

Gambling in digital games and esports: a scoping review

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Abstract

The convergence of gaming and gambling has become increasingly prominent in recent years, most notably in the context of esports. Consequently, there has been a recent surge of literature investigating this phenomenon. This convergence is often driven by the commercial advantages it offers, yet there are concerns over the effects of mixing gambling with gaming, both in relation to the quality of experiences, and possible ethical problems. In this scoping review of the related corpus, we explore the development of work addressing the presence of gambling associated with digital games; examining methodologies, research topics, the specific gambling activities addressed, and identifying gaps present in the field. The body of literature reviewed consists of peer-reviewed, English language publications (n=132). Our findings indicate a sharp increase in yearly publications in the late 2010s, attributed partly due to rising interest in novel gambling activities, such as loot boxes. We recommend future research incorporates both qualitative and mixed methods research to provide the field with results unavailable at current time.

Keywords: gambling, gambling-like activities, digital games, esports, scoping review

1. Introduction

While connections between gambling and gaming have been of interest for several decades, with increasing availability of digital technologies, the integration of gambling and digital gaming has only been truly possible in the 21st century. As digital technologies have facilitated the confluence of entertainment and gambling, novel activities and behaviors have emerged. This convergence was once limited to simple replication of gambling within games or informal, emergent gambling-like games (King et al., 2012). However, increasing amounts of opportunities of digital game-related gambling with real money have emerged over the years, from more traditional forms, such as social casino games (Ross & Nieborg, 2021), to

more novel, such as different forms of skins gambling and loot box spending (Macey & Hamari, 2019). Loot boxes as a form of gambling have gained a significant amount of attention, both in respect to mainstream media (Kelly, 2019), regulatory attention (Derrington et al., 2021) and academic publications (Montiel et al., 2022), with much discussion over their potential classification as a gambling activity (Drummond et al., 2020).

As the range of gambling activities associated with digital games is diverse, many different investigative paths are being pursued. Zanescu et al. have explored the economic perspectives of gamblification in platform economies (2021a), and Garea et al. (2021) have looked at the potential effects of digital game-related gambling on health and well-being. Indeed, the emergence of gamblification as a tool to drive both consumer engagement and monetization is particularly evident in the field of digital games (Macey & Hamari, 2022). Additionally, novel mechanics in digital games have allowed possibilities for the players to bet and wager on their games using in-game currencies, further augmenting the gamblification processes of gaming platforms and leading to an even increasing amount of potential gambling (Zanescu, et al., 2021b).

A noticeable point of convergence between the gaming and gambling world has been esports, and especially the industry-wide efforts to allow and promote gambling on esports competitions (Sweeney et al., 2021). These efforts have been pushed by both private companies and national policies, resulting in digital games, such as *CS:GO*, *Dota 2* and *League of Legends* being an increasingly attractive target for bettors worldwide (Absolute Reports Pvt Ltd, 2022). While opportunities to legally bet on esports matches are not still available worldwide, many countries already endorse esports betting (Gamopo, 2022). Even in the United States where, until recently all forms of sports betting were largely restricted, individual states have begun to loosen their regulation on esports betting (Noble, 2022).

Another novel form of betting on esports, skins gambling, i.e., using virtual items or currencies with real-world value as stakes to bet on matches via third-

party sites has been evolving during recent years (Zanescu, et al., 2021a). There has been discussion on whether skins gambling as a form of esports betting can subvert traditional gambling regulations, and offer minors a way to gamble (Wardle, 2019).

Although there has been a noticeable increase in research regarding novel gambling activities related to problem gambling (Garea et al., 2021; Gibson et al, 2022; Montiel et al., 2022; Spicer et al., 2022), this is the first study to provide an overview of the general characteristics of research focusing on gambling directly associated with digital games.

To deepen the knowledge on gambling associated with digital games and to explore how research has developed over the years, this work presents the results of a scoping review that examines peer-reviewed, English language literature on the topic (132 publications), highlighting the developments, topics of research, and gambling activities associated with digital games. The aim is to provide an overview of the available peer-reviewed literature on the subject and address the nature of the available literature of focus.

Following this, this scoping review aims to answer these research questions: “**RQ1:** How has the corpus developed since initial publications in the field, and which scientific disciplines are evident in the relevant corpus?”, “**RQ2:** What methods of data collection and analysis are employed among the empirical studies of the relevant corpus?”, and “**RQ3:** What research topics and gambling activities are explored and examined in the relevant corpus?”

2. Methods

2.1. Scoping review protocol

This study employs a scoping review as the main method to identify the breadth and span of the current scientific literature on gambling associated with digital games and the evolution and contemporary aspects of gambling-like activities in digital games. Our protocol for conducting this scoping review draws from protocols introduced by Arksey & O’Malley (2005), Peters et al. (2015) and the PRISMA extension for scoping reviews (Tricco et al., 2018). Scoping review was chosen as the review method for this study, as it is often used to map areas of research, and the available sources and types of evidence (Arksey & O’Malley, 2005).

2.2 Eligibility criteria

With this review, we wanted to solely focus on peer-reviewed, fully available English publications. As this study is itself a review, we wanted to exclude other

reviews and secondary analyses. The aim of this review was to scope the current research field regarding gambling and gambling-like activities associated with digital games. To accomplish this, the authors focused on three specific areas: 1) gambling within digital games, 2) participating in gambling or gambling-like activities through/with digital games, game items and/or game platforms and 3) the overall convergence of digital gaming and gambling. In addition to the focus detailed above, we decided to exclude any publication that: 1) focused solely on gaming or gambling addiction, 2) examined gambling and gaming as entirely separate from each other and 3) focused solely on monetization mechanics, such as loot boxes, separate from gambling. Additionally, our initial screening of the results showed that there were no publications published before the year 2010 that fulfilled the above-mentioned criteria based on title and abstract. Beginning of the 2010s has also been seen as a period when a) social casino games became popular on sites such as Facebook (Cassidy, 2013), and b), the discussions around the overall convergence between digital gaming and gambling began to take form (King et al., 2010).

2.3 Information sources and search strategy

To accomplish the presented scoping review, two databases were chosen to conduct the literature searches: Scopus database via the Scopus website, and Google Scholar database using the *Publish or Perish* software. A series of keywords were selected to build a search string which was used to interrogate each of the chosen databases. The search string was separated into two parts: first, terms concerned with gambling and with specific gambling activities; second, terms concerned with digital games in general and specific gaming contexts known to be associated with gambling. “Esports” and similar keywords were also chosen as search terms, as it is relevant to the overall aim of this scoping review. The Scopus database was chosen as it is another comprehensive database that specifically focuses on peer-reviewed literature. Additionally, the Google Scholar database was chosen as the second database to use, due its comprehensive and encompassing nature.

The following search string was used to search the Scopus database:

((TITLE-ABS-KEY ("esport") OR TITLE-ABS-KEY ("e-sport*") OR TITLE-ABS-KEY ("electronic sport*") OR TITLE-ABS-KEY ("video gam*") OR TITLE-ABS-KEY ("online gam*") OR TITLE-ABS-KEY ("video gam*") OR TITLE-ABS-KEY ("computer gam*") OR TITLE-ABS-KEY ("social casino*") OR TITLE-ABS-KEY ("scg") OR TITLE-ABS-KEY ("snc") OR TITLE-ABS-KEY ("gacha*")) AND (TITLE-ABS-KEY ("gambl*") OR TITLE-ABS-KEY ("betting") OR TITLE-ABS-KEY ("wager*") OR TITLE-ABS-KEY*

("lotter*") OR TITLE-ABS-KEY ("casino*") OR TITLE-ABS-KEY ("loot*") OR TITLE-ABS-KEY ("bet"))

As figure 1 demonstrates, 992 records from Scopus and 986 records from Google Scholar respectively were found through the search, totaling 1978 records to evaluate at level 1. Of these, 88 records were duplicates, 320 were not full-text, peer-reviewed English language journal articles, conference papers or book chapters, 17 were systematic reviews or secondary analyses and 379 were published before the year 2010. This left 1174 records to assess at level 2. Of these, 1064 publications were removed due to not being relevant to the focus of the review. Many of these removed publications were removed due to their irrelevant title and abstract. Before arriving at the final version of the extant corpus, hand searches were conducted using references lists and the "cited by" function of Google Scholar in prominent publications. This was done to capture any potentially relevant publications that were missing from the original records for unknown reasons, and new publications that were not yet indexed by the chosen databases. The searches on both Scopus and Google Scholar databases, and the subsequent hand searches were conducted from late October to early November of 2021.

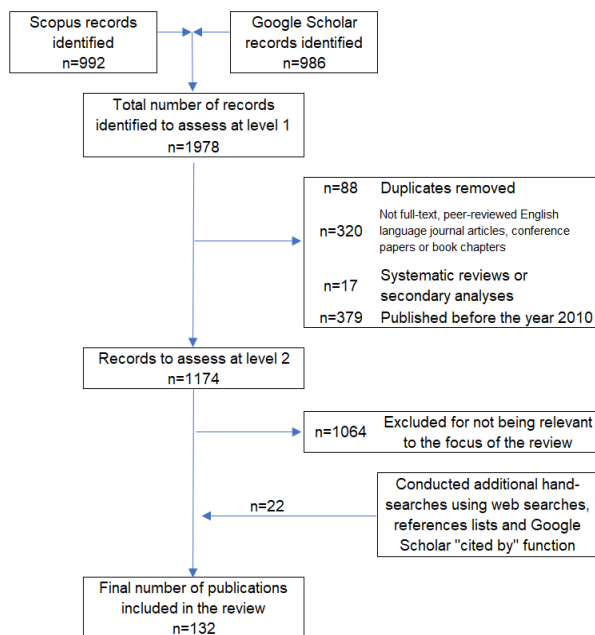


Figure 1. PRISMA flowchart of search strategy & data extraction

2.4 Data items and data collection process

After conducting the literature search and completing the data extraction, the researchers subjected the reviewed publications to qualitative content analysis. This analysis was used to gather the relevant

information in the captured reviews, thus allowing the creation of categories for 1) the year of publishing, 2) the type of the publication, 3) the scientific fields, 4) the overarching methodology employed in the publication, 5) data collection method employed, 6) data analysis method employed, 7) the topics of interest in the publication, and 8) the specific activities examined in the publication. The categories were then analyzed further, to answer the presented research questions.

Capturing the publication year, type, and the fields was transparent, as this information was readily available. To code the methods of data collection and analysis, the topics of interest, and the gambling activities; the content of each publication was examined thoroughly. Additionally, the titles of the publications and the authors' keywords were also taken into consideration when analyzing the data and creating the categories. In the finalized analysis, 10 methods of data collection, 4 different methods of data analysis, 16 distinct research topics and 13 distinct gambling activities were identified. Notably, publications sometimes had more than one scientific field, method of data collection and analysis, research topic and gambling activity attached to them.

2.4.1. Scientific fields. The classification related to the scientific fields the publications belong to was based on the classification of the venue in which the articles were published. We employed an international high-level classification scheme based on the "Revised Field of Science and Technology" list by OECD (2010). We operationalized the coding with the help of MinEdu (The Ministry of Education and Culture in Finland) online publication channel database. The MinEdu fields for each publication were extracted using the Finnish Publication Forum publication channel database. Publication channels that did not have any MinEdu classifications were categorized under "No scientific field available".

2.4.2. Methodologies and methods data items. Examining the "methodology" data item, individual publications were placed into either a "quantitative", "qualitative", or "mixed methods" category. To categorize the methods of data collection, and data analysis, the original authors' intent and expression were used in addition to our own content analysis process. This originally resulted in many individual categories that were later merged with the overarching method (e.g., reflective thematic analysis -> thematic analysis). In cases where the original authors did not express any specific method for their methods of data collection or analysis, and the publication was clearly empirical, our own analysis process was used to determine the employed methods.

2.4.3. Identified research topics. The "Research topics" category was created with the intent of capturing

the topics for each publication. To identify the topics, the content of the publication was carefully examined, together with the title and the keywords. As an example, categorizing topics such as “regulation”, “problem gambling” and “youth gambling” was facilitated by both the content of the publication, as well as the title and keywords. Topics such as “gaming-to-gambling-link”, “structural characteristics” and “game economies” required further familiarity with both the contents of the publications and the research field, in general.

Many topics, such as “problem gambling” are self-evident, but for some topics, some description is needed. For example, the “gaming-to-gambling link” topic was attached to publications that were specifically observing whether players would go on to gamble after playing gambling-themed games, such as social casino games, or games that heavily feature gambling-like activities, such as loot boxes. To describe the many structural facets of convergence between gambling and digital gaming, such as esports gambling markets and different processes of gamblification, a “structural characteristics” topic was created. The “game economies” was attached to publications that were concerned with how gamblified elements were used to monetize games, e.g., through loot box purchases.

2.4.3. Identified gambling activities. The “gambling activities” category was created to capture the specific forms of gambling with which the publication was concerned. This category featured specific activities, such as loot boxes, esports betting, and social casino games. The categories for the identified gambling activities were created following the same principles as with the “research topic” category.

The “loot boxes” category was used not only to capture activities directly referred to as “loot boxes”, but also when the authors referred to similar activities, such as loot crates and random reward mechanisms. *Gacha* as a term is often used as closely related to loot boxes, however there are differences (Yadav, 2021). To capture publications that specifically look at gacha mechanics, we included the term as a keyword, and created a category for it. Although many publications discussed gacha mechanics, this category only included works that were extensively focused on gacha games.

Simulated gambling, a term that can include various types of activities, was split into two different categories in our analysis. First, the “simulated gambling (closed)” category was created to include games within games that exhibit gambling themes. Second, the “simulated gambling (open)” category was created to include gambling activities in games that can be affected by outside currencies, and in cases where the authors did not sufficiently explain the analyzed form of gambling.

In many reviewed publications, what was referred to as different forms of “simulated gambling”, the actual

subject was social casino games (SCGs). Accordingly, in our analysis, a “social casino games” activity category was created, to separate it from the two “simulated gambling” categories detailed above.

A “skins gambling” category was created to include various activities of players gambling with virtual in-game items.

In a few publications, more niche forms of gambling were discussed, such as “PvP” gambling”, “emergent gambling”, and “skill gambling”. The first category refers to players betting on themselves to win a game against the other players. “Emergent gambling” refers to forms of gambling that are not necessarily designed as such by the game developers, such as “death rolling” in *World of Warcraft*. The last category was created for publications that investigated skill-based gambling.

3. Results

3.1 Growth and range of fields

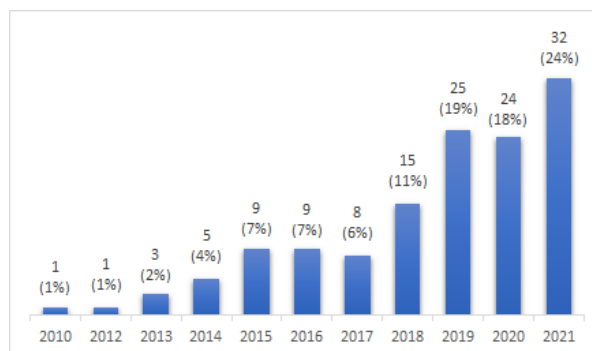


Figure 2. Publication count year by year, n=132.

To answer the first research question regarding the development of the field, and the scientific disciplines, both the publication years and the fields of the publication venues were captured. The frequency of publications in the field has notably risen, as evident in figure 2. The yearly publication count relevant to the topic of this scoping review has increased steadily from 2010 to 2017 and risen significantly thereafter.

Of the reviewed publications, 120 were journal articles (91%), 9 (7%) conference papers, and 3 (2%) book chapters.

Overall, 95 (72%) of the reviewed publications (n=132) belonged to one or more scientific fields. To observe the more holistic picture, the scientific disciplines the fields belonged to were gathered. Table 1 illustrates the count of publications that had at least one scientific field under its proprietary discipline.

3.2 Summary of methods and data in the corpus

To answer the second research question regarding the methodologies of the publications, both data collection, and data analysis methods were captured and analyzed. Of the reviewed publications, 45 (34%) were deemed non-empirical, as these publications had no apparent research problem, questions, or hypotheses, nor any defined method of data collection or analysis. This left 87 empirical publications for further analysis.

For the methodologies, most of the reviewed empirical publications (n=87) used solely quantitative

approaches (n=64, 74%) and 19 (22%) used solely qualitative methods in their studies. Overall, the use of mixed methods approaches among the empirical publications was low (n=4, 5%).

After analyzing the methods of data collection, 10 different categories were created, as illustrated in table 2. As the reviewed studies sometimes had more than one method of data gathering, the total percentages amount to more than 100%.

Table 1. Overview of disciplines, n=95.

Discipline (n of different fields)	Count (% of publications with scientific fields)	Publications (p)
Natural sciences (4)	19 (20%)	6, 12-13, 20, 22, 30, 34, 44, 64, 69-70, 74, 76, 78, 85, 100, 109-110, 120
Engineering & technology (1)	1 (1%)	93
Medical & health sciences (7)	31 (33%)	15, 17-19, 25, 31, 37, 49, 57, 60, 71-73, 75, 79, 82-83, 87, 89, 96, 102, 109, 111-113, 116, 118, 121-122, 127, 129
Agricultural sciences (1)	4 (4%)	69, 74, 110, 120
Social sciences (9)	81 (85 %)	1, 5, 7-9, 12, 14, 16-23, 25-27, 29-31, 33, 35, 37-38, 40, 43-45, 48, 50-52, 54, 56-57, 59, 64, 70-73, 75-83, 85-87, 89-90, 93, 96-102, 104-106, 108, 111-114, 116-118, 121-122, 124, 127-129
Humanities (1)	7 (7%)	22, 30, 40, 44, 97-98, 106
No scientific field available	37	2-4, 10-11, 24, 32, 36, 41-42, 46-47, 53, 55, 58, 61-63, 65-68, 84, 91-92, 94-95, 103, 107, 115, 119, 123, 125-126, 130-132

Table 2. Methods of data collection & data analysis among empirical studies, n=87.

Method of data collection	Count (% of publications)	Publications
Survey	62 (71%)	4, 6, 11-15, 20-21, 25, 27-29, 31, 33, 36-39, 45, 48-50, 52, 57-60, 63-64, 69, 70, 72-76, 78-79, 81-83, 85, 87-88, 90, 92, 99, 104-105, 107, 109-111, 113-114, 117, 120, 122, 124, 128-129
Interviews	7 (8%)	3, 19, 34, 51, 53, 86, 130
3rd party data	7 (8%)	1, 9, 18, p43-44, 47, 132
Longitudinal	6 (7%)	36-37, 70, 79, 86, 117
Ethnography	4 (5%)	26, 40, 54, 97
App walkthrough	3 (3%)	26, 97-98

Case study	3 (3%)	54, 112, 131
Literature review	2 (2%)	2, 29
Experimental	2 (2%)	22, 90
Vignette	1 (1%)	89
Method of data analysis	Count (% of publications)	Publications
Statistical analysis	68 (78%)	1, 4, 6, 9, 11-15, 20-22, 25, 27-29, 31, 33, 36-39, 44-45, 48-50, 52, 57-60, 63-64, 69-70, 72-76, 78-79, 81-83, 85, 87-90, 92, 99, 104-105, 107, 109-111, 113-114, 117, 120, 122, 124, 128-129, 132
Content analysis	10 (11%)	1, 26, 43, 47, 70, 97-98, 112, 130, 131
Thematic analysis	9 (10%)	3, 18-19, 29, 43, 51, 53-54, 86
Comparative analysis	4 (5%)	2, 34, 40, 93

3.3 Summary of identified topics and gambling activities

Table 3. Summary of domains, topics and gambling activities, n=132.

Domain	Count (% of total n)	Description & publications (p)
Gambling behavior associated with digital gaming (n=78)		Explores different forms of behavior concerning gambling associated with digital gaming
Problem gambling	44 (33%)	4, 11-16, 18-22, 25, 27-28, 31, 33, 39, 45, 48, 52, 59, 63-64, 69, 72, 74, 75-76, 83, 85, 88, 99, 102, 104-105, 107, 109-111, 113-114, 120, 122
Attitudes & motivations	24 (18%)	3, 6, 13, 25, 29, 34, 36-37, 43, 50, 53, 70, 78, 81, 83, 86-87, 89-90, 114, 124, 128-130
Gaming-to-gambling link	23 (17%)	16-17, 19-20, 36-38, 49, 51, 53, 56, 59, 64, 78-79, 81-82, 86, 99, 105, 114, 117, 130
Solely “gambling behaviors related to digital gaming”	4 (3%)	58, 73, 92, 127
Gambling during covid-19	3 (2%)	29, 39, 60
Gambling cognitions	3 (2%)	4, 25, 57
Physiological reactions	2 (2%)	22, 90
Characteristics of convergence (n=72)		Addresses different elements and aspects of convergence between digital gaming and gambling
Design & mechanics	54 (41%)	2-3, 6-8, 10, 18, 23-24, 26, 28, 30, 32, 35, 40, 42, 47, 50, 54-57, 61-62, 65-67, 70, 80, 82, 84-85, 87, 90-91, 94-95, 97-98, 100, 103, 106-108, 112, 115-116, 119, 121, 126-127, 131-132
Regulation	35 (27%)	1-2, 5, 7, 9-10, 24, 32, 42-43, 46-47, 55, 61-62, 65-68, 71, 77, 91, 93-96, 101, 108, 116, 121, 123, 125-127, 132

Structural characteristics	23 (17%)	1, 26, 32, 35, 41-45, 56, 65, 80, 84, 97, 100, 103, 106, 108, 113, 115, 118-119, 126
Game economies	18 (14%)	2, 23, 26, 30, 40, 62, 88, 97-98, 100-101, 106-108, 119, 121, 123, 127
Ethics	4 (3%)	30, 54, 66, 116
Exploration of groups and profiles (n=44)		Analysis of demographic data and attempts to establish profiles of people who gamble and play
Youth gambling	28 (21%)	10-15, 17, 27, 36, 78-79, 52-53, 70-73, 76-77, 79, 86, 92, 96, 102, 105, 113, 117, 130
Demographics & profiles	20 (15%)	20-21, 31, 33, 38, 45, 48-50, 58-60, 72, 75, 78, 92, 104, 109, 124, 128
Conceptual frameworks	11 (8%)	Attempts to establish conceptual frameworks for different gambling activities
		2, 8, 23, 26, 29, 35, 43, 97, 100-101, 118
Gambling activities	Count (% of total n)	Publications (p)
Loot boxes	60 (46%)	2-3, 5, 13, 18, 22-23, 25-26, 28, 30, 32, 39, 42, 45, 48, 52, 55, 59, 62, 64-77, 85, 88, 90-93, 95, 97, 100-101, 103, 106-108, 110-111, 113, 116, 119-123, 126-127, 132
Social casino games	54 (41%)	6-8, 10, 12, 14-20, 28, 32, 35-38, 42, 48-54, 56-57, 61, 70, 78-82, 84, 86, 94, 96, 98-99, 102-106, 112, 114-115, 117, 122, 126, 128-130
Esports betting	29 (22%)	1, 15, 21, 27-29, 32-34, 41, 43-46, 58, 60, 63-64, 83, 89, 92, 106, 109, 118-119, 121, 124-126
Skins gambling	17 (13%)	21, 23, 40, 44-46, 64, 92, 95, 97, 103, 106, 113, 119, 121, 123, 126
Simulated gambling (closed)	13 (10%)	7, 12, 14, 35-36, 48, 53, 57, 66, 86, 102-103, 115
Simulated gambling (open)	8 (6%)	8, 26, 35-36, 48, 52, 53, 57
Emergent gambling	5 (4%)	7, 12, 24, 57, 115
'PvP' gambling	3 (2%)	28, 64-65
Gacha games	3 (2%)	2, 6, 70
Skill gambling	3 (2%)	4, 56, 87
Cryptogames	2 (2%)	47, 131
Korean (online) board games	2 (2%)	9, 31

To answer the third and final research question regarding the research topics and related gambling activities among the publications, both were captured and analyzed. In total, 16 individual topics and 12 specific gambling activities were identified among the analyzed publications. Table 3 demonstrates the variety and frequency for the topics of research, and the identified gambling activities. For the domains, there's also a brief description and a count of publications that had any topics attached to it from that domain. In table 3, the count totals exceed the number of publications, as many had more than one topic or activity attached to them.

While all publications under the domain of "Gambling behavior associated with digital gaming" concerned behaviors related to gambling and gaming, a limited number, four, could not be categorized under a more specific topic in this domain. These publications are listed separately in table 3.

To highlight the interest over time in the five most frequent gambling activities, figure 3 demonstrates the yearly count for each of these activities.

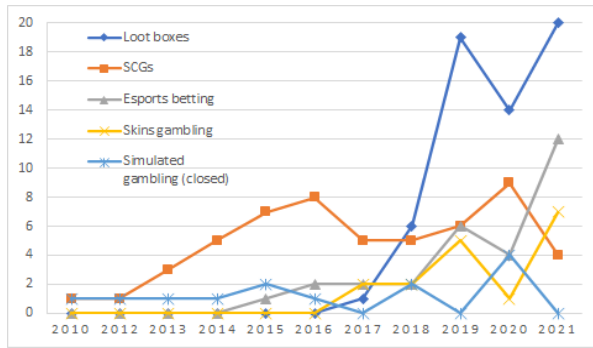


Figure 3. Count of the five most frequent specific gambling activities by year.

4. Discussion

4.1 Key findings

The aim of this study was to observe and analyze the various characteristics of scientific publications in the field concerning gambling associated with digital gaming. The results yield findings of interest related to the development, scientific approaches and employed methodologies, the major topics of research, and the gambling activities that are addressed in the field.

First, the amount of research in the field has significantly increased in the late 2010s. This increase can be partly attributed to the rise of interest in loot boxes, esports betting, and skins gambling. Nearly half of the 132 publications (46%) in the relevant corpus examined loot boxes. By 2019, loot boxes were included as one the examined activities in over 76% of the publications for that year (20 out of 26 publications). Interestingly, despite the second highest count among the identified gambling activities, figure 3 demonstrates that interest in social casino games (SCGs) has not recently been maintained. The interest in SCGs seems to correlate with the user growth of Facebook (Statista, 2022a) until 2016.

Second, quantitative approaches were overwhelmingly represented among the reviewed publications, with surveys and different forms of statistical analysis being the most common forms of data collection and analysis, respectively. The focus on quantitative research is expected, as problematic gambling behavior has traditionally been studied with self-reported survey measurements (Tse et al., 2012).

Third, through our results, four general domains of interest regarding the research topics were identified. Furthermore, there is evident interest in specific topics, such as problem gambling, design and mechanics relating to gambling associated with digital gaming, regulation, and youth gambling.

4.2 Implications

As one of the first works to analyze the different characteristics of scientific publications in the specific field of gambling associated with digital gaming, this scoping review contributes to the growing interest by analyzing the growth of publications, the employed scientific approaches, and frequencies of both the topics of research, and gambling activities that are examined.

Although there has been a noticeable increase in reviews relating to topics, such as novel gambling activities and problem gambling (Garea et al., 2021; Gibson et al., 2022; Montiel et al., 2022; Spicer et al., 2022), this work is the first to provide an overview of the general characteristics of research focusing on gambling directly associated with digital games.

By providing a holistic view of the field, this work can be used by future research in various ways. On a general level, readers can assess the frequencies of specific methodological approaches, research topics and the gambling activities that have been examined. More specifically, cross-referencing the available data points in the provided tables, readers can access publications that fit into various categories, from research topics, to gambling activities, to applied methodologies.

With an evident upward trend, and 2021 having the highest yearly publication count, there is a clear rise of interest in gambling associated with digital games, as novel gambling activities and discussions around them continue to develop.

4.3 Limitations & future work

A significant limitation of this study is the inclusion criteria of this scoping review. Including grey literature in future reviews could potentially yield interesting and informative results. Additionally, significant findings could be provided by more focused systematic reviews or meta-analyses on topics such as: tools of data collection and analysis employed among empirical research, the specific types and definitions of gambling activities included in studies, and reviews of studies focusing solely on youth gambling associated with digital games.

As the field is in a state of constant development, and the publications included in this scoping review extend only to fall of 2021, there is a potential need to update this scoping review in the future, as current research keeps expanding the field.

The scientific fields of the publication venues were extracted via database tools in the Finnish Publication Forum website. The database hosts the Finnish Ministry of Education's (MinEdu) classification schema for each venue, and we used that to categorize the publications in the corpus. However, we did not extend the

categorization for publication venues that did not have a MinEdu classification, leaving the analysis somewhat incomplete. Future research could potentially use a form of content analysis to fill in the fields for venues that do not have a classification to bridge this gap.

Another significant limitation of this study is the use of terms in the category creation. As this research field is still developing and new terms for novel gambling activities are forming quite rapidly, the use of terms in this review for specific concepts, such as loot boxes, can be ambiguous at times. As there exist multiple, nuanced forms of many of these activities, future works should take these nuances into consideration when conducting research based on them.

An example of this is the categories of “esports betting” and “skins gambling”, two closely connected activities that were analyzed separately in this review. Future studies could investigate the similarities or disparities between publications focusing on these activities. As the activities have been closely connecting and converging in recent years (Macey & Hamari, 2019), forms of esports betting that use virtual currencies or items (including skins) as stakes, especially in cases that subvert the traditional age regulations concerning gambling, should be closely followed.

Regarding the methodologies among the relevant corpus, there is a considerable gap of both qualitative and mixed methods-based research. Future research should actively consider qualitative methods, such as interviews and case studies to fill these gaps. Additionally, longitudinal study designs, vignettes and experimental settings could yield significant results that are not yet available.

The importance of focusing on esports betting and skins gambling is also evident by the fact that both activities have overtaken social casino games in frequency counts by 2021. However, as mobile Zynga games, a major game developer of social casino games, have seen a recent explosive rise in active users (Statista, 2022b), future research should still consider mobile gambling games a potential focus of study.

For the topics, our results indicate a lack of research in ethical aspects of novel gambling activities and their designs. Ethical discussions are especially of importance when considering including youth and adolescent gambling as a topic, as previous research has indicated a propensity of younger players to engage in novel gambling behavior, such as excessive loot box spending (Garea et al., 2021), and skins gambling (Hing et al., 2021).

5. Conclusion

This study presents the results of a scoping review of 132 peer-reviewed, English language publications consisting mostly of journal articles focused on gambling and gambling-like activities associated with digital gaming. Our findings indicate a steady yearly growth from 2010 to 2017, after which, by 2018, yearly count had nearly doubled from 2017, and tripled by 2019. By 2021, the yearly publication count continues an upwards trend.

The increase from 2019 onwards can be attributed to rising interest in novel gambling activities, such as loot boxes, esports betting, and skins gambling. Social casino games, albeit with an overall high-frequency count, have been of declining interest in recent years. Overall, gambling behaviors, such as problem gambling and motivations for gambling, and topics of convergence between gambling and gaming, such as regulation, were heavily featured among the reviewed publications. Notably, empirical research done in this field has been heavily quantitative, and the methods of data collection and analysis have focused heavily on surveys and different forms of statistical analysis, respectively.

As there is ambiguity among the specific forms of novel gambling activities, future research should focus more on identifying the exact nature of the examined activities. Systematic reviews or meta-analyses could be employed to review the types of activities examined among publications in the field, the tools and measurements used to collect data, the various statistical analyses employed, and how these novel activities affect specific groups, e.g., adolescents. We also stress the importance of longitudinal study designs, ethnographic and case studies, experimental laboratory settings, and overall, qualitative, and mixed method approaches in future research to fill gaps in methodologies in the field. Finally, the significance of youth gambling as a topic of research is heightened, as previous research has displayed a susceptibility for young players to engage in novel gambling activities, such as loot box spending (Garea et al., 2021) and skins gambling (Hing et al., 2021).

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Appendix 1. The extant corpus used in this scoping review: <http://dx.doi.org/10.13140/RG.2.2.25544.80648>

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