traditional review of bibliographic production and permits us to approach the intellectual structure or cognitive base that has allowed for the development of this field of Science; discovering its birth and evolution, the old and new lines of research that captured the most significant interest of researchers and even those possible gaps that it would be of interest to begin to fill [35,36].

Within the bibliometric analysis, one of the methods most validated by the academic community to obtain this global vision of a field of scientific activity is the cocitation analysis [30,35,36]. According to Small [37], it consists of observing the frequency with which two works are cited in the bibliographic section of a given set of citing works. When the same pairs of works are co-cited by many authors, one can begin to construct clusters ofresults that share a common theme and, therefore, discover, the interrelationships that led to the development of that scientific field, discover paradigm shifts and lines of thought, identify the intellectual structure behind them, discover the most influential or the most cutting-edge studies or those that seem likely to have the most significant impact [35,36].

So-called bibliometric maps often complement the bibliometric analysis of co-citations. These maps help to visually represent all those groupings and interrelationships in the intellectual structure behind a

scientific field [38,39]. In this paper, CiteSpace software [40,41] has been used for cocitation analysis and bibliometric mapping. CiteSpace has already been used in several studies that examine the intellectual structure of social sciences (e.g., Díez-Martín et al. [42]; Torres-Pruñonosa et al., [43]) and stands out for some interesting aspects that provide added value. It detects those authors and works that have been cited prominently in a given period and, therefore, have been, are or may end up being essential for the advancement of that field of research (burst detection and turning points).

A search in WoS and Scopus databases shows that bibliometric analysis methods have already been used in different fields related to the study of sports, including the use of cocitation analysis [44–46]. However, to date, the application of bibliometric methods in the specific field of eSport has not been practically applied. Bascón-Seda and Rodríguez-Sánchez [47] make a fundamental approach to the subject, and Cabeza et al. [48] are one of the few works that applied more in-depth bibliometric methods in this field. However, they did not opt for co-occurrence of keywords. Likewise, Chiu et al. [31] carry out a keyword co-occurrence analysis and basic co-citation analysis of authors and journals. Our article is the first to apply cocitation bibliometric analysis of papers in eSports research to discover the intellectual structure that has led to its development and to detect the most influential papers.

Like all bibliometric analyses, the co-citation analysis' shortcomings have to do with the fact of self-citation or that a group of researchers systematically cite another group and vice versa. Although this fact is less probable in co-citation analyses, given that the objective of analysis are pairs of citations, the role of specialists in the field of eSports are vital to detect some anomalies.

2.1. Data

The search strategy was quite exhaustive to obtain as many records as possible on a topic such as eSports that has recently generated interest in academic studies. First, a general search was carried out with some terms such as "esport", "e-sport", "electronic sport*", "multiplayer online battle arena", "MOBA" and "competi* video gam". Second, the title, abstract and the keywords of this first search were analysed in order to obtain new terms to increase the citing papers. We also chose to include a limitation to exclude certain terms that produced noise (papers unrelated to eSports) in the results obtained. This was the case in some non-English papers in which the word "esport" (and its variants) is not directly related to the subject of this work: eSports. For this reason, it was finally decided to exclude some terms. The following Boolean search of terms in the title, abstract, or keywords (TS) was used in SSCI and ESCI: (TS = esport* or TS = e-sport* or TS="electronic sport*" or TS="professional video gam*" or TS="professional video -gam*" or TS="professional video gam*" or TS="professional computer gam*" or TS="professional gamer*" or TS="professional gaming" or TS=" video gam* competit*" or TS=" video -gam* competit*" or TS=" video gam* competit*" or TS="computer gam* competit*" or TS=" video gam* tournament*" or TS=" video -gam* tournament*" or TS=" video gam* tournament*" or TS="computer gam* tournament*" or TS="competit* video gam*" or TS="competit* video -gam*" or TS="competit* video gam*" or TS="competit* computer gam*" or TS="MOBAS" or TS="online battle arena*" or TS="massive multiplayer online gam*" or TS="massive multiplayer online gam*" or TS="massive multiplayer online gam*" or TS="massive multiplayer online gam*" or TS="game* live stream*" or TS="virtual* sport*" or TS="league of legends") NOT (TS="i.e., sport*" or TS="l'esport*" or TS = esporte* or TS = sportiello or TS = esportiv*). In order to make the Boolean search more understandable, Table 1 shows the included and excluded terms.

(Insert Table 1 here)The sample search was carried out on April 2, 2021, for a 2011–2021 time frame with the result of 488 citing papers (43 % are available in open access options) containing 19,765 different cited references. These 19,765 cited papers encompassed the data sample of the analysis and corresponded to the sources of knowledge or the intellectual structure of eSports research. This intellectual base not only includes journal articles but also extends to other types of essential documents, given that the analysis focuses on the co-cited references of the 488 citing articles where books, chapters and conference proceedings, among others, are also located.

Table 1
Boolean search included and excluded terms.

INCLUDED TERMS		EXCLUDED INCLUDED
esport*	"video gam* tournament*"	"i.e., sport*"
e-sport*	"computer gam* tournament*"	"l'esport*"
"electronic sport*"	"competit* videogam*"	esporte*
"professional video gam*"	"competit* video-gam*"	sportiello
"professional video-gam*"	"competit* video gam*"	esportiv*
"professional videogam*"	"competit* computer gam*"	
"professional computer gam*"	"MOBAS"	
"professional gamer*"	"online battle arena*"	
"professional gaming"	"massive multiplayer online gam*"	
"videogam* competit*"	"massive multiplayer online gam*"	
"video-gam* competit*"	"massive multiplayer online gam*"	
"video gam* competit*"	"massive multiplayer online gam*	
"computer gam* competit*"	"game* live stream*"	
"videogam* tournament*"	"virtual* sport*"	
"video-gam* tournament*"	"league of legends"	

Table 2 shows the parameters introduced in CiteSpace. The g-index [49] is the criteria used for selecting the nodes to obtain a network as cohesive as possible in which the clusters are sufficiently differentiated from each other and, at the same time, are adequately homogeneous, containing similar works. In addition, CiteSpace adds to the g-index a regulation factor (k) of the total size of the obtained network. In the case of this study, a k = 40 has been selected to get the most appropriate network.

3. Results

ESports research has had a marked growth over the last decade, observing a pronounced take-off in the previous three years (Fig. 1). There is an average of 47.8 articles per year. Nonetheless, whereas the growth was scarce in the first years of the sample, between 2011 and 2017 (from 4 to 40 publications per year), there was a steep growth over the last three years: 80 papers were published in 2018, 101 in 2019 and 181 in 2020. There has been a higher number (362) of papers published over the last three years (2018–2020) than in the previous seven years (2011–2017), where only 116 papers were published.

Table 2
Parameters for the analysis.

Parameter	Description	Choice
(1) Timeslice	Timespan of the analysis	From 2011 to 2021 (April 2)
(2) Term source	Textual fields processed	title/abstract/author keywords/keywords plus (all)
(3) Node type	The type of network selected for the analysis	Cited reference (the networks are made up of co-cited references)
(4) Pruning	It is the process to remove excessive links systematically	None
(5) Selection criteria	The way to sample records to form the final networks	g-index (k = 40).

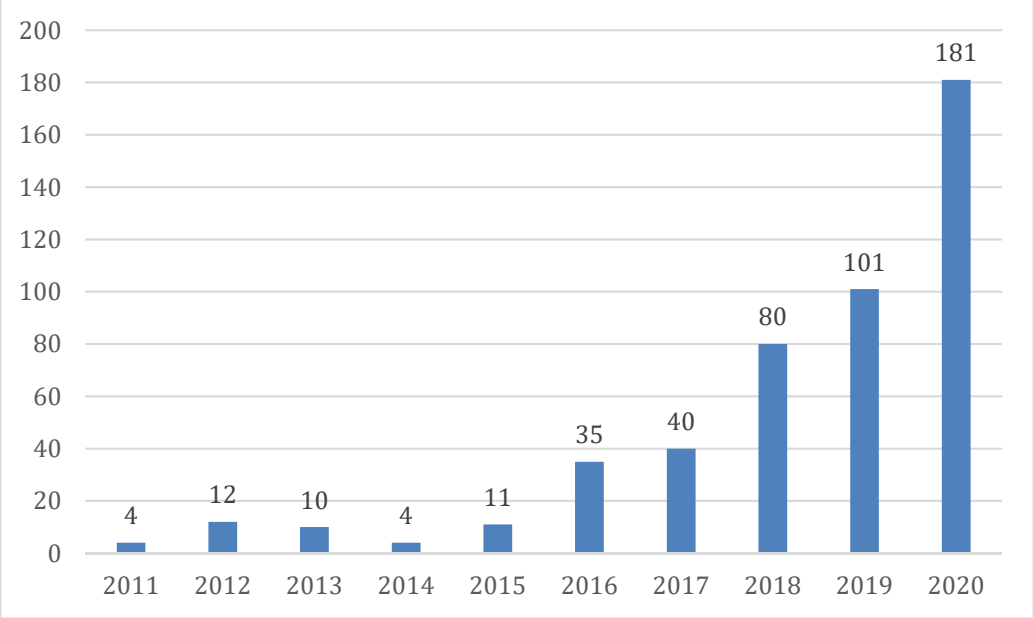

Fig. 1. Growth of publications on eSports research.

3.1. Main research areas in the eSport industry

Table 3 shows eleven cocitation clusters representing the eSports research main fields. Every one of these eleven clusters has a silhouette value higher than 0.85 when the range proposed by Chen et al. [41] is between 0.7 and 1.0. This means that the clustering configuration is both cohesive and separated. In other words, these clusters represent eleven well-structured thematic research fields as confirmed by the Modularity Q value (0.8132) [50,51]. Fig. 2 shows the eSports network.

In order to improve the robustness of the results, although Citespace software automatically labels clusters, the papers included in these eleven clusters have been studied to summarise their essence.

Cluster #1 has the most significant number of papers, being the most expansive field of research. This cluster tackles the **eSport industry's birth**. The research area introduces and explains some of the main elements to consider in the transition from video games to eSports, such as the origin of the phenomenon known as the culture of e-gaming [10,52–54]; the sprofessionalisation of the industry and its players [54]; generating an entertainment industry called experience economy [10,53]; and recognition of the collaborative efforts of gaming stakeholders [53]. In this cluster, there is also a first reflection on the need to define eSports [55] and set up a theoretical framework [52] to historicise its development [10]. The emergence of electronic competitions, however, also raises some issues to be resolved, such as legal issues related to proprietary rights [56], or linked to the players' physicality–such as haptic engagement– [57], embodiment, fundamental movement skills (FMS), and motor skills [55].

The second-largest **cluster** is **#2,** which focuseson **gaming-related disorders** included in the International Classification of Diseases, which is the basis *"for identification of health trends and statistics globally and the international standard for reporting diseases and health conditions"* [58]. The decision to include Gaming Diseases responds to a worldwide demand for treatment [59] that will permit the development of a brief screening tool, a new nine-item short-form scale, to assess gaming addiction [60]. Nevertheless, some concerns arise, such as the over-reliance on gambling and drug use criteria in present soperationalisation and the lack of agreement on the evaluation and symptomatology of problematic gaming. This cluster reveals some pertinent concerns. Firstly, there's a significant reliance on criteria associated with gambling and drug use in the current operationaliation of gaming disorders. This reliance raises questions about whether these criteria represent the unique challenges problematic gaming poses. Secondly, there is a lack of consensus within the academic community regarding the evaluation and symptomatology of problematic gaming. These issues underscore the necessity for ongoing research and dialogue to refine our understanding of gaming-related disorders and their treatment.

Gambling connected explicitly to video games and eSports constitutes the third area of research in this field (**cluster #3**). Researchers identify critical differences and similarities between sports and eSports bettors [61]. Gambling connected to eSports offers a new marketplace, following global trends and impacting local jurisdictions [61] for existing gambling products and providing new experiences [62]. They also analyse the bettors, concluding they are often young male (often under-age) users with higher levels of problematic gambling and determined to win money [63,64]. Therefore, they are warning about the negative impact of the sprofessionalisation of competitive games on individuals and society [65], noting that more research is needed to establish the generalizability of these findings. The consumption of eSports has been found to have a small to moderate association with video game-related gambling and problem gambling. Overall, the relationship between gaming, eSports, and gaming-related disorders is complex and requires further research.

Cluster #4 researchers focus their attention on **e-athletes** and the effects and **performance consequences** of professional practice. A good number of articles deal with the positive effects of electronic competitions' impact on cognition [66] and neurocognition [67], not only in the performance of the activity but also in how players achieve techniques to improve performance in competitive games [68]. Furthermore, the research also attempts to measure the impact and consequences of professional practice in the form of understanding the state of academic research in this field [21], the health habits and main threats such as injuries [69] or approaching their career transition when the lights turn off [70]. Nonetheless, it is essential to note that the number of retired e-athletes who have participated in research studies is still relatively small, so it is crucial to interpret the findings with caution.

Cluster #5 gathers papers that delve into eSports's definition and key features. When **defining eSports**, researchers analyse whether they should be included in traditional sports. The articles agree that they cannot currently be considered a sport because of their lack of physical activity [11,71] and its poor institutionalisation [3,11]. Nevertheless,

Table 3
Main research areas in eSports.

Cluster	Size	Silhouette	Mean (year)	Label	Description
1	69	0.905	2013	eSports industry birth	The birth of the eSport industry is analysed. Transition from video-games to eSports and the origin of e-gaming culture is explored.
2	59	0.901	2015	Gaming-related disorders	It develops the subject of Gaming disorder as a new trend included by the World Health Organization in the International Classification of Diseases and the pros and cons arised.
3	54	0.936	2017	Gambling	Gambling especifications are analized. Comparison with sport bettors and the way of betting is also tackled.
4	50	0.859	2018	E-athlete performance consequences	Positive and negative effects and consequences of professional practice are explored.
5	49	0.887	2017	Defining eSports	Contributions to define eSports and key features in relation to its shared attributes with traditional sport and the characteristics that set it apart.
6	47	0.865	2016	Consumer behaviour	Consumer behaviour of electronic competitions is analized.
7	38	0.941	2014	Multiplayer Online Battle Arena (MOBA)	It deals with Multiplayer online battle arena (MOBA), in particular with the social dimension of the Game and the players' performance.
8	34	0.996	2011	Behaviour effects on players	Positive and negative effects of video games are analized.
9	26	0.934	2015	eSports athletes experiences	Study on eSport athletes experiences and determinants.
10	23	0.938	2014	Online communities	It develops the subject of online communities and the platform where eSport happens: Twitch.
11	12	1.000	2017	Learning effects	Analysis of learning derived from the practice of eSports are explored.

Silhouette: quality of a clustering configuration [142], suggested parameters between 0.7 and 1 [41].

there are many similarities between sports and eSports in particular, concerning the growth of the industry and the managerial challenges. This is a reason why it is argued that eSports should be included in the field of sports management [20,24], education and research [72]. A closer examination of this cluster unveils an intriguing dichotomy. While there exists a clear distinction between sports and eSports, it is undeniable that they share certain parallels, especially concerning the rapid growth of their respective industries and the accompanying managerial challenges. This debate underscores the evolving nature of eSports and the need for flexible frameworks that can adapt to its unique characteristics, making it a subject ripe for interdisciplinary study and exploration.

Consumer behaviour of electronic competitions, thanks to media platforms such as Twitch, constitutes the area of research in **cluster #6**. Researchers identified critical behaviours thanks to the uses and gratifications theory [73–76]. Scholars point out how important social integrative motivations are to justify subscription behaviour [76] and how important the medium is (mainly Twitch), even more than the content [75]. They also analysed the relationship between the consumer and video -games consumption, emphasising the higher engagement of eSports compared with traditional sports [73] due to an active role where consumers nurture and sustain the eSports phenomenon with user-generated content [77]. In general, they notice that the fan base spends more time and money and motivationally connects and interacts with their peers intending to belong to the community [74]. eSports fans invest not only their time and money but also their motivation in forming connections and interactions with peers, all with the shared goal of belonging to the vibrant eSports community [74]. This analysis unveils the intricate web of motivations and dynamics driving consumer behaviour in the electronic sports landscape, shedding light on eSports's unique appeal and sociocultural relevance.

Cluster #7 deals with **Multiplayer Online Battle Arena (MOBA)**, the most famous eSports category. Despite being the most researched games, Mora-Cantallops and Sicilia [78] consider that MOBA games remain underexplored by the scientific community. The key issue of the cluster is related to the social dimension of the Game and the players' performance. On the one hand, MOBA games are not only structured in competitions that generate large audiences but also generate parallel participatory activities where any user, including players, are content creators in 'transmedia' mode, which also aims to train and refine the skills of other interested users Carrillo Vera [79]. On the other hand, researchers examine the players' expertise in tournaments. Bonny et al. [80] and Donaldson [81] show a link between gaming expertise and cognitive skills. Among the skills that stand out in MOBA gaming, players with gaming experience react more quickly to decisions requiring spatial memory and a binary model of expertise, in-game or mechanical expertise, and out-of-game or metagame [80]. Researchers will need to focus soon on various aspects of MOBA games such as metagaming or AI development. The concept of metagaming refers to the dominant playing strategies that evolve over time in the esports community. Fairness in group gaming, specifically in MOBA games, has been addressed through user allocation algorithms that aim to improve the gaming experience. Additionally, AI development in MOBA games has been a topic of interest, with efforts to train AI agents capable of playing full games and defeating top esports players. Overall, research in these areas contributes to a better understanding of MOBA games, enhances e-athletes experiences, and pushes the boundaries of AI capabilities in esports.

In **cluster #8**, the interest focuses on exploring the **behaviour effects** of video games **on players**. Researchers notice that a large majority of research, mainly performed by psychologists, focuses on the negative impact of some kinds of gaming. According to Anderson et al. [82], exposure to video game violence increases aggressive behaviour,

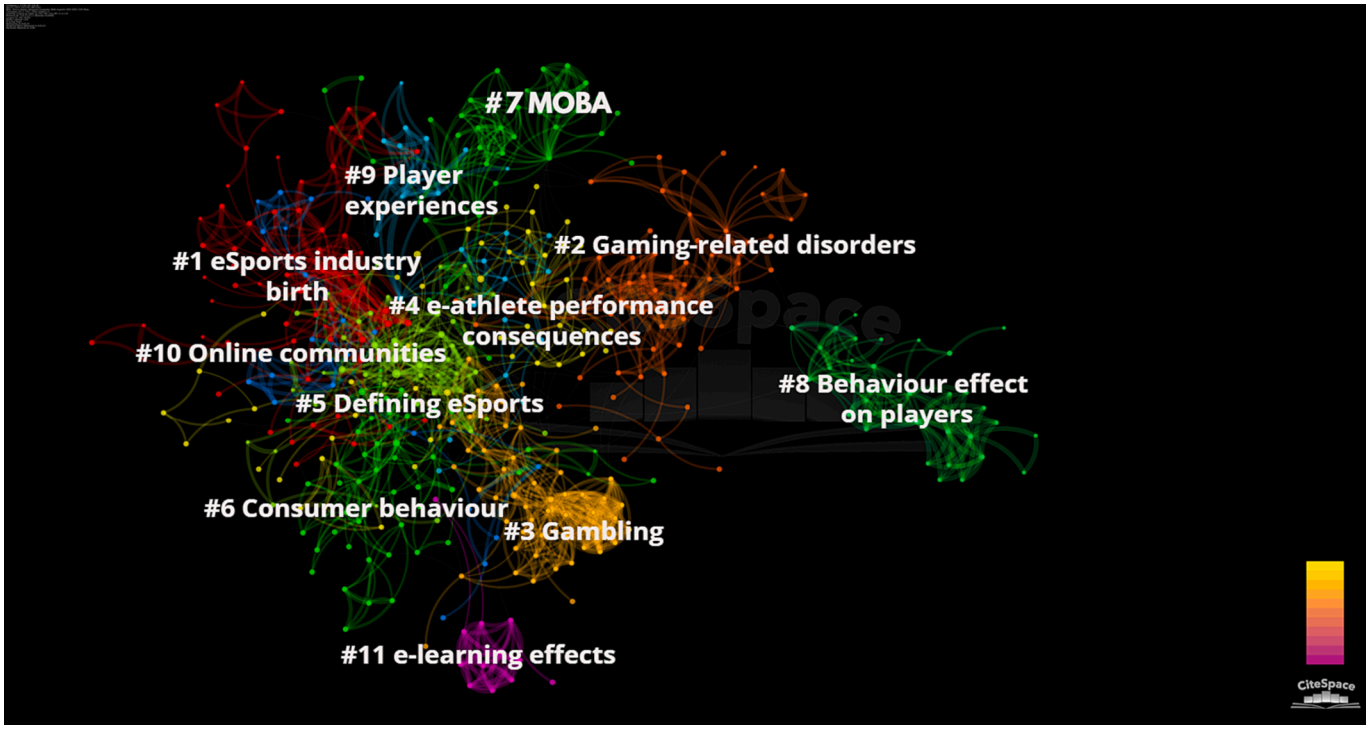

Fig. 2. eSport industry network.

cognition, and affect, as well as reduces empathy and prosocial behaviour. Adachi and Willoughby [83,84] state that in the short term, the video game competition, not violent content, is responsible for increasing aggressive behaviour. Other scholars also found positive cognitive, motivational, emotional, and social [85] effects on playing video games and a correlation between higher academic grades and problem-solving skills [86]. As the esports industry experiences rapid growth, there is an increasing focus on examining the psychological and behavioural consequences of competitions and gameplay. On the positive side, esports can foster teamwork, strategic thinking, and quick decision-making skills, which can translate into real-life benefits. However, prolonged exposure to competitive gaming may also lead to increased aggression, social isolation, and disrupted sleep patterns. Understanding these behaviour effects is crucial for not only the well-being of esports players but also for the development of effective training programs and support systems to optimie their performance and mental health.

Cluster #9 research area is related to some **eSport athletes' experiences** and determinants while playing at an advanced level. Researchers emphasise that the industry should correct some largely negative developments that affect gamers when playing, such as isolation [87] or sexism and sexual harassment that even cause women's withdrawal from competitions [88,89]. Parshakov and Zavertiaeva [90] tackle how performance is determined by government investments, predominantly in tech infrastructures. Following in the footsteps of traditional sports, there is growing concern over the health and well-being of esports athletes. Furthermore, the career aspects of esports athletes have been identified as an area requiring further research, with challenges such as career-entry difficulties, burnout, and post-career dilemmas.

Virtual worlds and **online communities** are related business areas. Several scholars analyse eSports services and platforms in **cluster #10**. If in cluster #6, the theory of uses and gratifications had guided the research on consumer behaviour, in cluster #10, researchers shift their interest to two more specific aspects: the analysis of the environment where it is carried out and the sociographic profile of users. Twitch is the place where eSports and gaming fulfil what every traditional sports competition or league is desperate to become: young, global, digital and increasingly diverse [91], in a place that combines broadcast video with open IRC chat channels [92]. Players, as well as the audience, seek to satisfy both competitive (competition and challenge) and hedonic (escapism) needs [93]. Twitch streams offer a forum to ssocialise and participate, from intimate communities to massive broadcasts. Twitch has reshaped how gameplay footage is shared online and has promoted the growth of online gaming communities. Relationships can develop within Twitch channels through interactions in the chat environment, facilitated by reduced physical cues and frequent interaction. Twitch streams act as virtual third places where informal communities emerge and socialise. However, Twitch communities face challenges such as online harassment and hate raids, which require new moderation mechanisms. Overall, while Twitch has revolutionised the sharing of gameplay footage and the growth of online gaming communities, it also faces limitations in community governance, moderation, and addressing harassment issues.

The **learning effects** derived from the practice of eSports are at the epicentre of the research area of interest for scholars of **cluster #11**. Compared to cluster #8, where research had focused on the most damaging effects of video games on gamers, in cluster #11, the epicentre shifts to various learning outcomes of playing eSports. Both theoretical review [94] and qualitative analysis [95] show e-athletes' need of learning a foreign language as one of the side effects of playing eSports. eSports contribute by creating a space for players to communicate in English with a single objective: their team's victory. Another collateral effect of this new industry can be seen in advertising strategies. Players are an efficient brand sponsorship strategy, either to promote their products or to develop branded content [96]. Nevertheless, it is important to note that the research on the learning effects of esports is still in its early stages, and more research is needed to confirm the findings and identify any long-term effects.

3.2. *Intellectual turning points in eSports research*

Papers with betweenness centrality is higher than 0.10 are considered essential network connectors and turning points, given that they

usually connect a great amount of papers and different clusters, being considered an intellectual resource by many scholars [38]. Heere [20], which belongs to cluster #5, is the only paper that fulfils this condition (0.11) and can be considered the intellectual backbone of eSports field. Although the existence of only a single paper with enough centrality in a bibliometric analysis is not ordinary, the nature of the field of knowledge, an industry in its infancy and whose scientific publication has a history of fewer than two decades, is conducive to this result. Heere [20] deals with the definition of eSports, mainly through its comparison with traditional sports and, specifically, with the discipline of knowledge encompassed by sports management. Sportification refers to integrating sports elements into various aspects of society, such as popular culture, Science, traditional sports clubs and esports. It involves the institutionalisation of practices, the formalisation of standards, and the specialisation of roles [97]. The sportification of popular culture, for example, can be seen in television reality shows like Masterchef, which adopt sport-like elements in their format [98]. Traditional sports clubs also embrace sportification by entering the eSports ecosystem to attract a younger audience and adapt to digitisation and internationalisation. Additionally, the sportification of Science is an emerging trend where sports principles and practices influence Science [99]. Overall, sportification reflects sports' growing influence and impact on various aspects of society, highlighting its significance in modern life.

Heere [20] revolves around sportification, a concept included in sports management, and, therefore, analyses the link between eSports and sport. Whether or not eSports qualify as sports, the article suggests that they should be incorporated as a core topic in sports management because they manifest sportification. Following the sportification concept developed by some of the most important associations in sports, such as the North American Society for Sport Management (NASSM), European Association for Sport Management (EASM) and Crum [100], Heere [20] establishes that "sportification" means: (1) sport-like, cooperative or competitive activities that can be viewed, organised or regulated and can be compared both from the past and the future; or (2) activities that are likely to be more attractive to their target audience by integrating a sporting ingredient. Therefore, Heere [20] argues for an open, interdisciplinary view of sport management [101] as opposed to the more closed view [102].

Heere [20] also shows that if the field of sport management wants to remain relevant, it should evolve and embrace new forms of sport or manifestations of sportification instead of narrowing its scope. Despite most authors arguing the lack of physical exercise for the non-acceptance of eSports in the sports ecosystem, Heere [20] believes this must be the reason for its acceptance. His arguments focus on the fact that sport management expertise should not only address elements of physical health but also analyse the potential of an emerging field with undeniable connections to the sport industry.

Heere [20] belongs to cluster #5 (defining eSports) and is a turning point that connects this cluster with #1 (eSports industry birth), #6 (consumer behaviour) and #8 (behaviour effects on players). In this sense, it is interesting to see how Heere [20] has influenced later research and study lines. Heidenreich et al. [103], with clear connections with cluster #6, analyse the feelings of Counter-Strike videogame community and find the negative feelings outnumber the positive ones, and some of them are related to sportification concept, such as their opportunistic economic behaviour, the standardisation of rules, protecting e-athletes and the growth of eSports. Nonetheless, they conclude that the influence that eSports communities will have in the institutionalisation process will be limited, what will make that these kind of organisations will be accepted by consumers as an ongoing process. Cumming et al. [104], with also clear connections with cluster #6, analyse how to construct genuine spectatorship at an eSports bar, citing Heere [20] five times along the paper, and describing eSports as a relatively new type of media spectacle that, as a result of sportification, has recently been imbued with sports authenticity conventions that are not yet well defined, such us the use of sporting iconography and conventions to make it appear more attractive to consumers. As a way of example, the bar's customers imitated actions seen on broadcast in order to verify that they were watchers. Therefore, Cumming et al. [104] have seen how sportification has an impact on eSports spectator behaviours that goes beyond structural and aesthetic modifications. Tjonndal [105] uses the concept of sportification to investigate the case of the virtual backlash against the establishment of Eserien, the professional FIFA league, as Norway's first professional eSport league under the sport video games category, and its affiliation with the Norwegian Football Federation. Turtiainen et al. [106] examine the process of sportification of eSports in the context of tournament broadcasts; in order to find similarities and differences in the areas of broadcast structure, acknowledgments and game highlights, commentary and expertise, game presentation, players and teams, and audience, the Overwatch World Cup 2016 tournament is analysed and compared it to the FIFA World Cup 2014. Finally, sportification concept has been used in new study lines with case studies that does not have to do with eSports, such as the sportification of cooking in reality TV programmes, namely Master Chef USA [107], the sportification of surgical training [108], skateboarding [109], crossfit and parkour [110].

The concept of sportification has impacted the eSports industry in several ways. Firstly, traditional sports clubs have seen esports as a way to diversify their product or brand and attract a younger audience [97]. Secondly, eSports athletes [111] have recognised their identity as commodities within the industry, with their value being exploited by agencies and other actors [112]. Thirdly, the COVID-19 pandemic has led to a convergence between video games and traditional sports, with gamification modes used to engage fans and provide unique content [113]. Additionally, there is a significant degree of complementarity between eSports and traditional sports, with interest in eSports influencing overall interest in sports, particularly among young people [114]. Finally, sportification is relevant to sport management scholarship and discourse, as eSports represents a form of sport associated with various outcomes such as physical and psychological health, social well-being, and diversity and inclusion [24].

3.3. Burst detection in eSports research

Burst papers, according to the algorithm designed by Kleinberg [115], receive a considerable number of citations during a specific period, indicating that they attracted academic attention. Table 4 identifies the 12 papers with the largest citation bursts within the eSports field. Paradoxically, although the number of citing papers has increased from 2018 to 2020 (Fig. 1) and the average period to become a

Table 4
Burst papers in eSports research.

	References	Strength	Begin	End	2011–2021
1	Adamus (2012) [52]	4.39	**2015**	2017	
1	Borowy & Jin (2013) [10]	3.13	**2015**	2018	
1	Taylor (2012) [54]	9.74	**2016**	2017	
1	Witkowski (2012) [57]	8.01	**2016**	2017	
1	Seo (2013) [53]	4.69	**2016**	2018	
8	Granic et al. (2014) [85]	3.75	**2016**	2018	
2	American Psychiatric Association, DSM-5 (2013) [143]	3.75	**2016**	2018	
1	Burk (2013) [56]	2.81	**2016**	2018	
10	Weiss & Schiele (2013) [93]	3.63	**2017**	2018	
5	Holt (2016) [71]	2.84	**2017**	2019	
10	Hamilton et al. (2014) [92]	2.84	**2017**	2019	
1	van Hilvoorde & Pot (2016) [55]	2.58	**2017**	2019	

burst paper is 2.75 years after publication, no burst papers have been published since 2017.

Strength of the burst of a document is based on the Kleinberg's algorithm [115]. Red line segment represents (in Tables 4 and 5) the time period in which a reference was found to have a burst, indicating the beginning year and the ending year of the duration of the burst. Clusters with several burst papers are considered active and emergent research areas [50]. Table 5 indicates the number of burst papers per cluster, when the writing of the trend began (Min (year)) and ended (Max (year)), the mean year, the mean strength value as well as when the trend began (Min (begin)) and ended (Max (end)). Therefore, there have been five trends in the field of eSports research, given that there are five clusters with burst papers.

The first trend is encompassed by seven papers of cluster #1, which consists of early works eSports,n the applied framework of eSports, published from 2012 to 2016 and burst from 2015 to 2019. Secondly, one paper of cluster #2 that deals with gaming-related disorders was written in 2013 and became burst from 2016 to 2018. During the same year, 2013 until 2014, we found two papers from cluster #10. Their theme, online communities, bursts between 2017 and 2019. The writing of cluster #8 started one year after the beginning of the writing of cluster #10. It comprises only one burst paper (published in 2014) and deals with behavioural effects on players. This paper became burst from 2016 to 2018. The fifth trend is composed of one paper written in 2016. This last trend, cluster #5, thematically linked to the definition of eSports, coincides in its burst period with cluster #10, starting in 2017 and finishing in 2019.

We can find links between cluster #1, which lays the foundations for the birth of eSports, transiting from amateur and individual video game playing and recreational tournaments to an organised industry, and cluster #5. Interestingly, the end of the burst period of the former, in 2017, coincides with the latter's beginning. We can establish that researchers transited from a cluster where the epicentre is foundational to a second phase (cluster #5) where the intellectual challenge is to define what eSports are and, specifically, whether or not they should be considered sports, and included in the academic discipline of sport management.

A second exciting connection could be established between cluster #2 and cluster #8. We find that the years of publication are consecutive: 2013 (cluster #2) and 2014 (cluster #8). The themes are also related: cluster #2 addresses the psychological disorders that some video games and eSports can provoke in their players, whereas cluster #8 addresses aspects linked to behaviour but also emphasises their positive aspects. Note that both clusters burst in the same chronological period: 2016–2018.

Finally, cluster #10, which coincides chronologically with cluster #5 as a burst in the most recent period, addresses one of the critical elements of eSports: online communities. eSports users arouse the interest of researchers for multiple reasons, highlighting their size, their global nature, their capacity not only to consume content but also to create it, and their engagement as a result of taking place in digital-only environments.

4. Discussion and conclusion

Using a cocitation bibliometric analysis, we mapped out the intellectual structure of eSports research. Our results are quantitatively rigorous and make various contributions to the field's ongoing advancement.

First, we delimited eleven main areas within eSports research: eSports industry birth; Gaming-related disorders; Gambling; E-athlete performance consequences; Defining eSports; Consumer Behaviour; MOBA (Massive Online Battle Arena); Behaviour Effects on players; Player experiences; Online communities; and Learning effects. In comparison to Guorui [32], in which the sample finishes in 2011, their clusters are included among our clusters, namely, both eSports development and industry development correspond to our cluster #1 (where the birth of the industry has also been addressed), and the impact of eSports on education corresponds to our cluster #11. Therefore, our contribution to the field is expanding a previous clustering–only 3 clusters were obtained by Guorui [32]–into a more recent and consequently broader scope, with eleven clusters.

As far as the practical real-world practical implications, the bibliometric analysis delineated in our study offers actionable insights for the eSports industry, particularly in strategic planning and elevating fan engagement experiences. This research has already proven instrumental in consultancy endeavours, as evidenced by its application in advising the *Barcelona City Council* on eSports-related policy-making. Additionally, the insights garnered in this bibliometric analysis have pivotal implications for industry intelligence, with entities like LVP (*Liga video juegos Profesional, the Spanish Professional video Games League*), in collaboration with Deloitte, harnessing this data to craft a comprehensive *2022 Consumer eSport Report* [116]. This endeavour aims to meticulously unravel the dynamics of eSports fandom. The practical application of such bibliometric assessments underscores their significant influence, steering industry leaders towards informed, data-centric strategies.

As mentioned above, the consequences of the information and knowledge provided by the paper have had a direct impact on the city of Barcelona, through a consultancy project for its *City Council* during the first half of 2022. The aim of this intervention was to analyse the situation of eSports in the city of Barcelona and to define future actions. During the process, an analysis of the activities linked to eSports in the city was carried out, as well as a survey and a focus group of companies in the sector. Based on a bilateral meeting between the *City Council* (sports, economic activity and youth councillors) and a group of the most representative companies in the eSports scene, a conclusion was reached on the need to develop two commissions: the first aims to develop the eSports economic activity, and the second one to develop social and education strategies. Likewise, a *Strategic Plan* for the city on eSports was agreed to be created.

Second, the only paper that can be regarded as an intellectual turning point is Heere [20]. From the eight articles [55,56,74,85,117–120] with the strongest links to Heere [20], two were written the same year and six before, between 2013 and 2016. The centrality of the article and the date of its publication, later than most linked with, suggests that the article acts as a meeting point. Heere [20] successfully consolidated the previous knowledge regarding eSport and developed the concept of

Table 5
Burst papers per cluster in eSports research.

Cluster	Cluster label	No. Papers	Min (year)	Max (year)	Mean (year)	Mean (strength)	Min (begin)	Max (end)	2011–2021
1	Esports industry birth	7	2012	2016	2013	5.05	2015	2019	
2	Gaming-related disorders	1	2013	2013	2013	3.75	2016	2018	
8	Behaviour effects on players	1	2014	2014	2014	3.75	2016	2018	
10	Online communities	2	2013	2014	2014	3.25	2017	2019	
5	Defining eSports	1	2016	2016	2016	2.84	2017	2019	

sportification which led to the expansion of the concept of sports. This paper revolves around the concept of sportification, a concept included in sports management, and therefore analyses the link between eSports and sport. Its centrality can be interpreted by its interest in overcoming the debate on whether or not eSports should be considered sports, and thus be studied from a sports management perspective. Heere [20], with his concept of sportification, takes a further step in the line initiated by Weese [121] and followed by J. I. Newman [122], who propose to broaden the scope of study of what is considered sport management, and that it should be approached as an interdisciplinary field [101].

The sportification of eSports presents both challenges and opportunities. Traditional sports clubs are turning to eSports to diversify their product and attract a younger audience [97]. The COVID-19 pandemic has further accelerated the growth of eSports as a digital alternative to traditional sports events. However, there are challenges faced by female athletes in eSports, including gender stereotyping, communication issues, and the perception that women are not suitable for certain types of online games [123]. Overall, the sportification of eSports provides opportunities for traditional sports clubs to expand their reach and engage with a new audience while also creating challenges related to gender equality and inclusivity in the eSports industry.

Third, clusters with burst papers initially dealt with the eSports industry birth (cluster #1) and after that with its definition as eSports (cluster #5). Furthermore, the effects on gaming-related disorders (cluster #2) as well as players' behaviour (cluster #8) were analysed. Online communities (cluster #10) and audiences have been the last cluster to burst. No article written since 2016 has been trending. This fact shows that we need to rethink the future of research in the field of eSports to achieve burst articles once again. It is true that several research agendas were written over the last few years [124–128], but they failed to create trends. Therefore, as a complement to these, we would like to suggest some areas of study to obtain new burst papers.

The link between eSports and sport or sports management is conveyed both from the need to address the management of the industry in its regular activity: teams, tournaments or organisational models [127]; and from the relationship with super events, such as the Olympic Movement, [128]. With links to cluster #1 and cluster #5, both themes delve into the relationship between conventional sports and eSports. Nonetheless, for the time being, these two proposals have not become burst. Undoubtedly, and following the influence of traditional sport, we can intuit relevant opportunities that should be taken advantage of. Firstly, the economic and social impact of eSport events can also be analysed from both a territorial and a tourist perspective, as happened in traditional sport. Secondly, it links to the phenomenon of audiences and fans' commitment to eSports and its teams, players or casters. The connection with cluster #5 and Heere's [20] concept of sportification, that the authors recommend as a theoretical framework, would allow us to enter into areas linked to managing a nascent but booming industry. The traditional sport appears as a mirror where we find plenty of literature to look for inspiration. Studies related to the economic impact of eSports might be inspired by those already carried out in sports events [129,130] given that existing eSport research are limited in methodology, sample size, and generalizability. The meteoric rise of eSports signifies vast business opportunities, drawing major corporations and revolutionizing the industry's business models. As this sector matures, its economic fabric grows ever more intricate, with large companies playing a pivotal role in its evolution. Simultaneously, the transformation of video games into eSports phenomena like League of Legends has blended gaming with narrative spectacle, capturing global audiences. Exploring how this growth and narrative innovation are symbiotically driving the industry forward, creating a new paradigm where competitive gaming becomes a major spectacle and a significant business venture could be an intriguing future line of research.

Another area that may arouse the interest of scientists may be the analysis of the impact on a region, taking as reference countries such as Andorra or Malaysia, which are strategically investing in this emerging industry. Malaysia has launched a strategic plan (2020–2025) for this end. Kramer et al. [131] follow the path initiated by Abeza et al. [124], Agrawal et al. [125] and Corthouts et al. [126], and propose a research agenda that advances social media research. This line of study emphasises the analysis of professional athletes as eSports influencers and the functioning of eSports communities, linked with cluster #9, which deals with e-athletes' experiences and determinants. The rise of eSports has led to the professionalization of gamers as entertainers/athletes, attracting the attention of wealthy businessmen and iconic sports names, which particular cases could be considered as future lines of research. They propose to deepen the understanding of the customer and game experience of digital communities, both tackled in clusters #6 (consumer behaviour) and #10 (online communities), by analysing the motivational factors behind player engagement and what makes eSports an entertaining sporting option [132], and furthermore, to understand audience engagement [133] across the screen. Emulating the research of Rodríguez et al. [134], to understand the determinants of audiences in cycling and García and Rodríguez [135] for football can allow us to establish the differences and similarities between those who enjoy sports broadcasting and eSports fans. The study of emotional elements about attachment, satisfaction or the feelings of spectators or audiences, among others, have already been studied in traditional sport [136,137]. These trend areas fit perfectly into the eSports industry, with its growing audience following, but also continue to attract interest in conventional sport. ESports has established itself in the leisure and entertainment digital market, with a similar number of followers, turnover, and advertising to traditional mass sports, what can be considered as a prospective line of research. Studies [138–140] have focused on the emotional components of eSports fans and their engagement with eSports teams and players. Emotional engagement is a key component of eSports fan behaviour, with fans valuing both emotional engagement and management cooperation. Emotional contagion is also observed in collaborative learning contexts using virtual reality (VR), where spectators show similar emotional engagement with presenters. Playful-consumption experiences such as enjoyment, sensory experiences, emotional involvement, and arousal positively affect consumers' eSports game engagement. ESports game engagement, in turn, influences continuance intentions, electronic word-of-mouth (eWOM), and online reviews. Competitive video gaming in eSports has both positive and negative emotional impacts on players and consumers, suggesting the need for interventions to address the negative emotional impact.

Fourth, the scientific journals that mainly contributed to eSports research were identified. Centrality results identify *Sport Management Review* as the journal that published the most relevant or influential eSports article [20]. The following journals published burst papers: *Sport, Ethics and Philosophy* (2), *Journal of Marketing Management, American Journal of Play, American Psychologist, Computer Games and New Media Cultures, Electronic Markets, Games and Culture, International Journal of Communication* and *University of Pennsylvania Law Review*. Interestingly, no one of the burst papers is included in publications in the eSports field such as *Social Issues in eSports, eSports Insights* or *The International Society for eSports Studies*. As far as publications that have ten or more papers related to eSports, such as *Gaming Law Review Economics Regulation Compliance and Policy, Frontiers in Psychology, Computers in Human Behavior, International Journal of Environmental Research and Public Health, International Journal of Gaming and Computer Mediated Simulations, Lecture Notes in Computer Science, Frontiers in Sports and Active Living, Journal of Behavioral Addictions, Routledge Research in Sport Culture and Society, German Journal of Exercise* and *Sport Research, International Journal of Sports Marketing Sponsorship, Communication Sport, Sport in Society* and *Sustainability,* only Games and Culture has published one burst paper.

Finally, despite some limitations of bibliometric analysis, it is of great help to obtain quantitative and qualitative approximations of a large number of publications. It is still necessary to have a broad knowledge of this subject, a high capacity for its bibliographic review,

its synthesis and the contribution of its discussion with other experts in the field to reach reasonable conclusions [30]. A limitation of the paper is that Science Citation Index Expanded (SCI-E) has not been included as a source for citing papers, although some papers included in this index could be considered as social science. Nonetheless, papers dealing with technical issues, particularly information technology, was the main reason why SCI-E was not included. Furthermore, it would be advisable to include in future studies other traditional bibliographic sources of equal prestige (Scopus, Dimensions, etc.), grey literature (i.e.: *CHI Conference on Human Factors in Computing Systems*, *IEEE Conference on Games*, *Conference on* video*game Sciences and Arts*, *Joint International Conference on Serious Games* among others) as citing papers or the inclusion of two data bases of WoS that contain conference proceedings: CPCI-S (*Conference Proceedings Citation Index-Science*) and CPCI-SSH (*Conference Proceedings Citation Index-Social Science & Humanities*) [141] and, in addition, to take into account the new data that can be obtained from the activity recorded on the Internet (Altmetrics). Despite these limitations, the academic recognition of the sources used (SSCI and ESCI) in social sciences allows us to indicate that the results obtained have a reasonable scientific basis.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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