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Patterns of Disciplinary Involvement and Academic Collaboration in Gambling Research: A Co-Citation Analysis

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Abstract: The purpose of this study was to investigate the current academic research foci in peer-reviewed studies on gambling. The researchers used co-citation analysis as a bibliometrics method. All the gambling-related publications indexed in Scopus and Web of Science were identified, and their citation patterns were analyzed. Our dataset includes a total of 2418 peer-reviewed gambling studies published over the five-year period from 2014–2018. The VOSviewer tool was used to visualize bibliometric networks and reveal key clusters among the studies. The findings indicate that gambling researchers mostly cited authors from the disciplines of neuroscience, psychology, health science, and psychiatry. Only 2% of the cited authors were from other disciplines, such as those in the social sciences and humanities. The most frequently cited sources also reveal the same pattern: that gambling researchers mostly cited articles published in neuroscience, psychology, and health science journals. The publications reviewed deal mainly with the pathological and treatment aspects of gambling. We also discovered some unique patterns of citation and collaboration, focusing on topics such as videogames, social network games, family, business, and tourism.

Keywords: gambling, citation analysis, bibliometrics, academic disciplines

Introduction

As opportunities to gamble have increased over the last several years, accordingly the number of gambling studies has also grown (Dixon et al., 2015). Researchers from different disciplines, such as psychology (Ferrari et al., 2018; Hodgins et al., 2016), health (Williams & Volberg, 2014), and neuroscience (Yücel et al., 2017), have investigated gambling mainly from psychological and medical perspectives. A small number of gambling studies are produced by researchers from other academic disciplines, such as economics (Tymula & Whitehair, 2018) and business (Prentice & Zeng, 2018). The field of gambling research has been described as multidisciplinary (Baxter et al., 2019), according to the disciplinarity continuum model that considers multidisciplinarity to be 'researchers from different disciplines studying the same topic'; as opposed to interdisciplinarity, which is 'researchers from different disciplines *working together* to study the same topic' (Martin, 2017). Despite the multiple disciplines studying the topic of gambling, there is great concern that it is dominated by researchers in only a few disciplines, such as psychology and other medical fields (Eber & Shaffer, 2000; Hancock & Smith, 2017; Nicoll, 2019). This raises a question: If researchers are unaware of the breadth and variety of current research because of a tendency to focus on results published only in their own field, could this cause a delay in knowledge transfer across disciplines (Baxter et al., 2019; Rinia et al., 2001)? And more importantly, if a research field is dominated by researchers in only a few academic disciplines, might researchers then tend to focus on common problems only in familiar ways and thus hinder the expansion of the field (Price, 1963)?

Bibliometrics have been widely used as a reliable and valid method to reveal the knowledge structure of a research field (e.g., involved authors, institutions, journals, and disciplines, as well as collaborations among those authors and institutions) (Culnan, 1986; Stehmann, 2020). A major advantage of bibliometrics is its proven capacity to explore, organize, and analyze large amounts of quantitative parameters for citation data from a variety of studies (Garfield, 1979b; Stehmann, 2020). Using a bibliometrics method, this study aimed to measure and analyze certain indicators in the gambling field, such as journals, disciplines, and collaborations among published authors and institutions. To achieve this, the researchers used a co-citation analysis, which identifies relationships between

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papers that are regarded as important by academic authors (Kessler, 1963; Small & Griffith, 1974).

Purpose of the Study

Mapping the research field helps researchers to utilize a birds-eye-view perspective, assists policy makers to identify and prioritize key areas within a research field, and permits readers to see collaborations among authors by viewing broader collections of citations. This study analyses citations across the metadata of peer-reviewed gambling studies in the five countries where most of the literature is produced (Australia, Canada, New Zealand, UK, and USA). The following research questions (RQs) are addressed by means of co-citation analysis:

RQ1: How concentrated are gambling researchers within specific academic disciplines?

RQ2: How closely do gambling researchers collaborate within and across academic disciplines?

RQ3: To what extent are the patterns of citation and collaboration in the field of gambling studies unique in comparison to similar fields of research?

Method

Bibliometrics generally involves counting citations to other publications in a body of literature within a scholarly discipline (Culnan, 1986). This study used a type of citation analysis that is one form of bibliometrics or quantitative bibliography (Pritchard, 1969).

The Article Selection Process

Scopus and Web of Science were searched to identify relevant studies. These databases cover many academic disciplines, such as psychology, health, computer science, psychiatry, business, tourism, and education. We used the advanced search function with the broad search term 'gambl*' to ensure that all relevant studies would be identified. The search parameters used to select articles were: Document Type 'article', Language 'English', and Countries/Regions 'Australia, Canada, New Zealand, UK, USA'. The time span selected was 2014 to 2018 in order to prioritize current collaborations in gambling studies, and because some previous reports (e.g., Cassidy et al., 2013) covered the period up to 2013. The initial search was conducted on 7 August 2019 and yielded 5135 hits. We downloaded bibliographic data for all 5135 citations. All citations were imported into Thomson Reuters EndNote X9 (a reference management software program) and duplicates were excluded by application of the EndNote function 'Remove Duplicates'. One of the researchers then scanned all the articles by reading the abstracts to check whether they were suitable for the purpose of this study. To be included, the article had to be peer-reviewed and have gambling as a primary component (i.e., the central topic of the article). Articles were eliminated if they mentioned the term 'gambling' but were actually about other topics (such as standard gamble, a medical term) or where 'gambling' was used as a synonym for risk. After implementing these inclusion and exclusion criteria, a total of 2418 peer-reviewed articles published between 2014 and 2018 from (in alphabetical order) Australia, Canada, New Zealand, the UK, and the USA were retained for analysis.

The Systematic Mapping Process

A citation occurs when the author of one paper mentions or refers to another paper (Wang et al., 2016). Over time, scholars have come to accept that documents or authors that are heavily cited have a significant impact on and make significant contributions to the advancement of the field (Hallinger & Kovačević, 2019). To identify top cited sources, associated disciplines, and relationships among papers, citation analysis is used in many disciplines. Citation patterns also have been employed to derive maps of the structure of networks within scientific fields (Gilbert, 1977). While there are several techniques in research literature mapping, co-citation is among the most accurate for mapping scientific fields (Boyack & Klavans, 2010) and is commonly used in various disciplines. Co-citation occurs when two papers are cited together within another paper. Co-citation analyses have a high degree of reliability (Fellnhofer, 2019) and identify 'invisible colleges' (Gmür, 2003). The degree of co-citation is defined as 'the number of times two documents have been cited together[; this] provides a natural and quantitative way to group or cluster the cited documents' (Small & Griffith, 1974, p. 19). Co-citation analysis measures the number of documents that have cited any given pair of other documents (Garfield, 1979a; Small, 1973).

We used the software program CiteSpace (Chen, 2006) to combine the Scopus and Web of Science files. VOSviewer (van Eck & Waltman, 2009) was used to create visual representations or 'network maps' of relationships among the gambling research papers and to cluster identifications based on co-citation. VOSviewer was preferred because it provides clear depictions of the data (Fellnhofer, 2019) and because previous studies have shown that it provides reliable and valid results (e.g., see Li et al., 2019; van Eck et al., 2010). Each cluster was analyzed and interpreted for similarities to prominent papers, cited references, research areas, authors, journals, and institutions. VOSviewer also supports text mining, which helps to construct the networks by terms extracted from titles and abstracts in the English-written data (Li et al., 2019). To identify the academic disciplines of the authors, we used the first author's affiliated field, which is similar to the approach used by González-Valiente et al. (2019) and Reynolds et al. (2020).

Results

The results of our co-citation analysis are presented visually in Figs. 1 and 2. We discovered 60,077 authors who cited research on gambling for the five year period from 2014–2018. We used VOSviewer to generate a co-citation map that displays similarities in the scholarship of 992 authors; a threshold of at least 20 citations was used for selections (Fig. 1). The map groups the gambling researchers into four main 'clusters,' and each cluster is indicated by a specific colour. The co-citation map displays nodes, each representing a different author. The size of the node reflects the number of the authors' co-citations, and the size of the clusters denote their significance. The links reflect the relationships between co-cited authors. Since the main aim of this study is to identify citation patterns in the academic discipline and not to identify specific authors, the authors' names were anonymized.

From left to right, cluster 1 (blue) includes 226 authors, mainly from the health sciences or public health disciplines; cluster 2 (green) comprises 239 authors, mainly from psychology; cluster 3 (yellow) includes 81 authors from psychiatry; and cluster 4 (red) comprises 426 authors from neuroscience. In terms of author numbers, cluster 4 is the largest, and most of the authors are in the area of neuroscience. The closer the two clusters, the higher they are related. In other words, gambling studies over the five year period from 2014–2018 have mainly cited researchers from the neuroscience discipline.

Cluster 4 (red) represents the strongest focal citation point related to gambling studies over the five-year period from 2014–2018. This cluster is composed of authors who mainly have a neuroscience background. Within this cluster, the most frequently cited neuroscience studies mostly focused on topics such as the decision-making process, risky decisions, individual differences in decision making, near misses, and impulse control. In cluster 4, researchers used different data collection tools, including but not limited to: neuropsychological tests to assess basic cognitive functioning, gambling tasks, impulsiveness questionnaires, impulsiveness scales, and MRI- and fMRI-related images. Our findings indicate that neurocognitive researchers were highly cited in recent gambling studies. More specifically, when the distribution of the most cited authors' disciplines are examined, nearly half (43%) of the top-cited authors are from the neuroscience discipline (Fig. 2). According to the network map (Fig. 1), while researchers mostly cited sources within neuroscience, there are also citation networks linked to the psychology and psychiatry disciplines.

Cluster 2 (green) includes researchers mainly from the psychology discipline. In this cluster, researchers mostly focused on the treatment of pathological and problem gamblers. The authors were also interested in other treatment aspects of gambling, such as the effectiveness of cognitive behavioural therapy, motivational treatments, guidelines for practice in treating gambling-related problems, as well as barriers to treatments and self-help. Twenty-four percent of the highly cited gambling researchers were included in this cluster. According to the network map, researchers in psychology more often collaborate with researchers in the health sciences than neuroscience.

The third largest cluster (blue) mainly includes researchers from the health sciences and public health disciplines. Researchers in this cluster mainly focused on problem and pathological gamblers. They were also interested in issues such as depression, personality disorders, addictive behaviours, and therapy. In this cluster, researchers used data collection tools such as the Canadian Problem Gambling Severity Index and the South Oaks Gambling Screen to identify pathological gamblers. Briefly, this cluster mainly focused on the medical aspects of gambling. There is a strong citation collaboration between the health sciences and psychology. This cluster comprises 23% of the top-cited authors.

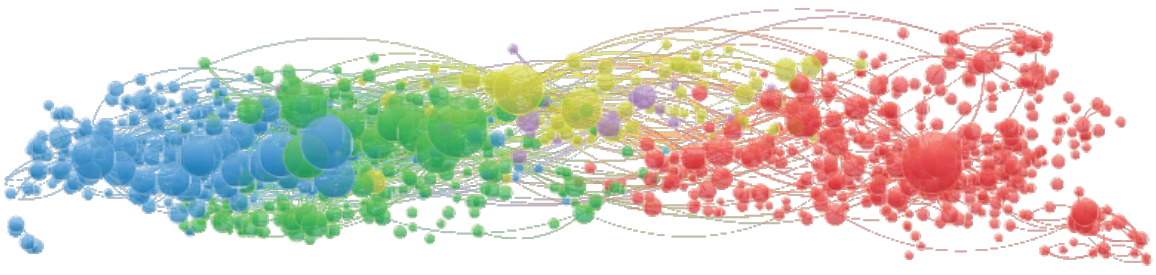

Fig. 1. *Citation Network Map for Authors of Gambling Research*
(threshold of at least 20 citations)

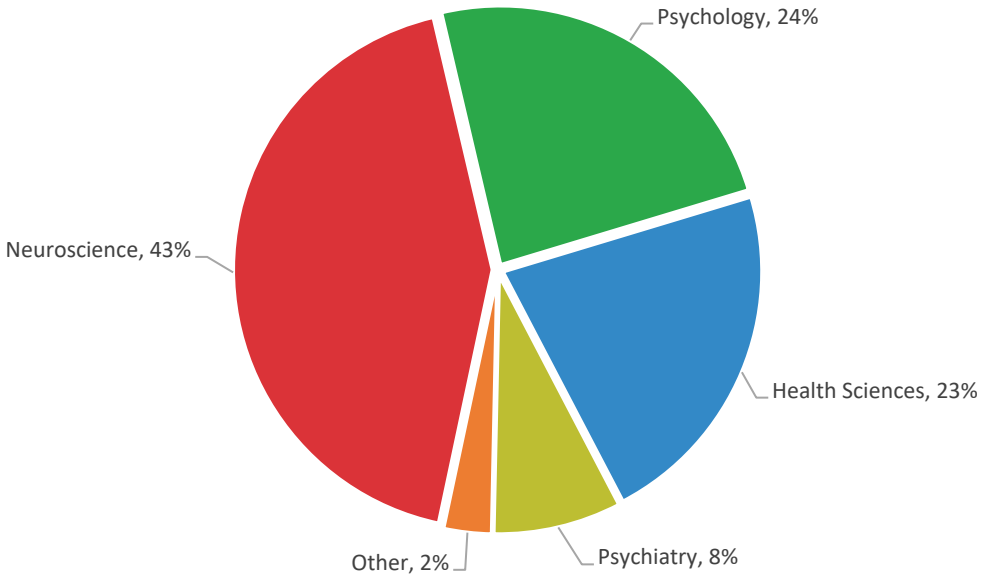

Fig. 2. *Disciplinary Distributions in the Cited Sources*

Finally, cluster 3 (yellow), gathers researchers mainly from the psychiatry discipline. The researchers here focused on gambling disorders, treatment of gambling disorders and of pathological gamblers, reducing gambling severity, and symptom control. Researchers in this cluster used data collection tools such as the Gambling Symptom Assessment Scale, Structured Clinical Interview for DSM-IV/V, and depression scales. Cluster 3 (psychiatry) acts as a bridge between different academic disciplines in gambling studies. Researchers from psychiatry collaborated with scholars in the health sciences, psychology, and neuroscience. Eight percent of the top-cited authors are in this cluster. According to our results, only 2% of the authors are from other disciplines, such as the social sciences and humanities.

In order to deeply examine the disciplinary distributions, the networks between the sources in the gambling studies were examined. The networks between cited sources also demonstrate the same pattern (Fig. 3). The ten most frequently cited journals in gambling studies are listed in Table 1. We used the journals' self-descriptions to assign them to disciplinary categories, except when terms overlapped or were used differently by different journals. This approach and these parameters gave us a comprehensive look at the field's metadata. These journals originate from disciplines such as neuroscience, psychology, the health sciences, and psychiatry (Table 1). This finding also supports our previous findings that gambling studies are largely based in neuroscience, psychology, psychiatry, and the health disciplines. In a recent bibliometric study on online gambling, Stehmann (2020) examined the most cited studies in online gambling and gaming and identified similar journals, such as *Journal of Gambling Studies, Addiction, The American Journal of Psychiatry, Psychology of Addictive Behaviors*, and *NeuroImage*. Stehmann (2020) concludes that there is a multidisciplinary but not interdisciplinary scope in online gambling and gaming research, especially regarding the areas of psychology, psychiatry, and mental health.

Table 1
Top Cited Sources

Source	Citations (2014–2018)	Discipline
Journal of Gambling Studies	6392	Interdisciplinary
Addiction	2619	Health
The Journal of Neuroscience	1716	Neuroscience
International Gambling Studies	1579	Interdisciplinary
Psychology of Addictive Behaviors	1459	Psychology
The American Journal of Psychiatry	1354	Psychiatry
Addictive Behaviors	1151	Psychology
International Journal of Mental Health and Addiction	1142	Health
Psychopharmacology	1109	Health
NeuroImage	1082	Neuroscience

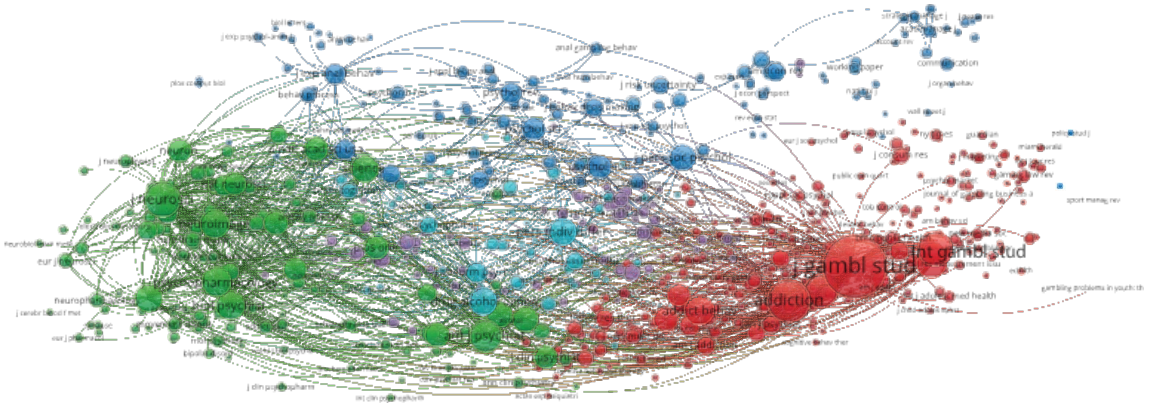

Fig. 3. *Citation Network Map for the Sources of Gambling Research*
(minimum number of citations per source: 20)

Notably, the editors of the journals we examined also have backgrounds in the same disciplines. Most of the most frequently cited journals in Table 1 publish clinical and treatment research, mainly conducted in laboratory settings. *The Journal of Neuroscience*, for example, publishes topics of interest to those who work on the nervous system. Likewise, *The American Journal of Psychiatry* publishes a full spectrum of topics related to mental health diagnoses and treatment research. We could not find a leading education or socio-cultural studies journal that comprehensively focuses on gambling. It should be noted that new gambling journals, which focus on socio-cultural, educational, historical, political, and other aspects of gambling, might have been launched after 2018 (e.g., *Critical Gambling Studies*).

We find that some of the patterns of citation in the field of gambling studies are unique. First, the increase in online gambling has led some researchers to migrate from videogaming and/or social gaming studies to gambling studies. We identified many citations in (relatively) different (or uncommon) journals, such as *Computers in Human Behavior* (426 citations) and *Cyberpsychology, Behavior, and Social Networking* (352 citations). Some gambling researchers from the social sciences examined the connections between game addiction and problematic gambling; for example, gambling studies in *New Media & Society* (124 citations) focused on videogaming and problematic social network games. Migrations of researchers from social network games research (i.e., Facebook games) to gambling has occurred recently, as is evident in the aforementioned journals. This is partly because social network games and some videogames appear to replicate the basic structural design of gambling activities and are free to play; the prizes awarded are generally virtual currency. There is a growing concern about changes in the way that videogames are played. Namely, there is potential for videogame or social network game players to be exposed to factors (e.g., in-game purchasing) that might encourage problematic gambling. This has also motivated social science researchers to study gambling (Macey & Hamari, 2018). At the same time, there has also been significant migration of gambling researchers to videogaming studies.

We also discovered 64 citations to *The Journal of Gambling Business and Economics*, which was launched in 2009 for academics and practitioners who have an interest in the economic and business aspects of the rapidly growing international gambling market. Similarly, we identified 38 citations from the *Journal of Marriage and Family*, which publishes gambling studies focusing on the social aspects of betting and gambling. These were by researchers in various disciplines, such as gender studies. Other citations, to tourism journals such as *Annals of Tourism Research* (81 citations) and *Tourism Management* (97 citations), which focus on tourism and travel perspectives of gambling (such as the effects of casino gambling on a community and tourism development in cities), were made by researchers mainly in the social sciences.

Discussion and Conclusion

The co-citation analysis techniques and visualizations in this bibliometric study allow us to examine the disciplinary distributions of cited authors and sources in gambling studies over the last five years. This study reveals that medical and psychological factors dominated researchers' collective focus in the recent literature. These results are consistent with previous bibliometric studies (e.g., Baxter et al., 2019).

Our findings support and update those of Cassidy et al. (2013), who concluded that 56% of editorial board members from the two leading gambling journals have backgrounds in psychology, psychiatry, or medicine. The majority of those who self-identify as Gambling Studies scholars are psychologists by training (Cassidy

et al., 2013). Our study also supports previous findings that the gambling field is still dominated by scholars in the neuroscience, health, and psychology disciplines, which mainly focus on diagnostic and treatment aspects of gambling (Cassidy et al., 2013). In a previous metadata study, Shaffer et al. (2006) examined the prevalence of primary keywords in gambling citations and found that 'pathological gambling' was by far the most commonly used term, followed by 'risk taking', 'decision making', and 'addiction'. According to their findings, 'pathology', 'risk-taking', 'decision making', and 'addiction' have dominated gambling research. This mirrors our findings that the pathological aspects of gambling are highly studied, and the field is mostly dominated by neuroscientists and health-discipline researchers. Overall, gambling research continues to be dominated by a focus on 'problem or pathological gambling.' These results indicate that other areas may need more attention.

To enhance our understanding of gambling, greater collaboration is needed with underrepresented disciplines, such as those within social sciences and humanities. As Cassidy et al. (2013) also highlighted, the tradition that gambling studies are conducted in laboratory settings (and commonly use psychology students as their subjects) might miss the real-world gambling context. Interviews with senior gambling addiction researchers such as Garry Smith (Nicoll & Johnson, 2018) and Robin Room (Room & Nicoll, 2020) point to the important perspectives that sociology might bring to gambling studies by focusing on the broader political and social contexts in which people and institutions provide, consume, and regulate gambling. Genuinely interdisciplinary gambling studies would see researchers from medicine and health sciences collaborating with experts on culture and education within the social sciences to focus on relatively unexplored aspects of gambling spaces, practices, and products. Without this new work, our understanding of the benefits and harms related to gambling will remain limited by the methods and theoretical frameworks of psychiatry, neuroscience, and psychology.

Limitations

Our review covers gambling articles whose primary authors are based in Australia, Canada, New Zealand, the UK, and the USA, and which are indexed in the Scopus and Web of Science databases. These five countries have all experienced significant deregulation of gambling over the past three decades, and there is significant collaboration between researchers through conferences, journal editorial boards, co-publications, and think tanks. For future studies, different research databases might be included in the co-citation analysis. Though VOSviewer has been validated as a reliable networking map tool, our categorizations are solely based on the VOSviewer outputs.

Cluster interpretation is one challenging aspect of co-citation analysis (e.g., Fellnhofer, 2019) because the borders between clusters can be rather vague, making interpretation difficult. In our study, we assigned disciplines to a particular cluster based on most of the researchers' background fields. However, it is very possible that researchers within a cluster also might publish articles in different academic disciplines. For example, a researcher placed in the psychology discipline might have published an article within the neuroscience discipline, either solely or collaboratively. Finally, authors might be affected by several factors when citing publications, such as the academic reputation of the source or author, accessibility and the type of article, and/or requirements from peer-reviewers (Canavero et al., 2014; Cronin, 1984).

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