



Global scientific production regarding behavioral addictions: An analysis of the literature from 1995 to 2019

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ABSTRACT

Aims: The increase in scientific interest in so-called behavioral addictions has been growing in recent years. For this reason, the aim of our study is to use bibliometric techniques to identify where and with what intensity these behaviors are being studied.

Methods: In October 2020, we conducted a search in the Web of Science Core Collection using a search equation designed to retrieve the articles that combine the general keywords of addiction with specific terms of the 7 groups of behavioral addictions analyzed (gambling; gaming; information and communication related disorders; and the so-called somatic addictions related to sex, shopping, food and sports). Articles published from 1995 to 2019 were included.

Results: We found 9199 distinct articles. Gambling was the most studied addiction, but Information and Technology Communication-related disorders (ITC) had the highest growth rate over the span of five five-year periods, followed by gaming and food addiction. In general, there was a growth rate of 130.46% in the research on behavioral addiction issues. By geographical region, the United States was the most productive country regarding all addictions, but Oceania had the highest proportion of publications per million population. There was a clear interest among Asian countries in studying problems related to ITC and gaming problems.

Conclusions: The importance of the seven behavioral addictions analyzed according to their growth rate in scientific research fields over the last 25 years was confirmed in our study. In addition, the differences in interest by geographical region show us that it is important to delve deeper into cultural particularities to better understand this phenomenon.

1. Introduction

Following previous studies, the problems caused by so-called behavioral addictions are similar to those caused by substance addiction. This is because what defines an addiction is not only the frequency of a behavior but also the relationship that is established with it and that implies the symptoms of tolerance and withdrawal as diagnostic criteria. For example, in the case of gambling disorder, the tolerance is defined as the need to betting with increasing amounts of money to achieve the desired excitement and, on the other hand, withdrawal is understood as a person becoming restless or irritable when trying to reduce or stop gambling (Alavi et al., 2012). Both tolerance and withdrawal syndrome

can occur with and without substances and are related to both the neurochemical addiction basis and psychosocial-derived problems (De Sola Gutiérrez et al., 2013; Derbyshire & Grant, 2015; Grant et al., 2006; Kim et al., 2020; Kim & Hodgins, 2018). One clear example is the mentioned gambling disorder and its acceptance in the DSM-V (Diagnostic and Statistical Manual of Mental Disorders). Here, gambling is defined as part of the “substance-related and addictive disorders” group and as “persistent and recurrent problematic gambling behavior leading to clinically significant impairment or distress” (Substance Abuse and Mental Health Services Administration, 2016). Although no behavioral addiction other than pathological gambling is currently included in the DSM, it is common to find other behaviors also considered addictions in

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the scientific literature (Derevensky et al., 2019; Kuss & Pontes, 2019). These other behaviors are related to food consumption, internet use, mobile phone use, physical activity, shopping and sexual behavior. In this way, dysfunctional food consumption, compulsive sexual behavior, excessive exercise or abuse of shopping can develop food addiction, sex addiction, exercise addiction and shopping addiction, respectively (Çakın et al., 2021; Collins et al., 2021; Goslar et al., 2020). Furthermore, behaviors related to the dysfunctional use of some devices and information and communication technologies such as unreasonable problematic internet use and the uncontrolled use or overuse of mobile phones or video games can also lead to a disorder that is related to addiction (Derevensky et al., 2019).

Beyond their inclusion in the DSM-V or their consideration or not as addictions, these problematic behaviors are causing real physical and psychosocial problems to those who suffer them (Grant et al., 2014). A close example of these problems could be observed with the health crisis due to the COVID-19 virus that is forcing us to change our lifestyles. Several studies have shown us how this crisis and its related consequences (physical distancing, lockdown, contact tracing, economic problems, etc.) also affect behavioral addictions (Jalal et al., 2020; Ko & Yen, 2020).

Therefore, due to the current relevance of this topic and its changing situation, it is necessary to know the scientific production in the area of behavioral addiction from a broad perspective. Furthermore, considering that the problems or consequences of behavioral addictions may not affect all countries and regions in the same way, as demonstrated with the problems of substance addictions (Khalili et al., 2018), it is necessary to deepen the knowledge of the geographical differences to enable the design of adequate policies and legislation.

To achieve this purpose, bibliometric studies offer us a very useful quantitative perspective that allows us to assess the development and evolution of the research on the topics to be analyzed. These studies use easy-to-understand production, collaboration, and impact indicators to identify trends over time. In the field of behavioral addictions, some studies have focused only on a particular behavioral addiction, such as internet use disorder (Moreno-Guerrero et al., 2020; Tran et al., 2020; Vega-Almeida & Arencibia-Jorge, 2019), gambling and gaming (Shaffer et al., 2006; Stehmann, 2020) or a combination of the internet and gaming (Carbonell et al., 2009). In the case of the analysis by country, the trend is the same, and studies focused only on a specific behavioral addiction (Moreno-Guerrero et al., 2020; Tran et al., 2020; Vega-Almeida & Arencibia-Jorge, 2019) or those that involved the use of technologies and the internet (Carbonell et al., 2009) were found.

However, no study that assess behavioral addiction and its differences among countries, regions or continents from a broad perspective was found. For this reason, following the idea of the study of Khalili et al. (2018) that focused on illicit drugs, in this work, we aim to conduct a global bibliometric study on the behavioral addiction literature from the last 25 years in order to quantify the research productivity.

2. Methods

2.1. Search strategy

The articles analyzed in this study were retrieved from the Web of Science (WoS) Core Collection. This database was accessed through the Spanish Science and Technology Foundation (FECYT) (wos.fecyt.es).

In this study, we consider behavioral addiction as the following: gambling disorder (as defined in the DSM-V); gaming disorder; somatic addictions (those related to instinctual behaviors or linked to bodily functions), including sex addiction, shopping/buying addiction, food addiction and exercise addiction; and behaviors related to technology and communication, including mobile phone addiction, internet use addiction and problematic internet use (Arslan & Kirazli, 2019; Derevensky et al., 2019; Di Lodovico et al., 2019; El Archi et al., 2020; Grubbs et al., 2020; Ste-Marie et al., 2006; Yau et al., 2014). In this

study, we chose to “package” the addictions related to technology and communication under the name of “ITC (information and communication technologies)-related disorders” (ITC onwards). This category includes different problematic behaviors related to the use of the internet (also known as internet addiction disorder or internet addiction) together with the use of technological devices such as computers, tables and mobile phones or smartphones.

In order to retrieve articles on these topics of behavioral addictions in the WoS, a specific search equation was designed and can be found in Appendix 1 of the [supplementary material](#).

The search was performed in the “topic” field of the WoS and articles from 1995 to 2019 were selected. The field “topic” includes the search in Title, Abstract, Author Keywords and Keywords Plus ®.

The search was conducted in October 2020, and a total of 17,259 records were retrieved. In a second step, we selected the records in which the document types were articles, resulting in a total of 13,625 documents.

2.2. Database generated and sample

Using our software “Bibliometricos”, bibliographic records were included and parsed in an SQL relational database. The first thing that we detected was that the search in the Keyword Plus ® (index terms automatically generated from the titles of cited articles), could result in the retrieval of articles irrelevant to our study. For this reason, a more exhaustive review was necessary.

For this purpose, two researchers (SCA and VZJC) conducted a conceptual analysis of the records in order to obtain the most relevant terms for this study. This analysis was conducted by selecting random samples to detect relevant items and correct the irrelevant ones according to our objective. To do so, more precise combinations of terms related to behavioral addictions (gambling, gaming, sex, physical activity/sports, food, buying or the internet) were used.

Once the selection of the relevant terms was performed, a search in the title and keyword fields was conducted, obtaining a total of 9,199 records (67.51% of 13,625). Examples of records that had been initially recovered from the Web of Science and their reasons for exclusion and specific keyword queries to differentiate between different types of behavioral addiction can be found in Appendix 2 of the [supplementary material](#).

The process of searching, retrieving and cleaning the data is explained in Fig. 1.

2.3. Data analysis

For the goal of this study, we have provided numbers, trends and the growth rate of documents published on seven categories of behavioral addictions for each country, region, and continent.

Of the 9,199 records, we designed specific keyword queries to differentiate between different types of behavioral addictions in articles. For this distinction, it was necessary to consider that an article could study more than one type of addiction; thus, we considered this possibility. In this way, 1,074 documents addressed more than one behavioral addiction. For the analysis by types of addictions, these articles were counted once for each addiction included in their studies.

To acquire global data on countries and regions, we located the countries through the author affiliations in each article. If a paper had authors from different countries, the paper appeared in the outputs of all affiliated countries. For this reason, it is possible that the quantities are greater than 100%. The author affiliations do not provide specific information about the regions. For this reason, we use the list of countries to identify each country with its region and continent following the UNODC classification (United Nations, 2019). The classification can be found in Appendix 3 of the [supplementary material](#). Moreover, in order to determine the proportion of articles by population, we collected information about the total world population in 2019 by country from the

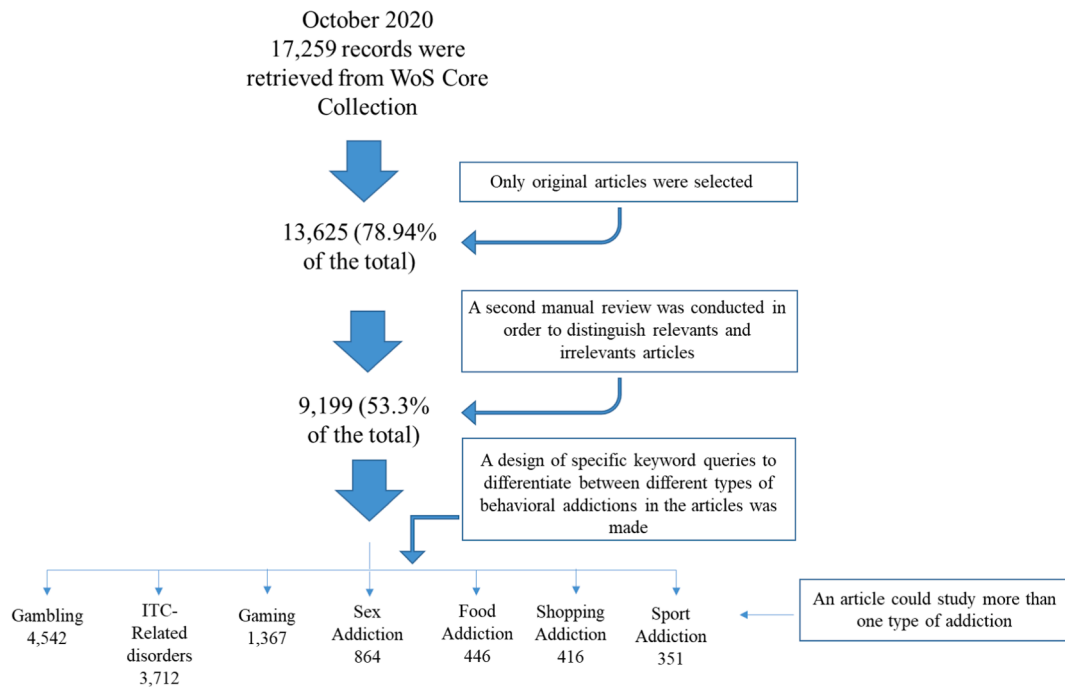


Fig. 1. Flow chart about the process of searching, retrieving and cleaning the data.

World Bank (The World Bank, 2021a).

From the resulting database, the following production indicators were calculated for each behavioral addiction: the numbers of articles in the five-year periods per country and region and the proportion of articles by population. Then, indicators based on citations were also obtained: the number of citations of the articles published in these periods related to the type of behavioral addiction and countries. Additionally, we calculated the growth rate using the following equation adapted from Valderrama-Zurián et al. (2020):

$$\left[\left(\frac{\text{Last quinquennium}}{\text{First quinquennium}} \right)^{\frac{1}{n \text{ quinquennium}}} - 1 \right] \times 100$$

In addition, an infographic map was created to show the scientific

collaboration between countries. To make this map, a matrix was made in Microsoft Access, which was then moved to the Pajek program (<http://mrvar.fdv.uni-lj.si/pajek/>) to create the network. For the elaboration of this network, a threshold of more than 5 collaborations was used as it was considered the most appropriate for its visualization and analysis. In the representation, each sphere represents a country, and its size is proportional to the number of different countries with which this country collaborates. Furthermore, the thickness of the line between two spheres is proportional to the number of scientific papers on which two countries collaborate.

3. Results

The first thing that we can observe in the analysis by five-year

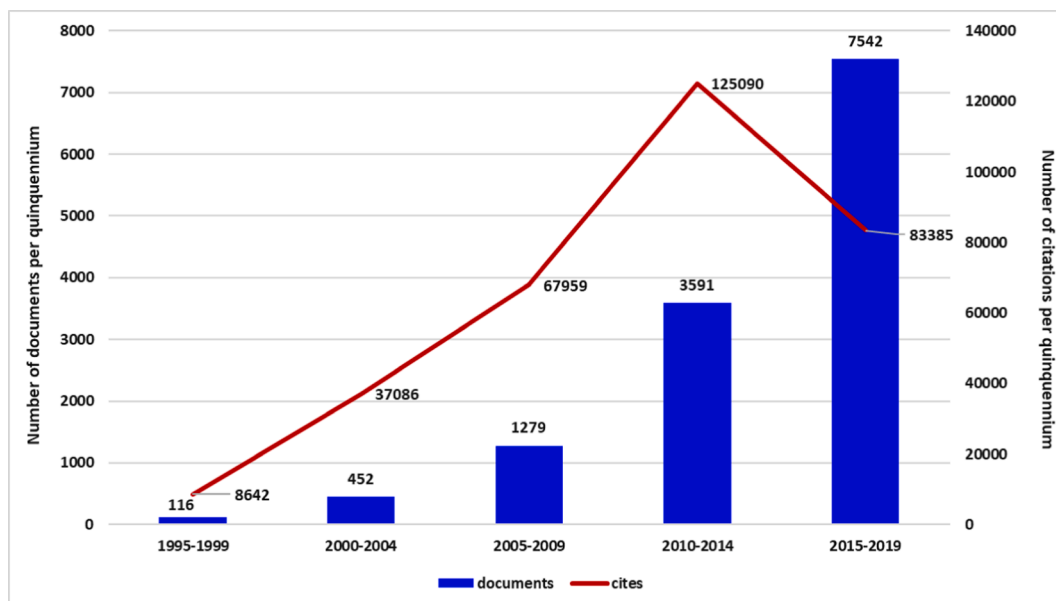


Fig. 2. Total numbers of publications and citations in each five-year period.

periods is that in general, the growth of the research on the topic of behavioral addiction doubled over each five-year period. Fig. 2 shows this growth in terms of the number of documents and the total number of citations per five-year period.

Regarding the different types of behavioral addictions, we found that the highest shares of documents on behavioral addictions was for gambling (38.83%) and ITC (31.73%), followed by gaming (11.69%). Conversely, food addiction, shopping addiction, sports addiction and sex addiction were less represented (3.81%, 7.39%, 3% and 3.56%, respectively). Regarding the analysis by five-year period, although gambling is the most prevalent addiction in the literature, it is important to highlight that ITC was the topic that had the greatest growth both in the number of documents and especially in citations, as Fig. 3 shows.

Regarding the growth rate between the first five years and the last five years, we obtained a general growth of 130.46%. However, when we assessed the growth of each specific behavioral addiction over the five-year periods, we observed interesting trends. First, we detected the largest growth of publications on ITC (299.6%), gaming (236.9%) and food addiction (218%); they were followed by sex addiction (114%), sports addiction (113%), gambling (99.4%) and shopping addiction (70%).

The analysis of the geographical differences was conducted according to the 96 distinct countries obtained through the authors' affiliations. First, we observed that the most productive country in regard to all the addictions was the United States (gambling n = 1232; ITC n = 463; gaming n = 160; sport addiction n = 75; shopping addiction n = 144; sex addiction n = 403; and food addiction n = 179), with variations in the second most productive country depending on the type of addiction. Canada was second in gambling (n = 845), China was second in ICT (n = 463) and gaming (n = 160), the United Kingdom was second in sports (n = 75) and sex addiction (n = 60), Australia was second in food addiction (n = 31) and Germany was second in shopping addiction (n = 73). Furthermore, we observed two main patterns among the ten most productive countries. In six of the countries, all of which were Western countries (the United States, Canada, the United Kingdom, Australia, Spain and Italy), gambling was the most studied addiction; in the other four, the majority of which were Asian countries (China, Turkey, South Korea and Germany), ITC was the most studied addiction (Fig. 4).

The analysis by five-year period of publications by region and by type of behavioral addiction showed a general growth of publications over years in all regions and all types (Appendix 4 of the supplementary material).

Moreover, ITC research, followed by gambling, gaming and sex addiction, involved more regions over the years. Shopping addiction, food addiction and sports addiction have generally had less presence.

The analysis by type of addiction regarding the global data of the different regions provided the following results (Appendix 4 of the supplementary material).

3.1. Gambling

North America published the most articles in the last 25 years at 40.9% and was followed by Western and Central Europe (35.8%), Oceania (13.3%) and East and Southeast Asia (5.5%).

3.2. Gaming

Western and Central Europe (39.6%) and East and Southeast Asia (26.3%) were the regions with the most publications on this topic over the years. In the next places are North America (18.1%) and Oceania (7.5%).

3.3. ITC

Again, Western and Central Europe (35.5%) and South-East Asia (25.7%) were the regions with the most publications on this topic over the years and were followed by North America (15.3%), Southeastern Europe (8.2%) and Near and Middle East/Southwest Asia (5.4%).

3.4. Sex addiction and food addiction

These addictions followed a very similar pattern. In both of them, the most productive region was North America with 41% for both food addiction and sex addiction, and was followed by Western and Central Europe at 31.6% and 37%, respectively. The third most productive region, Oceania, was very far from the second region.

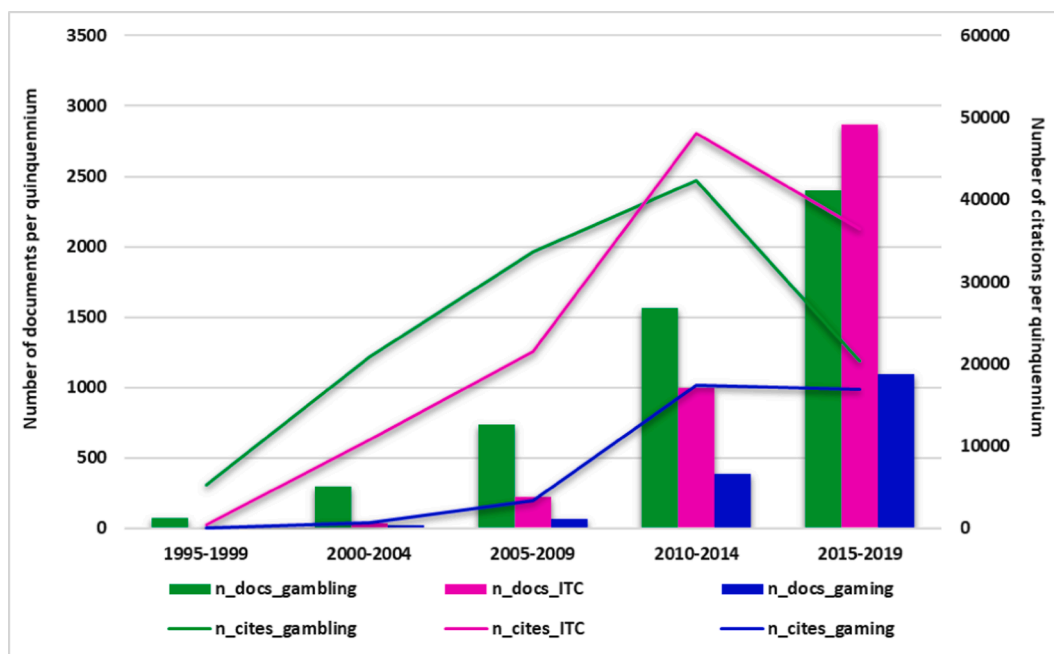


Fig. 3. Total number of publications and citation in each five-year period differentiated by gambling, ITC and gaming.

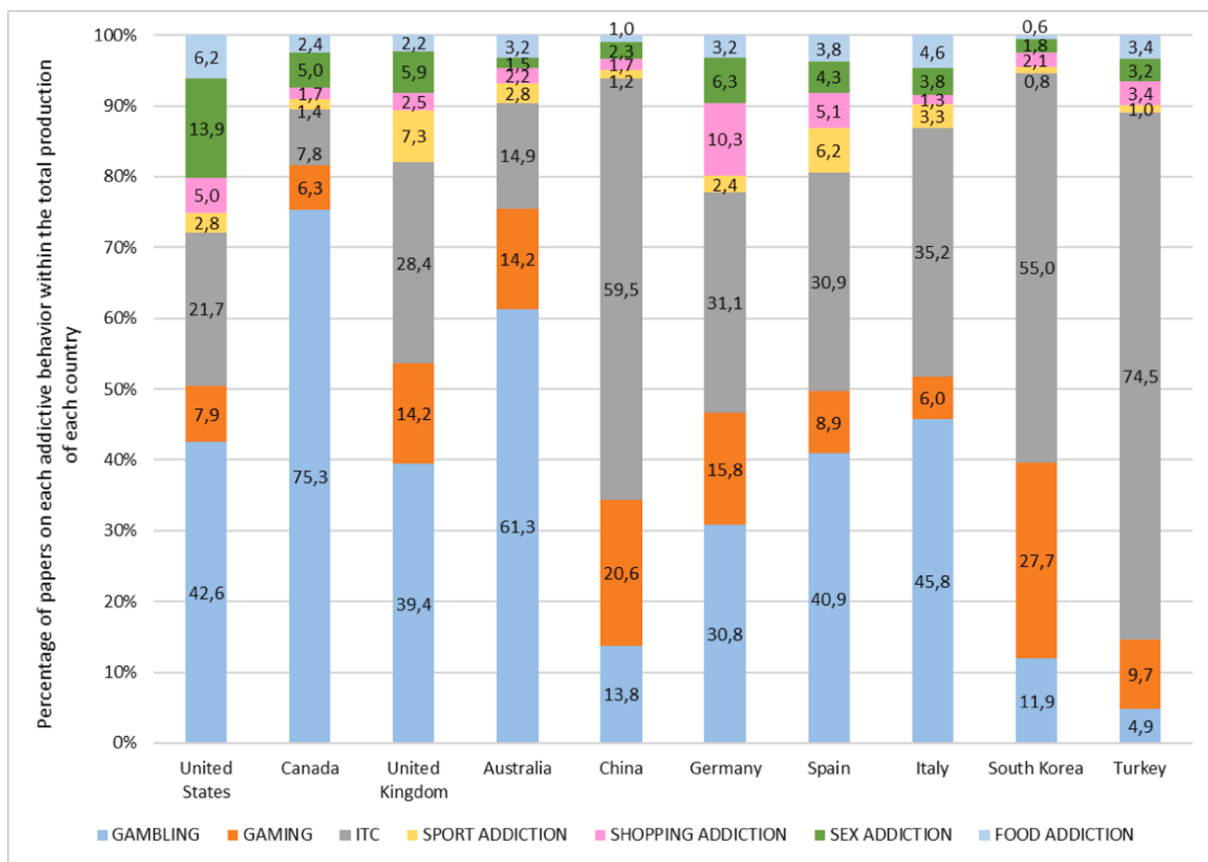


Fig. 4. Percentage of papers on each addictive behavior within the total production of each country in the top ten most productive countries.

3.5. Shopping addiction

The pattern is similar to that of sex and food addiction. The difference in this case was the order. The first region was Western and Central

Europe (45%), and the second region was North America (22.8%). The third position is East and Southeast Asia (11.6%). In this case, 7 areas did not publish articles on this topic.

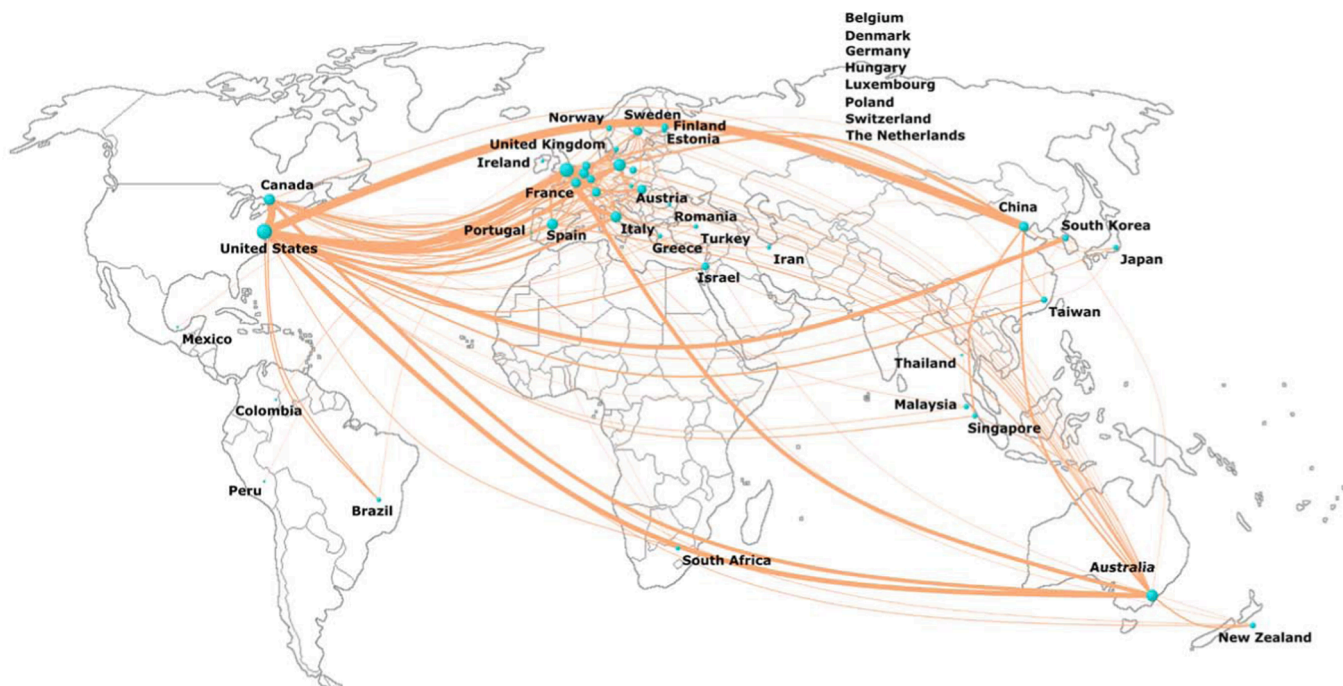


Fig. 5. Collaboration of countries with more than 5 collaborations in common.

3.6. Sports addiction

In this case, the most productive region was Western and Central Europe, 37.3%, followed by East and Southeast Asia at 36% and North America at 15.3%. In this case, 8 areas did not publish articles on this topic.

Another metric that we studied was the proportion of publications with respect to the total population of each region according to the 2019 data available from the World Bank ([The World Bank, 2021a](#)) (also Appendix 4 of the [supplementary material](#)). Once we calculated that proportion, we found that the case of Oceania was especially remarkable: the countries (Australia and New Zealand) belonging to this region had the highest proportion in all addictions except sex addiction. Furthermore, in four of the seven addictions studied (gambling, gaming, ITC and food addiction), the proportion was greater than 1; in the case of gambling, the ratio rose to 22, which was the highest among all regions.

Regarding the analysis of the collaboration networks between countries, 40 countries that collaborate five or more times were selected ([Fig. 5](#)). This analysis showed that the United States and the United Kingdom are the countries that collaborate the most with other countries (58 and 54 collaborations respectively). Additionally, we observed the “classical” collaboration flows between the United States and European countries, between European countries, and between countries that have linguistic and cultural proximity, such as Anglo-Saxon countries (Australia, the United States, the United Kingdom and Canada). However, we noticed that other flows such as the strong collaboration of the United States and China ($n = 167$) and between the United States and South Korea ($n = 90$) less frequently occurred. These flows that we detected between China and the United States and between the United States and South Korea were especially in ITC-related disorders (56.9% and 41.1%, respectively) and gaming (23.4% and 32.2%, respectively). Besides, China also collaborates intensely with Australia ($n = 44$), Germany ($n = 40$), the United Kingdom ($n = 33$) and Singapore ($n = 33$). Moreover, we detected two triangles of strong collaboration in which the United States and Australia collaborate with France and China. By geographical area, international collaborations according to this threshold are located between North America, Europe, East Asia and Australia.

4. Discussion

In this work, we conducted in-depth research on behavioral addictions from 1995 to 2019 with a special focus on geographical characteristics. For this analysis, we differentiate between seven types of behavioral addictions: gambling, gaming, ITC, sex addiction, food addiction, sports addiction and shopping addiction. To our knowledge, this study is the first bibliometric approach to such a varied group of behavioral addictions.

This analysis allows us to understand different aspects of the research trends in this area and, consequently, the expression of the social interest and concerns related to this topic during the latest century quarter. The first thing we observed is the notable growth of the research in behavioral addictions (in general) both in number of documents and in the quantity of citations in the WoS. This information could be questionable because, in general terms, there is exponential growth in science that is not exclusive to the behavioral addictions area ([Publishers & Cartuja, 2004](#)). For this reason, we checked if this growth is effectively occurring when it is compared to the general growth of the documents in the WoS. For this, we calculated the proportion between the total number of documents on behavioral addictions and the total number of WoS documents for the five five-year periods studied for each of the approximately 10,000 documents. The results of those proportions were as follows: 0.35 in 1995–1999, 1.25 in 2000–2004, 2.5 in 2010–2014 and 8.57 in 2015–2019, which effectively confirms this notable growth of the research in behavioral addictions

This increase in behavioral addictions research shows how this

relatively new area (the DSM-V, which includes gambling as a disorder, was published in 2013) has an influence on both science and society. The evolution of these problematic behaviors until they were considered addictions has been related to the similarities that scientific evidence has found with chemical addictions or substance addictions ([Derevensky et al., 2019](#); [Zou et al., 2017](#)). These parallels are based on the similarities in the effects of withdrawal, craving, the loss of control over the behavior or the compulsive seeking of them on the reward system circuitry and consequences ([Zou et al., 2017](#)). The links to these similarities, especially those related to neurobiological aspects, social and psychological consequences/concerns, were also highlighted. These concerns could dominate areas of people’s lives and cause social, occupational, scholar, economic, and family problems; furthermore, they could cause psychological and mental health issues, including anxiety disorders, depression, and impulsivity ([Derevensky et al., 2019](#); [Dussault et al., 2011](#); [Ste-Marie et al., 2006](#)).

When we focused on the different types of behavioral addictions, we found different patterns among them. First, there were two types of addictions that were clearly highlighted: gambling and ITC. Regarding gambling, it is not so surprising if we consider that the so-called “gambling disorder” is the only behavioral addiction that was considered as such in the DSM-V, which in the context of the DSM means that there is sufficient scientific evidence to establish the diagnostic criteria for addiction ([Stinchfield et al., 2016](#)). Furthermore, the scientific literature shows us a clear concern with gambling practices in the last 20 years, especially in regard to young people in developed countries ([Ferrara et al., 2018, 2019](#); [Floros, 2018](#); [Moreno-Guerrero et al., 2020](#)). In this regard, the main concern is how gambling as a “pastime” could become a real health problem with adverse impacts on psychological and social life and cause economic or even legal difficulties ([Ferrara et al., 2018](#)). In this context, current specific problems related to gambling, such as sports betting, are causing real concerns in society ([Aragay et al., 2021](#)).

The next most studied type of addiction, ITC-related disorders, showed a particularity that is necessary to underline: the outstanding growth both in the number of citations and articles on the topic in the last two five-year periods. The first thing that we have to highlight is the miscellaneous that could be the behaviors related to ITC. In this context, there are researchers that emphasize specific activities in which the people are engaged (gambling, gaming, porn, shopping online, etc.) through the internet rather than examining ITC problems per se ([de Alarcón et al., 2019](#); [Derevensky et al., 2019](#); [Pontes et al., 2014](#)). For this reason, in our bibliometric analysis, we considered that an article could study more than one type of addiction. Following the example above of sports betting, evidence of how ITC-related disorders could connect with other addictive behaviors is provided by Riley et al. ([Aragay et al., 2021](#)), who studied therapies that address online mobile smartphone sports betting addiction. In any case, it seems obvious that the spread of the internet (following The World Bank, the percentage of internet use in the world population has increased from 0.049% in 1990 to 51.1% in 2019 ([The World Bank, 2021b](#))) has had an intense influence on our lives that has notably affected problematic behaviors.

Among the other types of addictive behaviors, gaming is third in the number of articles published (with a considerable distance from the first two) and is followed by shopping, food, sex and sports addiction. In the case of gaming disorders, their negative effects associated with problems such as psychological detachment, sleep deprivation, eating and nutritional problems, a lack of personal and social interaction, depression or anxiety were well documented in the literature ([Derevensky et al., 2019](#); [Lafrenière et al., 2009](#)). Furthermore, shopping, food, sex and sports addiction also cause problems that have been studied very recently in the scientific literature ([Arslan & Kirazli, 2019](#); [Di Lodovico et al., 2019](#); [Grubbs et al., 2020](#); [Peng-Li et al., 2020](#)). However, in general terms, these addictions have been less studied than the others. The reasons could be related to two factors. First, they are activities that normally are far from being considered addictions. In fact, some of them are closely

linked to a positive, healthy and socially well-accepted lifestyle (playing a sport or having an active sexual life), which is why the line between good practice and a problem could be more difficult to see. Another reason is that the behavioral addictions related to the use of technology have grown so much in recent decades (Lopez-Fernandez, 2018) that, in contrast, the nontechnological behavioral addictions could have stayed on a secondary level. To support this idea, we assessed it through our search equation, which found the first articles in WoS without filtering by year. The results of this testing provided interesting information; i.e., the first articles on behavioral addiction in the WoS were related to sexual addiction, food addiction and gambling. These articles were as follows: “Drug addiction and ‘hypersexuality’: Related modes of mastery” written by Martin Hoffman, M published in the journal “Comprehensive Psychiatry” in 1964; “The descriptive features of food addiction - addictive eating and drinking” written by Randolph, T, published in the journal “Quarterly Journal of Studies on Alcohol” in 1956, and “Compulsive gambling” written by Fink, H in the journal “Psychotherapy and Psychosomatics” in 1961.

This findings suggests two primary things: 1) the increase in interest in technological addictions is so important that it has surpassed other addictions that have existed for much longer in publications, and 2) gambling is a real concern until the very beginning of the research on the topic of behavioral addition.

Another factor that was studied in our work was the geographical differences among countries and regions. In our study, we clearly found these differences at both the country and region levels.

First, at the country level, we found that in general, ITC-related disorders, gambling and gaming are the most studied addictions among the ten most productive countries. However, there were notable differences in the interest that each country showed in the seven types of behavioral addictions that suggested possible cultural and epidemiological factors.

Firstly, we observe that Asian countries are less productive in gambling and more productive in ITC and gaming. This interest was also observed in the literature (Chia et al., 2020; Tran et al., 2020). More specifically, it was observed that ITC and gaming have received special attention in Southeast Asia being considered both in China and South Korea as national health problems (Kuss et al., 2021). This problem is also accompanied by the prevalence, what suggest that there are cultural factors that could be influencing in the developing of this behaviors in these countries (Chi et al., 2020; Kuss et al., 2021; Sussman et al., 2011). In addition, also in relation to ITC-related disorders, there are studies that relate greater availability or accessibility to the Internet with a high prevalence of addiction and that it is inversely related to an overall national index of satisfaction with life and to specific national indices of environmental quality (Cheng & Li, 2014). In relation to the results of our study, this may explain why countries with more access to the Internet are the ones that do the most research on Internet addiction because they are more likely to have associated problems.

Regarding gambling, it was observed that Western countries have become more interested in investigating the problems that derive from this behavior. One explanation of this could be the problems that gambling is causing in their societies, where the problematic gambling sometimes coexists with legal gambling activities, in which the action of betting, for example on sports competitions, is completely normalized (Newall et al., 2021; Nikkinen, 2017; Planzer et al., 2014; Welte et al., 2017). For example, the World Health Organization (WHO) states that studies from countries in Oceania indicate that the potential harms due to gambling are comparable to the harms due to depression and alcohol use disorders (WHO, 2021a).

Moreover, the prevalence of other behavioral addictions related to bodily functions (sex, food, exercise), or to other disorders of the impulse control such as shopping addiction, was also especially linked to Western countries, suggesting that the influence of factors such as consumerism and materialism in the Western lifestyle may be related to these problems (Tarka, 2020). On the other hand, other prevalence

outside the realm of behavioral addictions may also offer keys to current events, as in the case of the obesity epidemic in many countries. The prevalence of overweight and obesity, which according to WHO data has tripled in the last four decades, could explain the growing interest in food addiction research that we have observed in the data on the publication growth rate (Wieland, 2019; WHO, 2021b).

All these cultural and epidemiological clues that could be inferred from the differences between countries showed in our study (always regarding the number of publications on these topics by geographical region and assuming the limitations that this criterion entails), would undoubtedly be an interesting topic to investigate in future works.

At the region level, the patterns were similar. However, the analysis of this level allows us to go into more detail and appreciate some particularities. For example, Western and Central European and North American countries were either first or second in the total number of publications in the seven types of behavioral addictions. However, in contrast, Oceania was first in all the behavioral addictions except sex addiction in the proportion of papers/million population (papers/MP), which clearly shows a high interest/concern among the countries of this region in the behavioral addictions, especially in gambling, which has a papers/MP proportion of 22.26, which is the highest not only in gambling but also in all behavioral addictions. This interest of Oceania in gambling was also observed both in other scientific studies (McCarthy et al., 2020; Nyemcsok et al., 2021) and in the institutional interests of Australia (its most populous country), shown through the enactment of specific laws on this subject (Gambling Measures Act 2012 (Cth), 2014) and the creation of specific centers such as the “Australian Gambling Research Centre” (<https://aifs.gov.au/agrc/>). In our analysis of the collaboration, we also observe this interest of Australia in the behavioral addictions in general by examining the multiple flows of collaboration between Australia and other countries. Additionally, it is interesting to highlight the case of sports addiction and the countries of East and Southeast Asia, which were second in both the number of works and the proportion of papers/million population. This curiously contrasts with the data at the country level, where Asian countries (China and South Korea) did not show a particular interest in this addictive behavior.

5. Limitations

We used the Web of Science database for this study because of its relevance and pertinence. Nevertheless, we are aware that the use of other databases could have provided us with a broader view of this subject. In addition, the Web of Science has an Anglo-Saxon bias, of which we are also aware; therefore, the use of other sources of information that do not have this bias could be considered for future work. Furthermore, although we used a wide range of keywords, it is possible that we missed some terms that could be relevant. Moreover, it is necessary to state that the leadership of the Anglo-Saxon countries, which was also observed in the Khalili study (Khalili et al., 2018), could be influenced by the certain Anglo-Saxon bias of the WoS.

In addition, we assumed that there might be an overrepresentation of articles on Internet gaming disorder in our classification of Internet-related disorders. This is because when an article addressed Internet gambling disorder, it was classified in both gambling-related and Internet-related disorders.

Finally, we are aware that other behavioral addiction could have been taken into account, such as work or study addiction.

6. Conclusions

The first conclusion is that amount research on behavioral addictions has clearly increased in recent years. Therefore, the obvious conclusion that can be made regarding this is that it is a problem that concerns society and, by extension, the scientific community. However, we observed different interests depending on the type of addiction, clearly highlighting an interest related to addictions related to the use of

technology. Moreover, we detected that interest in one or other behaviors varies depending on the geographical region, with some being seldom studied in certain countries while others are studied more frequently. These differences could suggest cultural and demographic determinants that should be studied in depth.

This study provides a context that reveals several clues that may inspire not only new research but also legal and educational actions to address the reality of the problem of behavioral addictions.

7. Future directions

This study allows countries to obtain an overview of the state of the research on behavioral addictions so that governmental and research institutions can encourage future lines of research on a specific type of addictive disorder. Future lines of research could include a microlevel analysis (authors and research groups) and an in-depth study on the causes of the differences between countries by type of addiction. In addition, future studies could consider the country where the study took place, that is, the country of the sample.

CRedit authorship contribution statement

Andrea Sixto-Costoya: Conceptualization, Methodology, Software, Formal analysis, Writing – original draft. **Lourdes Castelló-Cogollo:** Methodology, Software, Formal analysis. **Rafael Aleixandre-Benavent:** Conceptualization, Writing – original draft, Validation, Writing – review & editing. **Juan Carlos Valderrama-Zurián:** Conceptualization, Methodology, Software, Formal analysis, Writing – original draft, Validation, Writing – review & editing.

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.

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Appendix A. Supplementary material

The supplementary material of this study was uploaded to the Zenodo repository and can be consulted through the following link: <https://zenodo.org/record/5105823#.YPANU-gzY2w>.

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.abrep.2021.100371>.

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