



Full length article

## Social gaming: A systematic review

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### ABSTRACT

Digital games often constitute a shared activity where people can spend time together, communicate and socialize. Several commercial titles place social interaction at the center of their design. Prior works have investigated the social outcomes of gaming, and factors that impact the experience. Yet, we lack a comprehensive understanding of how social gaming has been approached and explored before. In this work, we present a systematic review covering 263 publications, gathered in February 2021, that study gaming experiences involving more than one person, with a focus on the social element that emerges among partakers (players and/or spectators). We contribute with a systematized understanding of (1) how the topic is being defined and approached, (2) what facets (mainly in terms of outcomes and determinants of the experience) are being acknowledged and (3) the methodologies leveraged to examine these. Our analysis, based on mixed deductive and inductive coding, reveals relevant gaps and tendencies, including (1) the emphasis in novel technologies and unconventional games, (2) the apparent negligence of player diversity, and (3) lower ecological validity associated with totally mediated evaluations and a lack of established constructs to assess social outcomes.

### 1. Introduction

Humans have a fundamental need for stable and meaningful bonds, and frequent personal interactions (Baumeister & Leary, 1995; Bowlby, 1982; Ryan & Deci, 2000). It affects cognition, emotional state, and general well-being, while heavily influencing our motivations and behavior (Baumeister & Leary, 1995; Kaplan, Cassel, & Gore, 1977; Ryan & Deci, 2000). To satisfy this drive, humans engage in a variety of shared activities to build new and strengthen existing ties with others—among them is gaming. For many, nowadays, playing digital games with others is paramount to social well-being. Young people are playing with peers, discussing games as a common interest, and expanding their interactions and relationships thanks to digital gaming (Lenhart et al., 2008; Olson, 2010; Orleans & Laney, 2000). Older people have expressed the social benefits of digital gaming, in dealing with loneliness and connecting with family (De Schutter & Vanden Abeele, 2010; Kaufman, Ma, Sauv , Renaud, & Dupl a, 2019; Osmanovic & Pecchioni, 2016). Research has, on many occasions, shown how digital gaming can be an important means to satisfy social needs and how these can be a central motive to play (Cole & Griffiths, 2007; Ferguson & Olson, 2013;

Granic, Lobel, & Engels, 2014; Kowert & Oldmeadow, 2015; Wang, Taylor, & Sun, 2018; Wen, Kow, & Chen, 2011; Williams et al., 2006).

Multiplayer games typically pose challenges that promote competition and/or collaboration<sup>1</sup> among players. Many games, in particular collaborative ones, often demand player interaction outside the game environment, with players having to actively communicate to succeed (Depping, Johanson, & Mandryk, 2018; Depping & Mandryk, 2017; Depping, Mandryk, Johanson, Bowey and Thomson, 2016; Nardi & Harris, 2006). By design, games offer players various ways to interact, both through game actions (e.g., combat) and embedded features that allow for communication (e.g., in-game chat) and sharing personal moments (De Kort & Ijsselstein, 2008; Emmerich & Masuch, 2017). Beyond that, gaming provides a “third place” (Oldenburg, 1999) where players and other people involved (e.g., spectators) can be sociable with each other, even outside gameplay interactions e.g., talking about the experience, gaming events (Ducheneaut, Moore and Nickell, 2007; Sobel et al., 2017; Steinkuehler & Williams, 2006).

Gaming as a social activity (or social gaming<sup>2</sup>) can occur in a variety of contexts and research has identified some of the determinants of the

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<sup>1</sup> Throughout this paper, we opt to use “collaboration” instead of “cooperation”, but we consider the two terms to mean the same: working along with someone else to achieve a shared goal.

<sup>2</sup> While we agree with previous definitions of “social play” (Isbister, 2010) that describe it simply as gaming where more than one person is involved (players and/or spectators), in this work we posit social gaming as any gaming experience where the social outcomes (i.e. any aspect resulting from the interaction between two or more people) are framed as the main interest/focus.

experience (De Kort & Ijsselstein, 2008; Emmerich & Masuch, 2017; Isbister, 2010). The characteristics of the environment, those of the people involved, and of the game itself all can impact how the game and interaction is experienced, as well as its outcomes (Emmerich & Masuch, 2017). Regarding the environment, determinants such as the spatiotemporal configuration (e.g., if players are co-located or at a distance) are shown to impact player experience (De Kort & Ijsselstein, 2008). Similarly, the characteristics of the players also influence how gaming occurs and is perceived—age (Bilgihan, Cobanoglu, Nusair, Okumus, & Bujisic, 2013; Birk, Friehs, & Mandryk, 2017; Nap, Kort, & Ijsselstein, 2009) and abilities (Yuan, Folmer, & Harris, 2011) are some of the aspects previously investigated. Finally, the experience is also dependent on the design intent, the features and elements that shape the gameplay (Emmerich & Masuch, 2017). When designing multiplayer games, these various determinants have to be acknowledged and reflected on.

There is a large body of research work focused on better understanding gaming as a social activity. Various works cover the outcomes of playing with others in players' perceptions and behavior (e.g., Depping et al., 2018; Emmerich & Masuch, 2016), some acknowledging the different contexts of play (e.g., Kappen et al., 2014; Kowert, Domahidi, Festl, & Quandt, 2014). However, it is not clear how research has approached this topic and what outcomes and experiences, in terms of games, populations, and contexts have been considered. While previous works identify and categorize some of the determinants that impact multiplayer experiences (e.g., spatiotemporal configuration, group relationship) (De Kort & Ijsselstein, 2008; Emmerich & Masuch, 2017; Isbister, 2010), it is yet unclear which of these are being considered in research work, what and how social outcomes have been investigated. As such, with this work, we aim to answer the following research questions:

- **RQ1:** How has prior work defined social gaming?
- **RQ2:** How does prior work contribute to better understanding social gaming?
- **RQ3:** How has prior work covered the various determinants that impact social gaming?
  - **RQ3.1:** (...) considering determinants associated with the game design?
  - **RQ3.2:** (...) considering determinants associated with the people involved?
  - **RQ3.3** (...) considering determinants associated with the environment (e.g., physical space)?
- **RQ4** How has prior work covered different outcomes (e.g., impact on relationships) of social gaming?
- **RQ5** What kinds of research methods are employed to investigate this topic?

Following the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) statement (Page et al., 2021), we conducted a systematic review on the topic, covering 263 full-papers published between 1995 and 2020, across 104 venues, including research conferences and journals. Our work addresses research work that investigates digital gaming with more than one person involved, that specifically focuses on the social element that emerges between them (i.e. social interactions and outcomes). We systematized and reflected on the ways the topic is conceptualized and on the various aspects that are considered, presented and investigated by these works—in particular, determinants associated with the game, the people, and the environment, as well as specific outcomes resulting from playing with others. Further, we derive important gaps and tendencies, namely (1) the prominence of specific genres (e.g., massive multiplayer games) and design elements, based on collaboration, novelty, and physicality, (2) the undervalue of determinants emerged from players' idiosyncrasies and context, and paucity of participatory design approaches,

and (3) the prevalence of studies conducted in mediated settings and non-established constructs to assess social outcomes, resulting in little ecological validity. We contribute with:

- An analytical systematization of research focusing on gaming as a social activity, including (1) definitions and grounding provided by the works, (2) the contribution provided, (3) determinants and (4) outcomes considered, and (5) methodologies employed. This analysis can inform future practices of researchers and game designers when designing for social interaction in digital games.
- A *dataset* that includes detailed information about all research papers gathered through our collection procedure (n = 263), including metadata and all the data amassed by our analysis. This dataset can be leveraged by future work to conduct further reviews of the corpus or a subset of it (e.g., meta-analysis of works that focus on social presence as an outcome).
- A *taxonomy* of the determinants and potential outcomes involved in a social gaming experience as investigated by prior work:
  - Determinants associated with (1) game design and technology (e.g., input mode), (2) the players (e.g., personality), and (3) the context (e.g., remote or co-located);
  - Outcomes as (1) perceptions on the experience (e.g., immersion), (2) the interaction quality (e.g., social presence), (3) perceptions on co-players (e.g., trust), (4) perception on the community (e.g., group identification), (5) impact on relationships (e.g., family satisfaction), (6) impact on social support, well-being, and health, (7) impact on personality and behavior.
- A discussion of research gaps and design implications that consider the different determinants and outcomes of social gaming at stake.

## 2. Background

Our work encompasses concepts and assumptions resulting from sociology and psychology that characterizes human social needs, as well as work from game research focusing on the social dimension of the medium. In this section, we summarize work done at these two fronts.

### 2.1. Social needs and interpersonal interaction

A large body of work posits social connection and belongingness as an universal prerequisite for one's physical and psychological well-being (Baumeister & Leary, 1995; Kawachi, 2001; Seeman, 1996; Thoits, 2011). This need is established as transversal to all generations and cultures and rooted in ancient times, where humans had to group in order to survive (Baumeister & Leary, 1995). The deprivation of these needs leads to social isolation and loneliness, which ultimately are associated with sickness, suffering (Baumeister & Leary, 1995; Cacioppo & Cacioppo, 2014), and behavioral problems such as criminal activity (Baumeister & Leary, 1995). Research has also shown how the fulfillment of such needs is fundamental to successful aging (Seeman, Lusignolo, Albert, & Berkman, 2001) and longevity (Seeman, 1996; Yang et al., 2016). This notion has been accentuated with the recent COVID-19 pandemic where social isolation and disconnectedness severely affected the mental health of many (Pietrabissa & Simpson, 2020).

Baumeister and Leary (1995) present the “need to belong” as the simultaneous need for frequent interpersonal interactions, and the perception of bonds revolved around genuine concern, stability and continuity. To attain these needs, humans engage in a variety of social activities. Interpersonal interaction can sometimes be instrumental, but it can also come free of purpose or just to feel part of society (Simmel & Hughes, 1949). The mere presence of other people may be

comforting (Baumeister & Leary, 1995). Importantly, the valence of interactions is determining, as interactions based on social undermining, like conflict and constant criticism, can actually have negative effects on one's well-being (Baumeister & Leary, 1995; Vinokur & Ryn, 1993).

Frequent and positive interaction is not enough to satisfy our social needs (Baumeister & Leary, 1995). The need for stable bonds grounded on care and concern is fundamental. As such, human interaction is shaped to form relationships based on mutuality and reciprocity, while avoiding breaking existing ones (Baumeister & Leary, 1995). Self-determination theory (Ryan & Deci, 2000) posits relatedness i.e. feeling connected and belonging amongst others, along with autonomy and competence as a core source of intrinsic motivation. Feelings of relatedness, based on access to help and support, can dictate one's psychological health and motivation to do and learn new tasks (Ryan & Deci, 2000). Similarly, attachment theory establishes that stable bonds are key for personal development (Bowlby, 1982). A healthy social circle benefits people in a variety of ways. Social capital theory (Putnam, 1995) describes the resources embedded in our social ties, which are leveraged for individual and collective benefit. Both weak (i.e. bridging) and strong (i.e. bonding) ties can have benefits, with one mostly associated with knowledge sharing, and the other with caregiving and support, respectively (Putnam, 1995).

## 2.2. Gaming as a social activity

Digital technology brought everyone closer, with new ways to pass time with others and even interact at a distance. In particular, the advent of digital gaming brought new possibilities and spaces for people to get together, becoming an important part of social life for many (Quandt & Kröger, 2013). Past research portrays gaming as a way to initiate, maintain, and strengthen relationships—this is shown not only in the lives of younger generations (Lenhart et al., 2008; Olson, 2010; Orleans & Laney, 2000), who could experience the medium since childhood, but also for older generations (De Schutter & Vanden Abeele, 2010; Kaufman et al., 2019; Osmanovic & Pecchioni, 2016). Studies show positive links between multiplayer gaming and quality of relationships (Trepte, Reinecke, & Juechems, 2012; Wang et al., 2018), social support, and psychosocial well-being (Freeman & Wohn, 2017; Trepte et al., 2012; Zhang & Kaufman, 2017). Apart from that, social exchange is shown to be a central motivation to play games (Cole & Griffiths, 2007; Kowert & Oldmeadow, 2015; Williams et al., 2006). Communities, from micro to massively large, are formed around gaming, not only at a virtual level (Harald & Marko, 2011), but also in the physical world (Freeman & Wohn, 2017; Jansz & Martens, 2005).

Isbister (2010) set forth the various ways a game can be “social”, not only when more than one player is simultaneously involved, but considering situations where people can engage in the social space of a game—e.g., watching and commenting others play, passing the controller to play in turns, playing asynchronously. Besides, similar to other types of media, gaming can foster interactions in the real world as a common interest (Sobel et al., 2017). Past research (Ducheneaut, Moore et al., 2007; Steinkuehler & Williams, 2006) uses the concept of third places (Oldenburg, 1999) and applies it to gaming, depicting it as a place of common interest, to exchange ideas, pass time together, and build relationships.

Social aspects have been highlighted for specific genres and games (Consalvo, 2011; Ducheneaut, Moore et al., 2007; Quandt & Kröger, 2013), and specific mechanics are explored to foster interaction—in particular, collaboration where players are interdependent on each others' actions (Depping et al., 2018; Depping & Mandryk, 2017; Depping, Mandryk et al., 2016). However, with an immense variety of game genres and playstyles, it is unclear what has been covered and how research has been approaching these different dimensions.

Further, not only aspects related to the game have an impact on the social experience, but also determinants associated with the group of

players and the environment (De Kort & Ijsselstein, 2008; Emmerich & Masuch, 2017; Isbister, 2010; Salen & Zimmerman, 2003). Isbister (2010) outline contextual determinants, such as the platform, display and physical environment, as well as motivational determinants, such as the characteristics of the group and motives to play together. It is essential to understand what these determinants are, how they have been addressed, and how they actually impact the experience. This knowledge can improve designers' ability to better achieve positive outcomes with new games, while identifying and avoiding negative ones, such as addictive behavior (Colder Carras et al., 2017) and toxic interactions (Sengün, Salminen, Mawhorter, Jung, & Jansen, 2019).

## 3. Methods

We followed the 2020 Preferred Reporting Items for Systematic Reviews and Meta Analysis (PRISMA) guidelines (Page et al., 2021) to conduct and present this review. In this section, we first clarify the scope of the review, by presenting the inclusion and exclusion criteria we defined. Next, we describe the procedure to collect and then select our corpus of publications. Finally, we detail the analysis process and coding framework used to extract information. The whole process is summarized in Fig. 1. We also make the protocol available as supplementary material<sup>3</sup> (not registered).

### 3.1. Scope and eligibility criteria

The present study aims to survey research focused on the social side of gaming, meaning digital game experiences involving more than one person with focus on the social element that emerges between players and/or spectators. In other words, all included works had to contribute with theories, methodologies, empirical studies, or interventions to better understand and/or promote social interactions and/or outcomes through the act of playing digital games with others. With this framing and the research questions mentioned before, we defined inclusion criteria (IC1–IC3) and exclusion criteria (EC1–EC4) that all papers had to pass to be included. These criteria are as follows:

- **IC1** - The article investigates the experience of playing games.<sup>4</sup> Studies solely focusing on game-related activities not centered in the act of playing (e.g., game conventions) do not pass this criteria.
- **IC2** - The article focuses on better understanding, promoting and/or assessing social interactions and/or outcomes.
- **IC3** - The article is written in English.
- **EC1** - Articles focused on analog games are excluded, except for games hybrid by design (i.e. with both a physical and digital dimension).
- **EC2** - Articles focused on solitary gaming experiences (one player only, with no spectators or other people involved) are excluded.
- **EC3** - Studies focusing on purposeful (serious) game interventions (e.g., training social skills) are excluded.
- **EC4** - Introductions, letters, comments, abstracts, talks, and demonstrations are excluded.

### 3.2. Information sources and search strategies

We identified candidate articles through exhaustive database searching. We started by performing exploratory searches in different databases to get a sense of the search space. We iteratively established our search query, by first identifying relevant keywords and then

<sup>3</sup> Full protocol. [https://osf.io/fu7nq/?view\\_only=1de7860e96c74a1cb1c365d8c9f32814](https://osf.io/fu7nq/?view_only=1de7860e96c74a1cb1c365d8c9f32814).

<sup>4</sup> When in doubt if an actual “game” is investigated, we considered it a “game” if the work described it as a “game”.

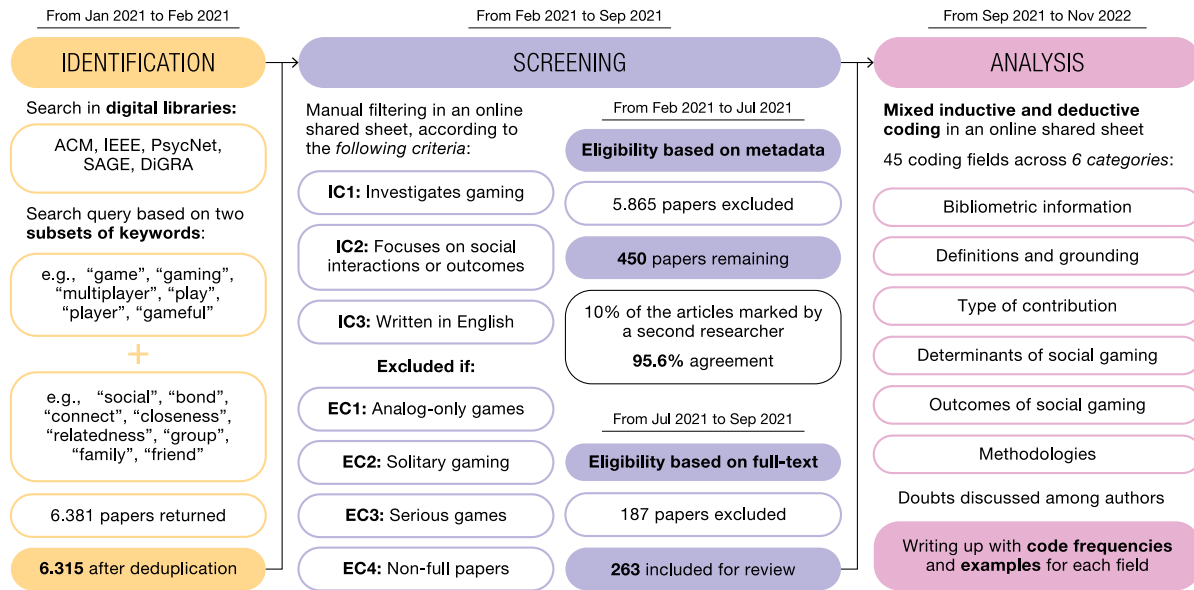


Fig. 1. Graphical representation of the procedure.

experimenting with synonyms and variations of these. By checking the titles, abstracts and author keywords of some of the papers retrieved with each search, we also identified new keywords. We organized the results of these initial searches in a shared document, allowing us to discuss different queries, and take an informed decision to establish a final one. For instance, through these exploratory searches, we found that words directly related to social outcomes such as “closeness” and “bonding” were commonly used in papers aligned with our criteria. We established two subsets of keywords, one that contained terms related to gaming (S1) and one that contained terms related to social interaction and outcomes (S2). These are as follows:

- **S1:** “game”, “games”, “gaming”, “multiplayer”, “multi-player”, “play”, “plays”, “playing”, “player”, “players”, “gameful”.
- **S2:** “social”, “socio”, “socially”, “socialize”, “socialization”, “sociability”, “sociality”, “bonding”, “bond”, “bonds”, “connecting”, “connect”, “connectedness”, “closeness”, “relatedness”, “togetherness”, “group”, “groups”, “family”, “families”, “friend”, “friends”, “friendship”, “friendships”, “relationship”, “relationships”, “inclusion”, “inclusive”, “inclusivity”, “including”, “intersectionality”, “intersectional”.

Our search strategy consisted in collecting articles where a combination of two terms, one from S1 and one from S2, appeared across title, abstract and/or author keywords. The final search was conducted in February, 2021, by the first author, on the following web bibliographic databases: the ACM Guide to Computing Literature (ACM), the IEEE Xplore digital library (IEEE), APA Psycnet (Psycnet), SAGE Journals (SAGE), and the DiGRA digital library (DiGRA). We selected a set of comprehensive bibliographic databases (except DiGRA), indexing works from various research venues, publishers, and subject areas (in particular social sciences, psychology, computer science, and human-computer interaction). DiGRA was also selected, as the conference is an important venue for games research, but it is not indexed by other data sources (it has its own self-contained digital library).

With ACM, IEEE, Psycnet, and SAGE, we leveraged the corresponding advanced search features, based on a search string with the terms and boolean operators. Given there was no advanced search tool available for DiGRA, we collected the metadata from all articles available in the library and performed the search manually on a spreadsheet. No further filters were applied when performing the searches.

Comments, replies, editorials, erratums, books, chapters in books, reviews, PhD/MSc thesis, and proceedings were filtered out manually,

based on the metadata. The total number of articles (research papers published in either journals or proceedings) after this process was 6381 (3239 from ACM,<sup>5</sup> 942 from IEEE, 780 from PsycNet, 1276 from SAGE, and 144 from DiGRA). After deduplication, there were 6315 articles.

### 3.3. Identification and selection of publications

We organized the 6315 articles’ metadata into an online sheet, shared among authors to evaluate candidate articles based on the metadata. The first author marked every article with either “pass” (or “fail”), when possible to ascertain, by reading the abstract and other metadata, that the article met (or not) every criteria. When not possible to ascertain this, the author marked the article with “uncertain”, meaning that it would be necessary to delve deeper to evaluate eligibility and, as such the article also passed to the next phase. The criteria were verified in order (from IC1 to IC3 and then from EC1 to EC4), and whenever an article failed one, the author would proceed to the next article, without verifying the remaining criteria. Ten percent of the articles were marked by a second author to determine reliability of article inclusion. We compared results, ending up with an agreement of 95.6%, which provided confidence to proceed to the next phase. The disagreements were resolved by consensus between the two authors. At this phase, 5865 articles were excluded and 450 remained. Abstract eligibility was finished in July 2021.

Then, the remaining 450 articles were evaluated through full-text analysis. Again, the first author marked each article with either “pass” or “fail”, following the same process as before but based on the full text of each article. Doubts and irresolutions during this process were marked and discussed with the team to ensure that decisions were not based on a single interpretation. 180 papers were excluded. Additionally, we excluded one paper that consisted of an older version of

<sup>5</sup> We found that some results returned from ACM did not correspond to the search (one or both terms were absent from the metadata). We still included these in the initial corpus (these ended up excluded in the eligibility phase). However, we decided to take an additional step to confirm that the search tool was collecting all relevant articles, according to our search. We manually collected and filtered (on a spreadsheet, as it was done for DiGRA) all articles published at the ACM CHI Play conference, one of the venues with more articles identified at this stage. After comparing with the results retrieved by automatic search, we concluded there were no articles missing, and thus proceeded to the eligibility process.

**Table 1**

Number of papers excluded, discriminated by criteria, on first round (metadata) and second round (full-text). Percentages relative to the total number of papers excluded per round. Note that papers were excluded by verifying criteria in order (from top to bottom).

Criteria	First round	Second round	Example
IC1	4114 (70.1%)	33 (17.6%)	Sobel, Rector, Evans, and Kientz (2016).
IC2	1520 (25.9%)	113 (60.4%)	Harteveld and Sutherland (2017).
IC3	0	1 (0.5%)	Cornejo, Hernandez, Tentori, and Favela (2015).
EC1	37 (0.6%)	11 (5.8%)	Leite et al. (2010).
EC2	46 (0.7%)	3 (1.6%)	Banks and Bowman (2016).
EC3	58 (0.9%)	5 (2.6%)	Fares et al. (2011).
EC4	90 (1.5%)	14 (7.4%)	Nandwani, Coulton, and Edwards (2011).

**Table 2**

Distribution of works per type of venue (conference or journal) and most relevant venues.

Type	N of works	Most relevant
Conference	170 (64.6%)	DiGRA, CHI, CSCW
Journal	93 (35.4%)	Computers in Human Behavior, Games and Culture

one other paper also included in the corpus (approximately 75% the same content, but the most recent one had paraphrased and additional excerpts). Finally, we excluded six papers as we were unable to access them. We ended up with a final collection of 263 publications. Full-text eligibility was finished in September 2021. We present the number of papers excluded, discriminated by criteria, in Table 1.

### 3.4. Coding and information extraction

We started the analysis by deductively creating coding fields according to our RQs (e.g., data collection methods to answer RQ5). Codes and new fields were iteratively created when we started the process of reading and coding a subset of the papers. We kept and confirmed existing metadata about the authors, year of publication, and venue. Following multiple discussions among the authors, we established a coding framework that includes 49 coding fields across six coding categories: (1) bibliometric information, (2) terminology, definitions and grounding, (3) type of contribution, (4) determinants of social gaming, (5) outcomes of social gaming, (6) methodologies. We also added a field for other observations. A full description of the coding framework is available as supplementary material.<sup>6</sup> The first author used this framework to code all 263 articles in a shared document, while marking and discussing codes and interpretations in doubt with the other authors (finished November 2022). The full dataset is also made available as supplementary material.<sup>7</sup>

## 4. Findings

Below, we present the results in sections corresponding to our coding categories. For each, we provide further detail on the coding process, present frequency of codes and describe representative examples in order to capture the variety of the corpus. We will refer to the papers by their unique identifier (P1-P263), which can be consulted in Appendix A. When quotes are presented, citations in the original text are omitted, but mentioned when relevant.

### 4.1. Bibliometric information

We collected descriptive information for each article, namely the venue where the article was published and the date of publication.

<sup>6</sup> Coding framework. [https://osf.io/xyrtg/?view\\_only=4239c641d88f432b85078c7d0a567b69](https://osf.io/xyrtg/?view_only=4239c641d88f432b85078c7d0a567b69).

<sup>7</sup> Full dataset. [https://osf.io/r576z/?view\\_only=30ad991eb2554e2fb863a35bdbb6913a](https://osf.io/r576z/?view_only=30ad991eb2554e2fb863a35bdbb6913a).

In total, the 263 works were published in 103 different venues [Table 2]—170 articles were published in conference venues, while 93 were published in journals. Among the most relevant conferences (more than three papers), there is DiGRA—Conference of the Digital Games Research Association (n = 25), CHI—ACM Conference on Human Factors in Computing Systems (n = 19), CSCW—ACM Conference on Computer Supported Cooperative Work (n = 15<sup>8</sup>), CHI PLAY—ACM SIGCHI annual symposium on Computer-human interaction in play (n = 14), FDG—International Conference on the Foundations of Digital Games (n = 9), ACE—ACM SIGCHI International Conference on Advances in Computer Entertainment Technology (n = 7), Mindtrek—International Conference on Entertainment and Media in the Ubiquitous Era (n = 4), CoG—IEEE Conference on Games (n = 4), and DIS—Conference on Designing Interactive Systems (n = 4). Note that four papers were published in joint conferences (P109, P126, P174, and P189)—for those, each of the two conferences involved are counted. Among the most relevant journals (more than three papers), there is Computers in Human Behavior (n = 24), Games and Culture (n = 14), Journal of Media Psychology (n = 4), and New Media & Society (n = 4). We collected publications ranging from 1995 to 2020. Most have been published since 2007 (n = 237, 90%), and the year with the biggest number of publications is 2015 (n = 24, 9.1%). The distribution of publications per year can be seen in Fig. 2.

### 4.2. Terminology, definitions and grounding (RQ1)

We observed that several papers introduced their view on digital gaming as a social experience, especially in the first sections e.g., Related Work. To code for definitions, these excerpts were identified, extracted, and scrutinized. Additionally, terms used by the authors (e.g., “social gaming”) were also extracted, even when the work did not provide an explicit definition for them.

Some terms were recurrent across the corpus. The term “social play” (or “social game play”) is used in 64 articles (in the title of 11), while “social gaming” (or “social video gaming”) is used in 37 (in the title of 7). In most articles, these terms are not explicitly defined, but portrayed simply as playing digital games with other people (as opposed to solitary play). Yet, when an explicit definition or rationale is not provided, it remains unclear what the authors actually envision when using these terms, as their meaning can span a wide range of co-playing scenarios (e.g., playing a single-player game with an audience might or not be considered “social gaming”) and interactions (e.g., interactions beyond the gameplay such as talking about the game might or not be considered “social gaming”). This is especially confounding when these terms are extensively used or included in the purpose of the work, but are not disambiguated (e.g., P9: “designing for social play”).

The terms “sociality” and “sociability” are also used to depict the existence and extent of a social dimension in games<sup>9</sup> (e.g., “aspects of

<sup>8</sup> One of the papers is actually published in the Proceedings of the ACM on Human-Computer Interaction journal as part of the CSCW issue.

<sup>9</sup> We should note that “sociability” is also used with a different meaning in some works, in particular to describe a type of social behavior where player socialize with no specific objective (Simmel & Hughes, 1949).

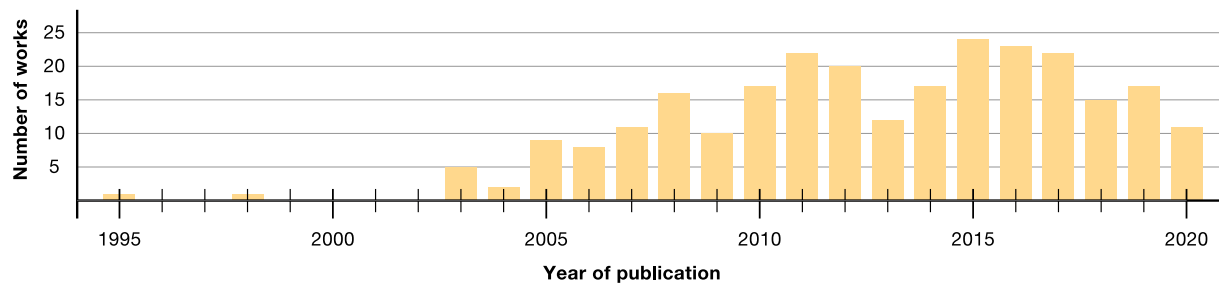


Fig. 2. Distribution of works per year of publication.

*sociology in games*”) but, similarly, it is often unclear what the authors mean when using these terms. The term “*social game(s)*” (used in 66 articles) is usually used in place of games played through social media platforms (e.g., P3: “*games which are played on social networking sites*”). Some papers (e.g., P126) question the use of the term in this context, given that not all games played in social networks are actually “*social*” and the common factor between them is simply the platform in which they are played (Wohn, Lampe, Wash, Ellison, & Vitak, 2011). Apart from that, the term “*social game(s)*” is used in various papers without a clarification of which games would actually be considered “*social*”.

#### 4.2.1. Definitions of social gaming

Some articles ( $n = 44$ , 16.7%) address these ambiguities, by providing some type of rationale that frames social interaction within digital games from the perspective of the authors [Fig. 3]. In some cases, the authors support this rationale in previous definitions and/or theory.

**Social as non-solitary.** In many works, the authors make explicit they consider gaming to be social in any scenario where more than one person is involved: “*social play (which usually simply means playing with others)*” (P27). This goes in accordance with the definition of “*social play*” by Isbister (2010), which states that “*social play is the active engagement with a game by more than one person*”. Five papers in the corpus (P61, P119, P145, P191, P253) actually use this same reference to support their definition. As mentioned before, it was observed that many papers opposed social play to solitary (or solo) play, suggesting that the authors view “*social*” simply as co-playing between more than one player: “*solitary play offers greater experiences of autonomy and presence than social play*” (P103). There are also works that look into social play as a measurement of to which extent people play with others—P104 operationalizes social play as “*the percentage to which one plays a multiplayer game collaboratively with others versus alone*”, while P122 defines a social player as “*a player who engages in any group activity with other players during observation period*”.

**Social in the game’s intent.** Other works consider social gaming to be more dependent on the game intent instead of the group that is involved. These discuss that the existence of a social facet depends if the game itself is made to promote social interaction: “*social gaming; i.e., computer gaming that is intended to support and trigger social interaction between players to occur within and around playing the game*” (P198); “*designed to encourage and facilitate interaction among co-players, creating a distinctive environment characterized by social play*” (P102). In this context, the concept of *social affordances* emerged frequently. This concept is presented in some papers as originally derived from Bradner (2001), and recently framed in the topic of gaming by other works, especially De Kort and Ijsselstein (2008) and Isbister (2010). Other papers use the concept of “*designed sociality*” as established by Simon, Boudreau, and Silverman (2009) to refer to the social capacities of a game: the “*forms of sociality or social structures [that] have literally been hardwired and soft coded by the programming choice of designer and the mediating condition of the hardware interface*”.

Even when the authors do not provide a rationale for how they view social gaming in general, it is common for authors to frame the types of social affordances existing in a specific game or genre of games (usually

the ones that the paper is focused on). In these, the game or genre is described in detail along with mechanics (e.g., trading) and features (e.g., chat) that allow for interaction between players (framing them as the proof that the game is actually “*social*”).

**Social in the interactions during and outside the game.** Some works make it clear they define “*social*” based on the interactions that are observed during the game: “*social play refers to social interaction between the players*” (P238). Some works use the frequency that players engage with “*social*” mechanics of a specific game to measure social play (e.g., P28 uses chat, trade, and collaborative action). Within these, some distinguish between the social interactions that are stimulated by design (e.g., communication required to succeed in the game) from those that are spontaneous (e.g., chatting about other topics while playing)—e.g., P22 supports this view on work by Zagal, Nussbaum, and Rosas (2000). Supported by previous work (Salen & Zimmerman, 2003), P126 argue there is also an “*external*” interaction powered by “*the pre-existing social relationship of the players*”, while internal interaction emerges “*from game’s rules, as in the social roles of the characters*”. The spectator or audience of gameplay are usually not addressed when framing social interaction in games, but some do—especially those that focus on assessing the audience’s experience. For instance, P17 defines the “*social experience of play*” as the interactions between the system, the players, and the audience during play. A few works frame social interactions beyond the gameplay—in particular, those focused on communities (interaction in exchanging messages in external message boards and FAQs for the game). Some concepts are commonly used to frame social interaction in and outside games like affinity space (Gee, 2004), third place (Oldenburg, 1999), and magic circle (Linser, Lindstad, & Vold, 2008).

**Social in the outcomes.** Curiously, some works seem to define “*social*” depending on the social impact that playing a certain game has on players. For instance, P80 frames social games as “*games to establish and facilitate social closeness*” and having “*the potential to help form new relationships and strengthen existing ones*”. These and other rationales bring the possibility that a game can be “*social*” when it facilitates social outcomes, such as closeness between players. P88 states that games become increasingly social when allowing “*players to maintain contact with friends, develop new relationships*”. Similarly, P66 argues that “*social play varies in terms of the degree of connection with others*”. Some papers explicitly state that they also consider playing with artificial co-players a social facet of gaming, as it can also give rise to social outcomes. P137 highlights this: “*As soon as more than one person or artificial social entity is included in the gaming context, social-psychological effects have to be considered [...] effects like evaluation apprehension, social learning, and emotional contagion [...]*”. A similar rationale is found in works that focus on comparing playing with humans versus playing with artificially-controlled entities.

**Social inherent to gaming.** Some works argue that every game is social: “*The term ‘social games’ has been considered a misnomer due to the fact that all games are inherently social*” (P126). This is explained as, even games that do not support multiple people, still have social affordances: “*[...] even for games which do not have multiplayer functions, these still hold social affordances for players*” (P126). Notably, P3 frames social play as

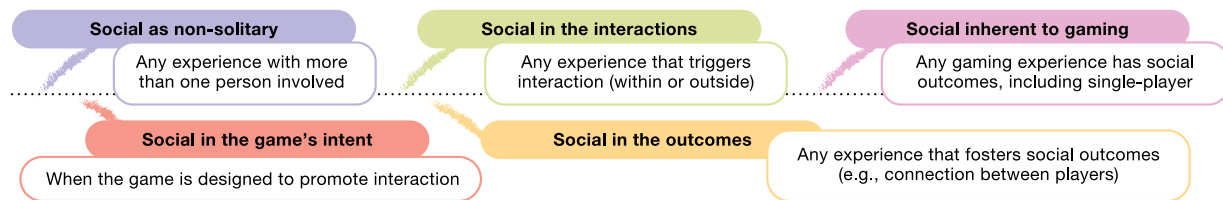


Fig. 3. Spectrum of rationales provided by previous works to define and frame social gaming.

a spectrum, acknowledging the various ways a game can be “social”: “At one end of this scale there is the hypothetical single player game that is played by the very person who created it. [...] even this kind of playing may increase the social and cultural capital that the player has [...] At the other end of the scale there is the even more hypothetical massively multiplayer game that every possible person participates in. A game played on such a scale would probably be indistinguishable from life in general”.

4.2.2. Theoretical grounding

Several works (n = 108, 41.1%) derive their approach and/or analysis from existing theoretical models or frameworks. Most prominently (in more than two papers), social presence theory (Biocca, Harms, & Burgoon, 2003) (n = 17), social capital theory (Putnam, 1995) (n = 16), social network theory (Wasserman & Faust, 1994) (n = 12), social identity theory (Tajfel, 1981) (n = 11), self-determination theory (Ryan & Deci, 2000) (n = 7), game theory (e.g., Schelling, 1960) (n = 5), social identity model of deindividuation effects (Reicher, Spears, & Postmes, 1995) (n = 3), the mechanics-dynamics-aesthetics framework (Hunicke, Leblanc, & Zubek, 2004) (n = 3), bounded generalized reciprocity theory (Yamagishi, Jin, & Kiyonari, 1999) (n = 3), flow theory (Csikszentmihalyi, 2000) (n = 3), and Goffman’s theory of framing (Goffman, 1974) (n = 3). While these were the ones recurrently leveraged, there were several others identified, with many works feeding from sociology and psychology research.

To be coded, it was not enough that the work mentioned a theory, it had to have a role in either deriving an approach, methodology (e.g., measurement of a specific outcome) or analysis process (e.g., informing deductive coding). For instance, social presence theory is commonly introduced in works that assess social presence as the main outcome (e.g., P57), but usually not framed in works that assess it as a secondary outcome. Social network and social identity theories are often a foundation for works that focus on aspects related to gaming communities (e.g., P22, P215, P240), while the mechanics-dynamics-aesthetics framework is leveraged to devise and examine design approaches (e.g., P109, P157).

4.3. Type of contribution (RQ2)

We used definitions from Wobbrock and Kientz (2016) to code for the type of contribution [Table 3]. Additionally, we further distinguished the type of contribution by coding for the type of social gaming experiences considered, and the facets of social gaming addressed: outcomes, determinants, communities, motivations, and/or barriers (detailed in Section 4.3.3). These codes were inductively created and iteratively established through multiple discussions among the authors. The coding for these fields was achieved by first extracting excerpts that described the purpose, research questions, and contributions of the paper.

4.3.1. Type of research contribution

238 works (90.5%) offer an empirical contribution (i.e. “provide new knowledge through findings based on observation and data gathering”). These works leverage various methodologies to collect and analyze data, which will be described in detail in Section 4.6. In our corpus, empirical contributions are often intertwined with other types of contribution.

Table 3

Distribution of works per type of contributions they present (note that one work might present more than one type of contribution).

Type of contribution	N of works
Empirical	238 (90.5%)
Theoretical	10 (3.8%)
Methodological	7 (2.7%)
Survey	3 (1.1%)
Artifact	69 (26.2%)
Uncategorized	7 (2.7%)

10 works (3.8%) offer a theoretical contribution (i.e. “consist of new or improved concepts, definitions, models, principles, or frameworks”). P59, P73, and P253 present conceptual frameworks to grasp specific styles of social gaming—audience participation mechanics (P59); qualities of in-game communication (P73); and forms of bodily interplay in multiplayer exergames (P253). P50 and P137 establish frameworks to account for determinants of social gaming—P50 focused on the social-spatial context; P137 covering determinants associated with the environment, the players, and the game. P115, P147, and P149 establish theoretical models to interpret in-game behavior. Finally, P236 defines patterns of collaboration to guide the design of collaborative games for players with autism spectrum disorder. For some of these works there are additional contributions, where the framework or model is derived from empirical (P147) or survey (P50) contributions, subsequently exercised empirically (P59, P73, P115, P137, P149, P236) and/or leveraged to build a new artifact (P59, P137, P236).

Seven works (2.7%) offer a methodological contribution (i.e. “create new knowledge that informs how we carry out our work”). Five works establish novel ways to assess player interactions and behavior—P11, P116, and P209 leverage behavioral data e.g., communication, facial expressions, psychophysiological activity; P191 derives metrics (social presence, cooperation, and leadership) from gameplay logs; P204 presents a self-reported scale to measure anti- and pro-social behavior in team-based online games. P114 and P140 propose structural models for analyzing social relationships (e.g., tie strength) in massive online games based on the analysis of server logs—P114 frames socially aware match recommendation as an example application of their model. We did not consider there was a methodological contribution when papers used custom models, measures or metrics, and these were not described and presented as contributions, but simply mentioned as an instrument to test their hypotheses.

Three works (1.1%) offer a survey contribution (i.e. “synthesize work done on a research topic with the goal of exposing trends and gaps”). While surveys are supported on observation (i.e. reading publications), we did not consider survey contributions as empirical. P24 reviews work focused on gaming communities (n = 17 publications), outlining existing conceptual definitions (e.g., guild) and various aspects that are inherent to these communities (e.g., management practices, communication tools). P80 reviews work focused on the benefits of multiplayer game mechanics for establishing or reinforcing social closeness (the number of publications is not specified). Finally, P204 surveys previously published measures (n = 106 measures) to assess social behavior during gameplay. It is important to note that only one of these works follow the process of a systematic review (P24)—P80 uses the term

**Table 4**

Distribution of works per type of social gaming experience they address (note that one work might address more than one type of experience).

Type of experience	N of works
Co-playing	259 (98.5%)
Spectating	18 (6.8%)
Mediating	3 (1.1%)
Event participation	2 (0.8%)
Artificial partner	9 (3.4%)

“systematic review” but does not describe the process of data collection and analysis.

69 works (26.2%) contribute with a new **artifact** (to “*reveal new possibilities, enable new explorations, facilitate new insights, or compel us to consider new possible futures*”). In most papers, this artifact consists of a new game in prototype form, sometimes coupled with a new device or platform e.g., in P224, a new platform (arcade cabinet) is built; P225 presents a novel controller that detects skin contact. P182 and P248 do not contribute with a new game but rather with a novel voice-over-IP system and a software framework to integrate geolocated features in mobile games, respectively. While the artifacts are described in detail in most papers, access to the prototype is not made available in any (e.g., link in the paper, supplementary material). See Section 4.4.1 for more details on the type of games developed and used in the corpus.

Seven works (2.7%) were coded as **uncategorized** contributions (P3, P27, P68, P69, P246, and P247), and include works discussing a personal view regarding a specific topic that is not grounded in empirical observations or surveys, nor developed into a theoretical proposal. These works were also not considered opinion contributions, as they do not present an explicit intent to “seek to change the minds of readers through persuasion”, as defined by Wobbrock and Kientz (2016).

#### 4.3.2. Types of social gaming experiences

Almost all the works ( $n = 259$ , 98.5%) examine the experience of **co-playing** i.e. where more than one person is involved in the game as a player. While in our corpus we find a large variety of experiences just considering multiplayer scenarios (which we detail in the next sections), we also collected papers that focus on other forms of social gaming [Table 4].

18 works (6.8%) examine the experience of **spectating** other people playing. These works usually frame gaming as an event that extends the interaction happening within the gameplay (the concept of “magic circle” is often used e.g., P62, P93, P231). Some of these papers consider active roles for the audience. For instance, P55 contemplates the potential for spectators to become players in public display games while P125 focuses on spectator perceptions when anticipating (and not) their turn to play. P59 and P86 explore mechanics of audience participation (i.e. audience directly affecting the game somehow)—P59 uses the text typed by audience members in a livestream to trigger certain commands (e.g., increasing the number of enemies) and P86 leverages spectators’ gaze input to generate visual markers over the gameplay.

P13, P35 and P79 examine the experience of **mediating** other people playing, namely parents mediating play habits of children. P13 and P35 focus on parents’ safety concerns in regard to Pokémon Go, both in terms of physical dangers and screen time. P79 describes various contexts of play for teenagers in Taiwan (home, netcafé, and student dormitories) and, in particular, the “*atmosphere of surveillance*” when playing at home.

Nine works examine how the experience of playing with **AI-controlled partners** differ from the experience of playing with others. 12 works compare the experience of playing alone with the experience of playing with other people (e.g., P52 finds differences in player experience and well-being outcomes while P66 identifies

**Table 5**

Distribution of works per type of facet they address (note that one work might address more than one facet).

Facet	N of works
Outcomes	171 (65%)
Determinants	184 (70%)
Interactions	72 (27.4%)
Communities	31 (11.8%)
Motivations	20 (7.6%)
Barriers	1 (0.4%)

motives to play in each scenario). Notably, P145 examines the impact of having social entities in the gameplay (in comparison with solitaire play), when these entities are controlled by the system or by an actual co-player.

#### 4.3.3. Facets of social gaming

Social gaming can be approached in different ways, with the works in our corpus considering various facets [Fig. 4, Table 5], including (1) the *outcomes*—in terms of players’ perceptions and reactions to the experience, (2) the *determinants* of the experience—those associated with the game, the players, and the context, (3) the *types of interactions* emerged—through gameplay actions, communication, and others beyond the gameplay, (4) the *communities* that are formed, (5) the *motives* to play with others, and finally (6) the *barriers* that stand in the way. Our corpus covers a panoply of different outcomes and determinants of play, which will be detailed in Sections 4.4 and 4.5, respectively. There is only one work focused on characterizing barriers (P219), which depicts the experiences and issues that hinder visually impaired gamers from playing with others, in particular with sighted peers. The remaining facets are detailed below.

**Types of interactions.** 72 (27.4%) works contribute with a better understanding of the type of interactions that can emerge from gaming in general and/or from specific games. These works focus on characterizing the interaction between players, through *in-game actions*, *communication* and/or *beyond-the-gameplay interactions*.

**In-game interactions** (i.e. afforded by the game itself), such as engaging in combat together or trading (e.g., P90, P164) are usually considered ( $n = 43$ ) in these works. **Communication** between players and spectators is also commonly examined ( $n = 52$ ). One work in particular (P73) looks at the various aspects of communication during gaming experience, resulting in a categorization framework. Works focused on communicative interactions are mostly focused on verbal communication ( $n = 50$ ), through the text chat and/or spoken. For example, P190 characterizes the use of the proximity-based voice system in DayZ and the type of unique interactions it promotes. Some works also consider non-verbal communication ( $n = 6$ ), such as pointing gestures (P86), expressing excitement with the body (P137) or moving away from opponents (P231). P57 and P86 integrate gaze as an input modality and investigate how it can act as a communication tool.

Many works look at these two modalities (in-game actions and communication) as two dimensions that form player interaction during play. Curiously, P199 lies in the middle, investigating how game actions can also act as communication between players (“*artifact-based communication*”) and actually substitute verbal exchanges. Other works consider other types of exchanges during gameplay, such as interpersonal touch (e.g., P61, P223). Finally, **beyond-the-gameplay interactions** are also considered in some works ( $n = 17$ ), such as message boards of a guild (e.g., P89, P257) or simply discussing a game in other contexts (e.g., P91). To give another example, P13 highlights walking together and sharing achievements in Pokémon Go as a social interaction that goes beyond the gameplay. There are also works that look at how groups arrange and coordinate their gaming sessions (e.g., P74, P150, P177).

Some works have a specific focus when investigating the type of interactions a game affords. We coded for these specific lenses



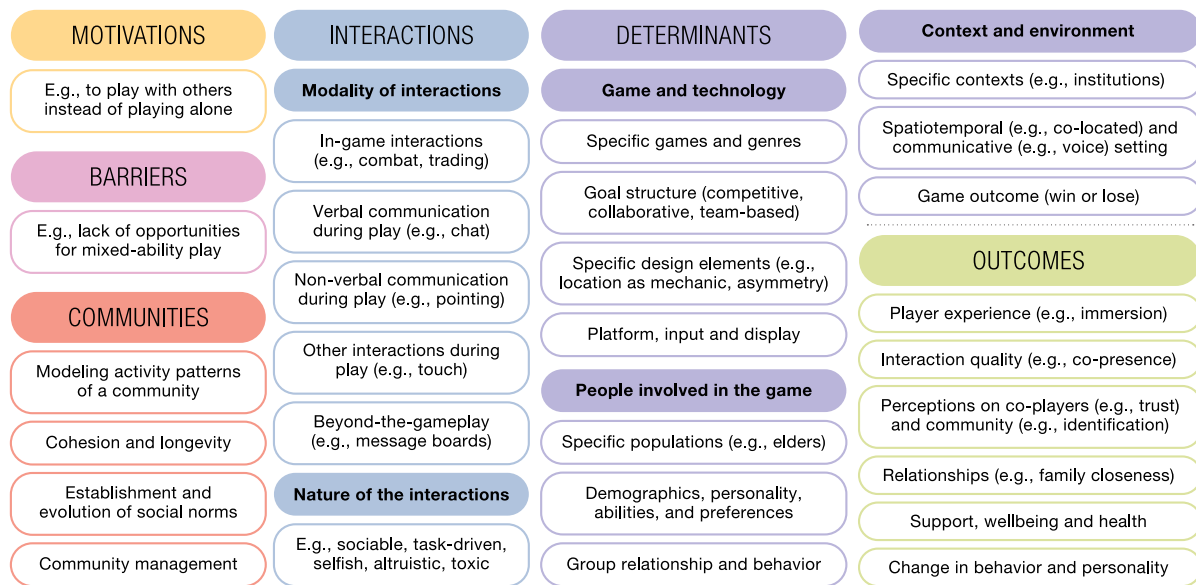


Fig. 4. Facets of social gaming as explored by previous works.

where the **nature of the interaction** is put at the center, which we now detail. In particular, several works ( $n = 16$ ) specifically focus on characterizing how players *collaborate and coordinate* when playing together—e.g., P27, P71, and P115 focus on collaboration within temporary groups in massive multiplayer games, while P107 and P256 focus on the role of group leaders in coordinating a team. Two works (P39, P60) compare collaboration that is *instrumental* (i.e. task-driven, collaborating with the purpose of succeeding in a task) and *sociable* (derived from Simmel and Hughes (1949) concept of sociability, meaning interaction free of meaning or purpose). For instance, P60 distinguishes this aspect in the nature of messages exchanged when playing (e.g., asking or giving information about the gameplay as task-driven, conversation about their personal life as socioemotional).

Other works differentiate between *self-centered and group-centered interactions*. For instance, P115 and P197 study player dynamics around the “need or greed” system in World of Warcraft, examining selfish (for individual benefit) and altruistic behavior when negotiating the rewards after completing a dungeon raid. In these works (also in P40 and P169), this lens is derived from game theoretical dilemmas, such as the Prisoner’s Dilemma (Poundstone, 1993). Along the same lines, P96 discusses interactions that emphasize the individual (e.g., trash talk) and the group as a whole (e.g., self-sacrifice), as well as shifting points between these (e.g., checking personal performances when scores are displayed). Some works specifically focus on *toxic interactions* through communication, addressing topics such as toxic masculinity, sexual harassment (P154), and racism (P36, P170). Similarly, others focus on interactions that are deemed unsuitable or seen negatively by other players, such as camping and trolling (P25, P147).

**Gaming communities.** 31 (11.8%) works contribute with a better understanding of the formation and evolution of communities around gaming. Of these, 19 focus on characterizing the *activity of a specific game community* (called “*social dynamics*” in P7 and P161 and “*network patterns*” in P28) by identifying patterns of interaction based on large databases of player logs—establishing ties based on games played together, or specific interactions (e.g., trading). Some of these contribute to better understanding behavioral phenomena such as social contagion i.e. how central players influence the rest of the player base (e.g., P104, P195) and homophily i.e. how similar players have stronger ties (e.g., P64, P242). P122 investigates different social profiles based on these social dynamics (for instance, the “*social butterfly*” has many weak ties with other players while the “*lone wolf*” has few strong ties).

Seven works look into aspects that contribute to the *stability and longevity* of a community (in particular guilds in massive multiplayer games e.g., P51). Six works focus on *community management* practices, including communication tools (e.g., P85, P107), and practices of leadership (e.g., P107, P256). Five works focus on the establishment and evolution of *social norms* in a community e.g., showing hospitality when hosting an event in one’s house in The Sims Online (P30). P24 reviews previous literature and establishes how research has defined gaming communities at a micro (e.g., teams), meso (e.g., guilds) and macro (e.g., whole body of players) level.

**Social motivations.** Finally, 20 works (7.6%) contribute with a better understanding of motives to play digital games with other people. In particular, there are works that look into how motivations differ when playing alone or with other people (e.g., P66 shows that solitary play is driven by immersion and autonomy, while multiplayer is driven by challenge, competence and connection with others). Some works focus on characterizing the motivations to play with others for specific populations (e.g., P43, P76, P91 and P101 focus on older adults) or in specific contexts (e.g., P214 focuses on motivations to play in game cafés).

#### 4.4. Determinants of social gaming (RQ3)

We used various coding fields to capture the determinants of play that each work considers. We consider a determinant of play any independent variable that might affect the course of the experience and its outcomes. We use the term as in previous work by Emmerich and Masuch (2017). This work also informed how we formed and organized this part of our coding framework. Usually, papers focused on one or more determinants of play also investigate some type of outcomes, given that, usually the impact of the determinants is assessed by looking at specific outcomes—exceptions include (1) design interventions that explore certain game elements but do not assess their impact (e.g., P45) and (2) works that map out determinants of play but do not explore their outcomes (e.g., P3).

##### 4.4.1. Determinants associated with the game and technology (RQ3.1)

We have coding fields to identify and characterize the games used by each work and their origin (commercial or developed by the authors), genre, and goal structure (i.e. collaborative or competitive). We also coded for works that focus on the experience provided by specific platforms or devices. Game genres, platforms and goal structure were

coded according to the description of the game in the article (when available<sup>10</sup>).

**Works focused on specific games.** 200 works (76%) are focused on the experiences provided by *specific games*—176 are focused on a single game while 24 examine and compare the experiences provided by (usually two) different games. Three works (P4, P48, P123) compare the experiences provided by different versions of the same game (i.e. game patches). Additionally, two works compare the experiences provided by specific games against other types of applications and activities—P44 compares a game against a social task in building trust between strangers while P130 compares a game against dating applications in building intimacy for potential dates.

The games that are focused by these works include *commercial games* (n = 124, from which eight are modified by the authors), *study prototypes* developed by the authors (n = 71, from which 10 are presented in past research and two are presented as an iteration of past research), *games developed by students* (P216, P222), and *games developed in game jams* (P93, P109). In three works, the origin of the game used is unclear. Four games are focused in more than three papers: *World of Warcraft* (n = 32), *Everquest II* (n = 7, while the first Everquest is also focused in one paper), *Pokémon Go* (n = 7), and *League of Legends* (n = 5).

**Game genres.** Games focused pertain to some recurrent genres, notably massively multiplayer online games or *MMO* (n = 57), role-playing games or *RPG* (n = 34), and, at the intersection of these two, massively multiplayer online role-playing games or *MMORPG* (n = 28). MMOs and MMORPGs are usually highlighted for their social outcomes and many of these works aim to identify how and why they are able to elicit such outcomes. Other recurrent genres (in more than six papers) include *location-based games* (n = 19), *shooters* (n = 18, from which 17 are first-person shooters or FPS), *movement-based games* (n = 15), *digital versions of tabletop games* (n = 10), *augmented reality games* (n = 9), *sports* (n = 7), *puzzle* (n = 7), *action* (n = 7), and *casual* (n = 7). Additionally, some papers are focused on social network games i.e. games played in social network platforms (n = 8).

Additionally, 20 works are focused on the experiences provided by specific genres, without being focused on specific games (e.g., investigating players' experiences of playing MMORPGs in general, without specifying certain games pertaining to the genre). These include works focused on *MMOs* (n = 10, of which eight specifically focus on *MMORPGs*), *first-person shooters* (P25, P160), multi-user dungeon or *MUD* (P240), *location-based games* (P248), *exergames* (P253), and *hybrid board games* (P262). Additionally, four works are focused on the experience provided by social network games. Despite the popularity of adventure (and action-adventure), strategy, racing, and simulation genres nowadays (YouGov, 2022), these are seldomly represented in our corpus—three works (P76, P176, P218) focus on games with an “adventure” component and four works (P41, P57, P107, P245) focus on games with a “strategy” component—, suggesting that research has not recognized the social potentialities of these popular genres. Similarly, party games, which are inherently social in nature, are not considered by our corpus.

**Game goal structure.** Regarding the goal structure of the games focused, 26 were *competitive* (from which two provided only indirect competition e.g., scoreboards), 60 were *collaborative*, 22 were *team-based*,<sup>11</sup> 16 offered *different modes* of interaction (e.g., P104 focuses

<sup>10</sup> There were no external searches to catalog a game's genre, goal structure or any other aspects. We noted that some recurrent games' genres were described differently by different articles — notably, World of Warcraft was usually described as an MMORPG but sometimes simply as an MMO, while Pokémon Go was described as a location-based augmented reality game in some articles but simply as a location-based game in others. We also adhere to how the authors describe their approach.

<sup>11</sup> While team-based games offer a mix of collaboration and competition, they are not counted towards the value presented as competitive and collaborative games.

on Tom Clancy's The Division, where players can choose to play the story missions collaboratively, or face opponents on a special arena), 76 were unspecific (e.g., MMORPGs where players are not bound to forcefully compete or collaborate), and six were actually *single-player* games (e.g., works focused on the audience experience). These values show a slight tendency of social gaming towards collaborative experiences. Also, it is important to note that many works focused on games with unspecific interaction, are focused on collaborative interactions (e.g., raiding in World of Warcraft).

The concept of cooperation and collaboration was not distinguished in the coding process and were both considered collaborative interaction. However, one work (P96) actually distinguishes these two concepts: “In a cooperative game, players' goals are not necessarily in direct opposition, but neither are their goals completely aligned. [...] In collaborative games, players share common goals and outcomes. All gamers either win or lose together”. The work then establishes that they consider modes of play as a spectrum between collaborative and competitive (with cooperation somewhere within this spectrum). No works mentioned semi-cooperative interaction.

**Game design elements.** Several works contribute with a better understanding of how game design elements and features affect the gaming experience, by selecting and *investigating these elements in existing games* (n = 30) or by *developing new games* (or modifying existing ones) with these elements as a fundamental part of the approach (n = 64). Most prominently, 19 works focus on the *goal structure* of the game e.g., P80 compares collaborative and competitive mechanics in contributing to the promotion of closeness between strangers.

Some other design elements are recurrently examined, including *interdependent dynamics between players* (n = 8) and *asymmetric roles* (n = 5)—e.g., P43 explores how different asymmetries between players coupled with degrees of interdependence affect the player experience. *Content-sharing mechanics* are also leveraged in three papers (P65, P72, P75), centering the experience on sharing meaningful personal experiences through photographs, videos and textual descriptions. Eight works focus on output and *feedback aspects* (e.g., gaze accuracy, communication visualization) and two works (P4, P117) explore game difficulty (e.g., P117 examines if a more challenging gameplay impacts prosocial behavior). While two works investigate the impact of the time pressure (P137, P191), there were no works considering the synchronicity of gameplay (if players play at the same time or not). Some works focus on specific game features and how their design impacts the experience, including voice chat features (P182, P190), group finding and matchmaking features (P48, P114, P123, P257), player balancing mechanisms (P146), and reward systems (P258).

Interestingly, more than half of the works exploring design elements in newly developed games (n = 38) focus on some type of *hybrid element* as a fundamental part of the design, such as the use of *location as a mechanic* (n = 12), *proximity-based networking* (n = 4), *interpersonal touch* (n = 7), *movement-based control* (n = 11), and *augmented reality* (n = 4). In some works, the physical element is explored to purposefully generate a feeling of body-related embarrassment or awkwardness (P55, P142, P143). There are also many works exploring *alternative forms of input* (n = 22), such as gaze (P31, P57, P86), foot (P136), skin resistance (P225), physiological activity, and facial expressions (e.g., P155), as well as *alternative forms of display* (n = 3)—“view-stitching” (P229), low resolution screens (P206), and unconventional use of conventional displays (P109). This suggests that design approaches towards social gaming in research often involve elements of novelty, by leveraging hybrid elements and new technologies.

Finally, 27 works *identify design elements* (usually by analyzing specific games) that somehow contribute or affect the (social) experience. P1, P5, P159, and P183 aim to identify game features that facilitate family play. P76 employs participatory design methods to identify design elements that encourage older adults to play online games. Five works (P26, P100, P126, P134, and P144) identify features and mechanics in social network games that contribute to their social

dimension. P262 identifies social features in hybrid board games as presented in marketing materials. Some works first identify design elements that are desirable in their context and then explore them in practice by developing a new game (e.g., P5, P76) and others identify social features of a game and then deepen the understanding of how these particular features impact the experience (e.g., P37). The design elements that are identified by these works were not coded.

**Platform and devices.** 22 works are focused on the experiences provided by specific game platforms. These include works focusing on *console gaming* (n = 7, from which three are focused on the handheld consoles from Nintendo, DS and 3DS), *mobile gaming* (n = 7), *immersive VR* (n = 4), *multitouch tablets* (P32, P236), *public displays* (P55), and *handheld devices* in general (P98). P128 compares the experience between playing on a mobile device and playing on a console. While no papers state an explicit focus on computer gaming, most games used in studies are played in a computer. Further, 12 works focus on the *use of controllers or input methods*, with some papers comparing actual devices and modalities (e.g., P34 comparing between standard controllers and custom Donkey Konga bongos or P62 comparing input through a NFC-based interface and through touchscreen) and others comparing the implementation (e.g., P137 comparing individual and shared control of one character). Three works compare different *displays or workspaces*, with P128 comparing actual devices (between using a mobile screen and the television), and P32 and P98 comparing how the game is presented (played in a single display with shared information or being played in multiple “private” devices).

#### 4.4.2. Determinants associated with the players and populations (RQ3.2)

Some works target a specific population, or inspect how determinants associated with the players affect the experience. Below, we describe these aspects and provide examples.

**Focused on specific populations.** 43 works (16.3%) are focused on the experiences of a specific population. These include 10 works focused on the experiences of an *older population* (described as “older adults” in most works but also called “the elderly” in P99 and “seniors” in P184 and P202), as well as 14 works focused on a *younger population*, including children (n = 9), adolescents and young adults (n = 6). Further, 11 works focus on the interlacement of different generations in gaming contexts (*intergenerational groups*). Usually, these are also focused on the *family context*, namely grandparent–grandchild and parent–child relationships (n = 8). For instance, P1 and P2 investigate gaming experience among Chinese parents and children around a social network game. P5, P226 and P227 explore new approaches to design for intergenerational play, with a particular focus on ensuring equal ease of play by embedding physical motion (movement-based games) that are familiar for both generations. Four works focus on *people with disabilities*—P38 and P236 focus on the experience of people with autism spectrum disorder, investigating the impact of multiplayer gaming on their well-being and relationships (P38) and exploring design patterns to encourage social interaction (P236); P219 characterizes multiplayer experiences of visually impaired gamers, the barriers they encounter and how they circumvent them; P210 presents the design of a new augmented reality game to bring together children with and without physical and/or learning disabilities. P36 and P170 investigate racial- and culture-based toxic behavior when playing with others, by focusing on “men of color” (P170) and *players from the Middle East and North Africa regions* (P36). In P245, mobile games are co-designed with a *digitally excluded* community. Lastly, P45 proposes a new design intervention to encourage interaction among *backpackers*, while P189 and P254 focus on an *academic community*. It is important to note that most papers do not have a specific target in mind when investigating social gaming experiences.

**Determinants associated with the players.** A few works focus on the human side of gaming, without being necessarily focused on a target population. First, several papers use determinants associated with the players (especially demographics) as *control variables* in quantitative

studies although their focus is not on these aspects. For instance, P137 evaluates how different design elements (e.g., time pressure) affect player experience and, as an additional step, it assesses the “*potential confounding effect of personality and familiarity on players’ communication*”. In this category, we coded for papers that focus particularly on comparing how specific player idiosyncrasies affect the experience.

These include four works focused on the impact of *gender* (e.g., P56 compares playing as a male against playing as a female in inducing aggressive behavior in co-players), five on the impact of *personality* (e.g., P41 examines whether personality according to the five-factor model (Digman, 1990) influences the frequency and type of player interactions when playing massive multiplayer games), two on the impact of *skills* (e.g., P146 explores ways to balance competition between players with differing levels of skill, and how these affect the experience for both parties) and one on the impact of *sexuality* (P131 explores the social construction of virtual marriages in an online game, focusing on players’ gender and sexuality and how they are represented). In P221, the disparate *digital expertise* existing in intergenerational contexts is framed as a catalyst for interaction. Two works investigate the impact of different *gaming motivations and preferences* e.g., players’ passion for a specific type of game (P78) or the preference for cooperative games versus competitive games (P54).

25 works compare the experience based on the *relation between players*, considering different levels of familiarity (e.g., strangers or known others) and proximity (e.g., quality of friendship). Four works look at the impact of *co-players’ behavior* e.g., supportive versus un-supportive (P117) or priming versus non-priming (P18), while P17 focuses on *audience behavior* (silent audience versus positive/negative audience). Finally, eight works consider the “*humanness*” of the co-players, comparing the experience of playing with artificially intelligent partners, including robots (P180), in comparison with the experience of playing with other people.

#### 4.4.3. Determinants associated with the environment or context (RQ3.3)

There are works which contribute with a better understanding of how contextual factors (not associated with characteristics of the game/technology and the players) affect the gaming experience. Several focus on specific aspects associated with a particular *spatiotemporal configuration*. Importantly, nine works focus on comparing the experience of people playing *co-located* against the experience of playing *remotely*. One example is P203, which aims to find differences in the feeling of immersion when players are in the same room or not. Coupled with this comparison, some works (n = 6) look specifically at the impact of the communicative setting (e.g., face-to-face or through a remote call). For instance, P53 looks at three different scenarios, one where players communicate face-to-face, and two where they communicate through a video call—one allowing for mutual gaze (where they can look directly at each other), the other not. Some works (n = 33) are specifically focused on the experience of people playing when *co-located* (e.g., works focused on game mechanics that require body contact), while others (n = 10) focus on *remote experiences* (e.g., works focused on the use of voice chat). Two works in particular (P108 and P128) focus on different sitting arrangements when *co-located* (side-by-side vs facing each other).

Other contextual determinants include the group size (P3, P4, and P230), when comparing groupings based on the number of players, and the game outcome i.e. whether the player has won or lost the game (n = 4). One article (P125) compares how turn expectation (i.e. either anticipating or not to play when spectating) impacts the overall experience.

**Specific contexts.** Some works are focused on the experiences provided by specific social contexts or places. These include works focusing on playing in *public spaces* (n = 4), within a *senior institution* (P47 and P99), and at *esports events* (P21 and P111). P105 focuses on the particular context of *traffic encounters* (i.e. playing as a passenger when on the road with other passengers from nearby cars). P243

explores gaming as an icebreaking activity for *co-working environments*. Some works compare the particularities of playing in different contexts: P214 compares western opposed to asian game cafés, P209 examines playing in the lab versus at home, and P79 looks at gaming experiences in netcafés, student dormitories, and at home.

#### 4.5. Outcomes of social gaming (RQ4)

Most works ( $n = 171$ , 65%) provide a better understanding of some sort of outcome, being directly observed or self-reported by the players themselves. The exceptions include design interventions that are not evaluated, works that solely focus on characterizing interactions and design elements that promote interaction, and works that are limited to surveys or game analysis. Gaming outcomes were coded according to the constructs and specific terms used by the paper (e.g., family connectedness), and then grouped into higher level categories (e.g., effects on relationships), which we present below. It is important to note that a few papers do not describe the theoretical foundations behind the constructs used (e.g., P133 measuring aspects of self-determination without introducing self-determination theory). There are also works that do not properly introduce and define the outcomes examined (e.g., P119 and P202 use social presence as a measure in a user study but does not explain the concept). We want to note that the same outcome can and is often assessed through different methodologies in different papers. To give an example, both P11 and P155 measure felt affiliation towards the co-players—P11 extracts relevant behavioral traces to predict affiliation through machine learning models, while in P155 affiliation is based on image ratings of the players. We will detail the ways that outcomes are measured in Section 4.6, where we detail methodological procedures.

**Perceptions on the experience.** Player experience is commonly evaluated in some way ( $n = 71$ )—in particular, when the work presents a new game, usually there is some type of evaluation that focuses on how players felt about the gameplay and general experience. These might simply address generic perceptions about the game (e.g., through interviews or questionnaires) without deepening the understanding of a specific outcome. The works usually assess how much the players are *engaged with the game*, and for that, a variety of constructs are used. Aspects recurrently examined include *immersion* ( $n = 16$ ), *tension* ( $n = 16$ ), *flow* ( $n = 16$ ), and *positive/negative affect* ( $n = 16$ ). *Intrinsic motivation* is assessed by many papers ( $n = 13$ ), in particular when resulting from the satisfaction of competence, autonomy and relatedness (Ryan & Deci, 2000) ( $n = 8$ ). Usability aspects are also considered, such as ease of learning (P98) and intuitiveness of controls (e.g., P52).

**Quality of the interaction.** There are also those which assess the quality of the interaction resulting from the play session ( $n = 44$ ). Some works ( $n = 11$ ) are interested in simply measuring the *degree of the interaction* fostered by a game. There are works that estimate this degree based on specific in-game interactions (e.g., P72 calculates the number of gifting exchanges between players) and others that measure it in terms of communication (e.g., P80, which calculates the number of conversational turns between players when playing). This is an aspect also considered by some works evaluating a new design intervention to promote interaction between players (to what extent the game is successful in that). Some use the term “*social engagement*” (e.g., P113) to represent the extent to which people engage with any social element within the game (e.g., using the chat feature, checking scoreboards).

*Social presence* (or co-presence) is recurrently measured ( $n = 28$ ) to capture the quality of the interaction, describing the degree of salience of the other players during a multiplayer experience (Biocca et al., 2003). Very few works address the quality of the interaction as perceived by the players (other than measuring social presence or asking for general perceptions about the experience)—exceptions include four works (P44, P83, P85 and P196) that measure *perceived quality of communication*, P187 which examines how individual flow is also reflected on collective flow, and two works (P118, P125) that

specifically ask how much players were immersed or involved in the interaction.

**Perceptions on co-players.** Another outcome addressed by research is how players perceive and feel towards other people involved in the gaming experience ( $n = 24$ ). This includes works examining general *impressions of co-players* (e.g., in P141 and P260 the goal is to understand how a human co-player is perceived in comparison with an AI-controlled co-player). Others examine how co-players are perceived in specific aspects, such as competence (P124) and intelligence (P261). There are also works that examine if and to what extent a *connection is formed between players* (e.g., P77, P103, P180, P186). This is done with specific constructs that captures connectedness at a more shallow level—e.g., *interpersonal attraction or liking* (P124, P136, P240, and P261)—, but also at a more in-depth level—e.g., felt *empathy* (P136), felt *compunction* towards the partner (P18), *interpersonal trust* (P44, P80) and *affiliation* (P11, P155). Expectations regarding co-player behavior (expectations of prosocial behavior in P117) and perception of partner’s enjoyment (P18) are also considered. These perceptions are usually addressed with groups of strangers in mind and formation of relationships. For instance, there are works exploring the development of intimacy (P127, P130 and P131) and social awkwardness (P55, P142, P143) between co-players as an outcome of playing games together.

**Perceptions about the community.** Other works ( $n = 17$ ) assess players’ perceptions about the gaming communities they are inserted in (e.g., perceptions of players’ guild in P91). These include works that examine the extent to which players feel they belong to a community (P152, P186, P200), are attached to it (P240), and trust it (P153). Apart from that, as mentioned before, many works have a background grounded on social identity theory, and as such, there are works ( $n = 8$ ) examining *identification with their gaming community*, based on perceived similarities, also measuring associated aspects such as ingroup bias (P87 and P240). Some examine how players get *committed to the community* ( $n = 6$ ), translating into continued gameplay and commitment to the game itself. Finally, some examine the *awareness and adherence to community norms* (P20, P132, P153, P158).

**Impact on relationships.** Gaming can affect and condition one’s existing relationships. Some works are simply interested in examining how gaming affects one’s social circle, in terms of the *quantity of relationships* (e.g., P91). Other works look into how existing relationships evolve after and/or through group play experiences. In some cases, a new game is designed to be played by a group with an existing relationship (e.g., family), assessing how the relation dynamics are affected. For example, in P47, the authors conduct a longitudinal study where older adults in a living center are involved in weekly Wii Bowling sessions, and assess how the relationship between residents develop.

A collection of 38 works examines how gaming affects real-life relationships, including *family* ( $n = 12$ ), while 20 specifically focus on *online-only relationships*. Some ( $n = 13$ ) consider *both real-life and online relationships*. Few works use specific constructs to measure this impact as, usually, it is assessed through qualitative methods (e.g., interviews). Exceptions include *enjoyment of relationships* (P91, P92) and *relationship quality* as measured by specific scales (e.g., P38, P102, P217, P235), *increase in interpersonal connectedness* (P47, P133), as well as *family communication, closeness, and satisfaction* (P152, P159). Lastly, there are works that focus on *relationship formation* as an outcome ( $n = 22$ ).

**Support and well-being.** Part of the corpus focuses on the perceptions of players regarding their social ties and resources, whether their social needs are supported, and how gaming can affect or promote that. Some ( $n = 10$ ) measure *social capital* as an outcome and others ( $n = 8$ ) measure *social support*. Further, some specifically assess how gaming can impact the feeling of *loneliness* ( $n = 9$ ) and *sense of belonging* (P15, P23). *Needs satisfaction of relatedness* is addressed in 11 works while the *satisfaction of social needs* in general is measured in P20. Social well-being and *well-being* in general is also a concern in three works (P52, P88, P235), while specific aspects related to well-being such as depressive symptoms (P15, P92, P235), self-esteem (P88, P235), and

subjective vitality (P263) are also considered. Finally there is a specific work that looks at how gaming can cause health disruptions (P97).

**Personality and behavior.** Gaming can also have an impact on how we behave in the real-world. For example, P91 and P165 investigate how gaming affects one's *lifestyle and social habits* (e.g., making friends). P178 outlines how the mobile game Pokémon Go encourages players to spend time outside. P179 and P193 examine how gaming translates into *social skills*. There are works that look at how gaming experiences can translate into *prosocial behavior* ( $n = 5$ ) and, in contrast, how it results in *aggression or hostility* ( $n = 8$ ). *Civic participation* (P8, P213) and *attachment avoidance* (P179) are also a considered outcome of gaming.

**Others.** Other outcomes include gaming as a catalyst for sentiments of *nostalgia and optimism* (P263) and for *learning outcomes* (P35, P183). Other works look at *direct reactions of the players* to the gaming experience (e.g., P72, P216, and P260 look at impact on performance, while P166 and P209 measure physiological responses). P243 examines how games as ice breaking activities affect *group work* among co-workers (P243). Further, there are four works (P70, P179, P220, P235) which investigate how social anxiety in the real-world translates into the virtual world and vice-versa. Some works also consider *problematic play* as a behavioral outcome of playing with others (e.g., P171, P172, P235, P250).

#### 4.6. Research methodologies (RQ5)

We coded for the studies and various data collection procedures presented in each paper, starting with the terms and exact values as described by the authors and then categorizing them into higher-level codes (e.g., one year of study duration categorized as longitudinal study).

Some articles present more than one empirical study<sup>12</sup> (only studies that are explicitly presented as separate studies are counted as separate). In total, there are 272 empirical studies across the 263 articles, with 20 articles presenting no empirical studies, 223 papers presenting one study, 13 presenting two studies, five presenting three studies, and two presenting four studies. The studies included in the works result in data that is *quantitative* in nature ( $n = 101$ ), *qualitative* ( $n = 93$ ), or *mixed quantitative and qualitative* ( $n = 65$ , from which 13 are explicitly focused on quantitative data and complemented with qualitative, and six are explicitly focused on qualitative data and complemented with quantitative).

##### 4.6.1. Participants playing

102 works include a study where recruited participants play at least one game according to an established protocol (which we call *play session*) [Table 6]. When an article suggests there is a study involving participants (e.g., “the game was playtested”) but does not explicitly describe it as a formal study, it is not considered a play session.

**Setting.** Most play sessions presented by prior works occur in controlled settings. In 82 of the works, at least one play session is conducted in a *mediated setting* while only 20 present play sessions conducted in an *unmediated setting* (i.e. a setting where researchers would not be able to intervene in the experience). 44 works include a play session conducted in a *research lab*. Unmediated play sessions include participants playing in *arranged sessions* without the presence of researchers (e.g., P47), playing through an *online platform* ( $n = 5$ )—game embedded in a survey (P124), crowdsourcing platforms (e.g., P44)—, or having *free access* (and sometimes instructions) to play the game on their own schedules and circumstances ( $n = 9$ ). Also, 15 works present a play session in a *public setting* (public to some extent e.g., university

<sup>12</sup> When an article suggests there are empirical observations (e.g., “the game was playtested”) but does not explicitly describe it as a formal study, it is ignored.

**Table 6**

Characteristics of the study protocols that include recruited participants playing a game—in terms of setting, co-location, grouping, procedure (engagement with the game), and participants' relationship. Percentages relative to the total number of works presenting this type of studies. Note that in two works, there were no grouped participants.

Setting	N of works
Mediated	82 (80.4%)
Public	15 (14.7%)
Familiar	15 (14.7%)
Co-location	N of works
Co-located	59 (57.8%)
Remote	33 (32.4%)
Mixed	7 (6.9%)
Not specified	7 (6.9%)
Grouping	N of works
Dyad	57 (55.9%)
Triad	8 (7.8%)
Tetrad	16 (15.7%)
Five to ten	13 (12.7%)
Variable	12 (11.8%)
Not specified	7 (6.9%)
Procedure	N of works
Single session	83 (81.4%)
Multiple sessions	6 (5.9%)
Period of time	12 (11.8%)
Not specified	3 (2.9%)
Relationship	N of works
Existing	39 (38.2%)
Strangers	26 (25.5%)
Not specified	49 (48%)

campus) and in 15 works it is conducted in a *familiar setting* to the participants (e.g., participants' own house).

**Grouping.** These works include play sessions where recruited participants are grouped in different configurations. To code the number of people grouped we considered the total number of recruited participants involved in each play session, even if participants are grouped in different teams or take part as spectators. There are works that present play sessions where participants are *not grouped* at all ( $n = 2$ ), where participants are grouped in *dyads* ( $n = 57$ ), *triads* ( $n = 8$ ), *tetrads* ( $n = 16$ ), other group sizes from *five to ten* participants ( $n = 13$ ), *bigger groups* (P43, where participants play in groups of forty), and in *variable grouping* e.g. where participants can freely join and leave the play session ( $n = 12$ ). Six works examine a *simulation of a group experience* i.e. players believe they are playing with other people, while actually playing on their own with interactions simulated by artificially intelligent agents. Others (P141, P201, P202, P203) also deceive participants, as they think they are playing with AI but are actually playing with human players. These works include play sessions where participants play when *co-located* ( $n = 59$ ), when *remote* or in a setting to simulate remote multiplayer ( $n = 33$ ) e.g., separate rooms or cubicles, or in a *mixed co-located and remote configuration* ( $n = 7$ ) e.g., playing a location-based game (P116), remote between teams and co-located within (P6).

**Procedure.** These works include play sessions where participants play for a *single session* ( $n = 83$ , might include multiple conditions), for *multiple arranged sessions* ( $n = 6$ ), or for a *certain period of time* ( $n = 12$ ), from which four are over a short-term period of time (one week or less) and eight over a longitudinal period of time (over one week). In 59 works, the play sessions have an *experimental setup*.

**Participants' relationship.** 39 works include play sessions where grouped participants have an *existing relationship*. In 10 of these, it regards a family relationship. In P182 and P243, they are co-workers and in P223, they are romantic couples. In 26 works, grouped participants *do not have an existing relationship*. In several articles ( $n = 49$ ), the relationship between grouped participants is *not specified*—it

**Table 7**

Characteristics of the study protocols that include researchers playing a game—in terms of role and procedure (engagement with the game). Percentages relative to the total number of works presenting this type of studies.

Role	N of works
Participant-observer	32 (84.2%)
Confederate	6 (15.8%)
Procedure	N of works
Single session	7 (18.4%)
Multiple sessions	2 (5.3%)
Period of time	20 (52.6%)
Not specified	9 (23.7%)

is important to note that, in some works, it would have been difficult to find the type of relationship between players (e.g., studies arranged through crowdsourcing platforms). Some works ( $n = 4$ ) specifically inform that participants have played together before the study. There are 17 articles that include at least one study involving both groups of strangers and groups of participants with an existing relationship.

#### 4.6.2. Researchers playing

38 works include a study where the researchers play at least one game according to an established protocol [Table 7]. In 32 of these, the researchers play as a *participant-observer* (autoethnographic study) and in six the researchers play as a *confederate* (playing alongside recruited participants). In seven works, researchers play for a *single session*, in two for *multiple arranged sessions*, in 20 they play for a *certain period of time*, from which only one (P212) is over a short-term period of time (a week or less) and 19 are over a longitudinal period of time (more than a week). These numbers show the relevance of in-depth first-hand experiences with multiplayer games within the topic. In some works, the experience of researchers playing a game is reported as background for the study, but it is not reported as part of the protocol and, as such, those were not considered in these values.

#### 4.6.3. Data collection methodologies

We now present the results for the coding centered on the data collection procedures leveraged by our works. 93 works include a study where participants are *interviewed* (individually or in group), from which 27 include participants in play sessions being interviewed about the experience. 135 works include a study where participants respond to a *written questionnaire* (printed or online), from which 64 include participants in play sessions responding to a questionnaire about the experience. 46 works include a study where *activity logs* collected from gameplay are analyzed. 41 works include a study where play sessions are recorded and analyzed in *video format*, either via screen capture ( $n = 17$ ), webcam ( $n = 8$ ), or other external camera ( $n = 21$ ). Other works catalog play sessions in different formats, analyzing *voice communication* ( $n = 11$ ), *text communication* ( $n = 14$ ), and *physiological activity* (P209). Three works include a study where participants can report a play session through a *diary*. P24 presents a *systematic literature review* and five works include *game analyses*. 20 works include the collection of *content available online*, from which 15 analyze online discussions (e.g., forums), while P149 and P190 analyze video content available online. Five works include a study where metrics from a play session is generated by applying an *observation protocol*—e.g., P81 uses a tagging framework, P155 measures affiliation with image ratings. Additionally, only eight works include a study where researchers engage in *participatory design* with stakeholders.

#### 4.6.4. Quantitative scales and measures

While some develop and use custom scales to measure the outcomes described in Section 4.5, many use already validated questionnaires. To measure perceptions about the players' *subjective experience*, two quantitative scales are recurrently used: the Player Experience of Need

Satisfaction questionnaire or *PENS* (Ryan, Rigby, & Przybylski, 2006) ( $n = 11$ ), which includes items to measure satisfaction of psychological needs (competence, autonomy and relatedness) and the Intrinsic Motivation Inventory or *IMI* (McAuley, Duncan, & Tammen, 1989) ( $n = 8$ ), covering subscales of interest/enjoyment, effort/importance, and pressure/tension. Both are grounded on Self-Determination Theory (Ryan & Deci, 2000). The core module and post-game module of Game Experience Questionnaire or *GEQ* (Poels, de Kort, & IJsselsteijn, 2007) are also used by several works ( $n = 15$ , including P119 which uses the KidsGEQ (Poels, IJsselsteijn, & de Kort, 2008)), measuring aspects of immersion, flow, positive and negative affect, among others. Other questionnaires include the Flow State Scale or *FSS* (Engeser & Rheinberg, 2008) to measure sense of flow (P17, P187), Igroup Presence Questionnaire or *IPQ* (Regenbrecht & Schubert, 2002) to measure immersion and presence (P83, P145), and Positive and Negative Affect Schedule or *PANAS* (Watson, Clark, & Tellegen, 1988) to measure positive and negative affect (P103, P187). *Social presence* is usually measured by using the Social Presence in Gaming Questionnaire or *SPGQ* (Kort, de, IJsselsteijn, & Poels, 2007), a separate module of *GEQ* ( $n = 18$ ). Social presence is also measured with the Competitive and Cooperative Presence in Gaming Questionnaire or *CCPIG* (Riva, Waterworth, & Murray, 2014) ( $n = 4$ ).

*Perceptions of co-players and community* are measured by various different scales and/or questions, but usually these are developed by the authors. Connection with co-players is measured with the Overlap of Self, Ingroup and Outgroup Scale or *OSIO* (Schubert & Otten, 2002) in P103, with Inclusion of Other in the Self or *IOS* (Gächter, Starmer, & Tufano, 2015) in P77, and with the Perceived Interpersonal Closeness scale or *PICS* (Popovic, Milne, & Barrett, 2003) in P180. Sense of community is measured with the Sense of Virtual Community scale or *SOVC* (Blanchard, 2008) in P200, while guild commitment is captured with the Organizational Commitment Questionnaire or *OCQ* (Mowday, Steers, & Porter, 1979) in P85. Usually, impact on relationships is also assessed with custom measures—exceptions include relationship quality as measured by the Network of Relationships Inventory (Furman & Buhrmester, 1985) (P256), the Berlin Social Support Scale or *BSSS* (Schulz & Schwarzer, 2003) (P102), and the Unidimensional Relationship Closeness Scale or *URCS* (Dibble, Levine, & Park, 2011) (P38). P159 uses the Family Closeness (Strage, 1998), Family Communication (Olson & Barnes, 2004), and Family Satisfaction (Olson, 2004) questionnaires to measure impact on family relationships.

Different questionnaires are used to measure *social support*, including the Multidimensional Scale of Perceived Social Support or *MSPSS* (Zimet, Dahlem, Zimet, & Farley, 1988) (P15, P92) and the Social Support Questionnaire or *SSQ* (Sarason, Sarason, Shearin, & Pierce, 1987) (P234). Social capital is usually measured with the Internet Social Capital Scales or *ISCS* (Williams, 2017) ( $n = 8$ ), which is originally intended to capture bridging and bonding ties in both offline and online contexts. Loneliness is assessed by using the *UCLA Loneliness* scale (Russell, Peplau, & Ferguson, 1978) in nine works (including its short form or *ULS* (Hays & DiMatteo, 1987) in three works). *PENS* (Ryan et al., 2006) is usually used to measure needs satisfaction of relatedness ( $n = 11$ ), but the Basic Psychological Need Satisfaction scale or *BPNS* (Deci & Ryan, 2000) is also used in P58, while *IMI* (McAuley et al., 1989) is used in P168. Well-being is assessed with the Mental Health Continuum or *MHC* (Keyes, 2002) in P52 and the Oxford Happiness questionnaire (Hills & Argyle, 2002) in P88. Finally, the Center for Epidemiological Studies Depression Scale or *CES-D* (Mirowsky & Ross, 1992) is used to assess depressive symptoms in two works (P15, P92).

## 5. Discussion

Our work shows that the concept of “social gaming” spans a multitude of facets. In this section, we first discuss how research has been

approaching the topic both in rationalizing what it means and in conceiving approaches to advance game design where the social element is at the center. We then scrutinize how these approaches have been considering (and mostly disregarding) the people involved and their characteristics, as well as the prevalent methodologies (and associated advantages and shortcomings) when assessing social outcomes.

### 5.1. Social gaming: What does it mean?

As expected, there is *no consensual definition of where gaming starts and stops to be social*. We found different ways this question can be answered based on how authors view the topic, while many do not even address the subject. We identify five ways in which game research describes social gaming: (1) non-solitary, (2) in the design intent, (3) in the interactions it promotes, (4) in the resulting social outcomes, and (5) gaming is social. While the definitions we found overlap, in many instances, an overarching one is not possible. Notably, the number of people involved in the experience (actually playing the game or not) is often used as an objective criterion to qualify it as social or not (Isbister, 2010). However, other works derive this conclusion based on the game design itself and its original intentions, the level of interaction the game actually promotes, and other resulting social outcomes, such as felt connectedness between players. We can see this definition as highly variable, with a game possibly being social for some but not for others. According to some, even solitary experiences (or playing with non-playable characters) can be “social”, as they can still generate interaction and social outcomes, such as shared achievement and conversational topics.

Social interaction through gaming is considered by research at different levels, spanning from *interactions within the game environment, verbal and non-verbal communication*, other types of interactions that emerge from the gameplay (e.g., interpersonal touch), and even *interaction beyond the gameplay*, such as players discussing a game, reliving their personal and collective experiences, and gaming events. Some works have considered not only the various *modalities of interaction*, but also its *nature and valence*. We found papers specifically addressing collaboration, toxicity, selfishness, among others, and examining how these types of interactions come to light. Research has also considered the variety of social implications of social gaming, from outcomes in terms of player experience, relationships, and well-being, up to the formation and evolution of *highly-structured communities* within and around games.

For the most part, research on the topic feeds from a *variety of theoretical foundations*, including ones derived from sociology and psychology, such as social capital and social identity theories. Further, a few works intersect with topics typically investigated in social psychology, such as the construction of social norms in communities and decision analysis. As highlighted by previous work (Isbister, 2010), it is important that work on social gaming continues to draw upon the rich body of knowledge generated by social sciences. We found that some works did not properly address the grounding behind their approach and methods (e.g., measuring social presence without actually explaining the concept). While this was not prevalent in our corpus, we call attention to the relevance of reflecting on the impact of sociological research, and properly introducing the theories and concepts relevant to our work.

On the other hand, only a few works on the topic present a theoretical contribution, revealing a *gap when it comes to systematizing and modeling social aspects of gaming*. We should continue to acknowledge the aspects inherent to the act of playing digital games with others, and clarify what actual dimensions of social gaming our works address. While a consensus of how we, as researchers, see and envision social gaming can be considered unimportant for the most part, our work should strive to frame what we are actually addressing within the topic, and encase its own scope—e.g., by designing for “social gaming” are we simply designing for a game that accommodates more than one person?

### 5.2. Designing for social interaction: Emphasis on collaboration and novelty

The diversity of views on the topic is also reflected in the approaches taken when designing for social experiences. Most of the works in our corpus centered on multiplayer experiences, but some considered other social gaming scenarios. Social gaming encompasses roles other than *co-players*, including *spectators* (from passive to active), *mediators*, and even *artificial partners*. It also encompasses different social-contextual contingencies that might determine the interaction (De Kort & Ijsselstein, 2008; Emmerich & Masuch, 2017)—if people are co-located or not, their nearness, opportunities for verbal and non-verbal communication, and even other contextual determinants (not considered in our corpus), such as lighting and the privacy of the context. Some aspects are seen as both an outcome and as a determinant that influences the collective experience, such as players’ and audience behavior. We encountered a few works that envision experiences *aligned with specific contexts*, such as senior institutions and public spaces (e.g., university campus), and platforms (e.g., multitouch tablets). Still, most works do not consider determinants associated with the environment, and explore new approaches that are agnostic to the context in which games are played.

We found there is a *tendency to investigate collaborative experiences*, as most works focus on collaborative games and many focus on collaborative and teamwork interactions, even if the game does not have a specific goal structure (e.g., massive multiplayer games). In line with past research (Depping et al., 2018; Depping & Mandryk, 2017; Depping, Mandryk et al., 2016; Harris & Hancock, 2019), collaboration and interdependent dynamics have special relevance when designing for social gaming. Some works also compare how playing collaboratively differs from playing competitively (individually or in teams) in terms of player experience and social outcomes. While most works view the goal structure of a game as a binary design option, there is work that highlights it as a spectrum (Volda, Carpendale, & Greenberg, 2010). By acknowledging other types of goal structure (e.g., semi-cooperative), we might encounter different subtleties in the interaction and outcomes. Also, future work could explore how the mere existence of a goal structure impacts the social experience, as some multiplayer games do not impose a specific objective to players e.g., again, massive multiplayer games, sandbox games.

While research is considering a variety of game genres, some are very recurrent in our corpus—in particular, *massive multiplayer games*, which are usually framed as having strong affordances for social interaction. Yet, there is research that questions whether this genre actually affords meaningful social interaction between players (Ducheneaut, Yee, Nickell, & Moore, 2006)—this parallels work that questions the “social games” label usually associated with games played in social networks (Consalvo, 2011; Janne, Kati, & Hannu, 2016), which are also recurrently examined in our corpus. We found that *some genres are seldom explored* (e.g., action-adventure and strategy), as well as certain types of interaction (e.g., asynchronous multiplayer). Some design elements reveal to be very relevant, notably *interdependence and asymmetry, the use of location as a mechanic, and motion-based controls*. In line with the lack of theoretical contributions, few works aim to map design patterns and how these are embedded in current games. Exceptions usually resort to game analysis and reflections based on auto-ethnographic studies—however, most do not result in a systematized way to leverage in new designs (e.g., taxonomies, frameworks).

Importantly, we found a strong tendency for design interventions to focus on the *novelty element*. This mainly comes in the form of *crafting special devices* for the purpose of the game and *exploring unconventional interactions* in gaming (e.g., control based on interpersonal touch). We found the use of controllers that go beyond the use of the hands, such as leveraging gaze, facial expressions, feet, and physiological activity. As discussed by previous work, alternative devices can afford compelling social and physical interactions (Zhou, Márquez Segura, Duval, John, & Isbister, 2019), and for some works we gathered the

feeling of “performance” was central. Several approaches were hybrid in nature, seeking to merge both the virtual and physical realities (in particular through augmented and mixed reality), and stimulate feelings of embarrassment and bodily awkwardness between players. We also have works that *explore unconventional contexts* to play games, such as playing with strangers found in traffic encounters, playing in public spaces, and affecting the game as a livestream audience. While exploring novel technologies and experiences can advance the design space of social gaming, we should also strive to systematize this space as it exists in the design of current games (especially commercial ones), and understand how they can be leveraged to promote certain kinds of interactions and outcomes.

### 5.3. Acknowledging player diversity: Idiosyncrasies as an overlooked determinant

As determinants associated with the context are usually disregarded or simply not considered, also *determinants associated with the people involved are seldom taken into account*. Research in social gaming is mainly concerned with age differences, as most populations targeted are based on that criterion, including older adults, children, adolescents, and intergenerational groups. The dangers of isolation at an older age are a common concern for HCI interventions (Baecker, Sellen, Crosskey, Boscart, & Neves, 2014; Vutborg, Kjeldskov, Pedell, & Vetere, 2010) and research has also recognized the potential of gaming when dealing with and preventing them (De Schutter & Vanden Abeele, 2010; Kaufman et al., 2019; Osmanovic & Pecchioni, 2016). While other characteristics are considered – e.g., gender, abilities, skills – they sparsely exist in the corpus. Gaming preferences, which have a direct impact on player experience, were unexpectedly neglected with only two works considering the effect of preference for certain types of games. This neglect is also reflected methodologically, with only eight works involving participatory design studies.

Only one paper contributes with a *characterization of barriers* that hinder or disrupt social gaming experiences, in the particular context of visually impaired gamers. It is important to recognize that not all people who do not play digital games (on their own or with others), do not do it because of a lack of interest, but because of a *lack of opportunities to experience gaming in a way that fits their needs and preferences* (e.g., games’ inaccessibility Gonçalves, Rodrigues, & Guerreiro, 2020; Porter & Kientz, 2013; Yuan et al., 2011). Further, while the wild variety of genres and playstyles encountered in commercial titles can bring something to everyone, it certainly does not ensure that those experiences can be shared with others. This was a concern existing in the works envisioning shared play among heterogeneous groups, namely intergenerational groups and mixed-ability groups. However, *bringing together heterogeneous groups* in gaming is a challenge that research has yet to tackle.

Research is seemingly not considering non-stereotypical populations that play digital games, and those that potentially would. Unfortunately, player idiosyncrasies are being mainly accounted for by merely controlling for demographic characteristics in quantitative analyses. It is pressing that research in social gaming explores personal characteristics as part of their main research questions and as a central determinant of the experience.

### 5.4. Assessing outcomes: The need for more ecological validity and established constructs

The outcomes of social gaming can be examined at different levels. First, we found outcomes that are relevant for general gaming experiences (social or not), mostly centered on *individual player experience*, which includes constructs such as intrinsic motivation, engagement, flow, immersion, and affect. Outcomes that emerge from the collective experience include the *quality of the interaction* as perceived by the players (e.g., social presence) and/or observed (e.g., number of

conversational turns), *perceptions on co-players* and feelings towards them (e.g., connection, empathy), and *perceptions on the community* (e.g., group identification). As more profound outcomes, research has considered the *impact on existing relationships* and the formation of new ones, *effects on social support and well-being*, and, lastly, *impact on real-life behavior and personality*. Many works investigate how outcomes vary by manipulating certain determinants of the experience, comparing between experiences provided in different contexts, by different games, different versions of the same game, and even comparing games with other social applications (e.g., dating apps).

Social outcomes of gaming can be assessed in a variety of ways, including attitudinal measures through questionnaires and behavioral analysis (e.g., through video recording and observation) (Isbister, 2010). Accordingly, to assess social gaming outcomes, research resorts to both quantitative, qualitative, and mixed methods, usually leveraging self-reported (mostly) and/or observed measures (with a few works using established behavioral observation protocols to measure outcomes). *Interviews* and *written questionnaires* are the most prevalent methodologies to collect data, also to gather player perceptions after a gaming experience. The collection and analysis of *activity logs* is also very common, in particular when characterizing in-game interactions, the evolution of communities, and studying behavioral phenomena (e.g., social contagion). For user studies, some works rely on complementary data collection techniques such as *video and communication recording*. Finally, *autoethnographic studies* are prevailing in this context, with researchers playing a game over long periods of time to derive or complement their results (in particular, when identifying and characterizing the social affordances of a game).

We found there were recurrent constructs and measures to assess player experience, leveraging mostly the same questionnaires, validated in previous works and grounded solidly in theoretical foundations, such as Self-Determination Theory (Ryan & Deci, 2000). However, for other types of outcomes, we found a miscellaneous collection of measures, mostly custom scales or adapted ones from questionnaires not originally created and validated for gaming contexts. In particular, we found that *very few works assessed quality of interaction or assessed at a rather shallow level* (e.g., social presence). Similarly, impact on existing relationships is often assessed qualitatively and, with a few exceptions, not based on specific constructs. Coinciding, we found few works that present methodological contributions in our corpus. A few past works proposed self-reported (Hughes, Griffin, & Worthington, 2017) and observational (Emmerich & Masuch, 2016; Seif El-Nasr et al., 2010) measures, but these are not yet being adopted and are probably insufficient to capture all the subtleties of social gaming. Seemingly, there is a *lack of constructs and established methodologies* (e.g., questionnaires, observational protocols) to assess social outcomes in gaming contexts.

Isbister (2010) call attention to the importance of *ecological validity* when assessing gaming outcomes. In order to maximize this aspect, evaluations should, ideally, occur in settings where the game is embedded in participants’ daily lives (Isbister, 2010). However, in our review, we found that most studies are conducted in *mediated, unfamiliar, and artificial contexts* to the participants—in particular the research lab. Further, most reflect on results gathered during a single session with a game. This becomes critical, especially when evaluating a newly developed game (as there is no assurance regarding prototype quality and prototypes are not made available).

A few works give participants free access to a game over a period of time and then assess their perspectives (or in the case of one work, during the period, with a diary). While such an approach has its own limitations, it may contribute to an experience that better resembles the typical gaming context lived by participants. Besides, we have at our disposal methods to follow participants’ experiences at a distance, with *log collecting*, *diaries*, and *embedded questionnaires*. Still, we should



be careful, as participants, just by being aware that they are partaking in a research study might tend to adjust or hide their real interactions and relationships (e.g., family members showing the best side of their relationship) (Isbister, 2010). It is also important to note that many works do not detail participants' existing relationship (or if there is one), which also affects how results can be interpreted. For social gaming, it is of utmost importance that future work explores new ways to increase ecological validity, by ensuring a *natural environment for participants* when conducting user studies, and being *transparent in describing the context, detailing and making available the materials used*.

## 6. Conclusion

By conducting a systematic review on the topic of social gaming, covering 263 research articles, this work encapsulates the multifacetedness of the social dimension of digital games. Games are social in different ways: in the motives that lead people to play with others, from simply passing time with others to looking for new relationships; in the way they prompt interactions within and around the experience, and lead to the formation of whole communities around a common interest; in the effects it has on relationships, feelings of social support and well-being; all of these taking into account the determinants that steer the experience, embedded in the game, the group of people, and the context of play.

### 6.1. Limitations

This work contributes by identifying core social aspects in gaming, their relevance and application in research. To answer our research questions, we intentionally opted for a large scope systematic review. As such, we do not focus on specific social aspects neither scrutinize in full detail all layers of the aspects we found—e.g., how certain interactions, outcomes, and elements are conceptualized and operationalized. While we considered a variety of data sources, some relevant articles might not have been gathered through our search strategy—it is important to note that the list of references of the papers was not scrutinized to identify further papers. Also, given that the analysis of the papers was mainly conducted by one author, there is a degree of subjectivity to be considered—as mentioned before, any doubts during analysis were discussed among the team. Lastly, as this review only includes works published up to February 2021, there could be other aspects (e.g., determinants) considered by more recent research that is not reflected in our work.

### 6.2. Outlook

By providing the full dataset and detailed information on the coding process and fields, we aim to enable future initiatives deepening the understanding of specific subtopics (e.g., review of works focused on interaction quality as an outcome) and/or applying other lenses of analysis.

Future work should acknowledge the facets of social gaming and strive to frame their view on the topic, weighed up with previous approaches and properly supported by related theoretical foundations. Further, we found some genres and playstyles are seldom explored. It is important to consider the varied experiences that exist and could exist, while being aware of how aspects of the game, the people, and the context, affect outcomes. In particular, there is an opportunity to characterize different personal needs and preferences when it comes to gaming, and how to cater for them—especially, in multiplayer experiences. Finally, future research should find and develop ways to assess the social gaming experience, while maximizing ecological validity and transparency.

## CRediT authorship contribution statement

**David Gonçalves:** Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Writing – original draft, Writing – review & editing, Visualization. **Pedro Pais:** Conceptualization, Methodology, Data curation, Writing – review & editing. **Kathrin Gerling:** Conceptualization, Methodology, Writing – review & editing, Supervision. **Tiago Guerreiro:** Conceptualization, Methodology, Writing – review & editing, Supervision, Funding acquisition. **André Rodrigues:** Conceptualization, Methodology, Data curation, Writing – review & editing, Supervision, Funding acquisition.

## Declaration of competing interest

None.

## Data availability

We have made available the data amassed by our analysis, along with the full protocol and coding framework (attached as supplementary material as well as links in the manuscript)

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## Appendix A. List of publications included in the review

- P1 Designing Online Games for Real-Life Relationships: Examining QQ Farm in Intergenerational Play (Kow, Wen, & Chen, 2012)
- P2 Online Games and Family Ties: Influences of Social Networking Game on Family Relationship (Wen et al., 2011)
- P3 The Many Faces of Sociability and Social Play in Games (Stenros, Paavilainen, & Mäyrä, 2009)
- P4 The Changing Dynamic of Social Interaction in World of Warcraft: The Impacts of Game Feature Change (Chen, Duh, & Renyi, 2008)
- P5 Designing Intergenerational Play via Enactive Interaction, Competition and Acceleration (Vanden Abeele & De Schutter, 2010)
- P6 The Effects of Winning and Losing on Social Presence in Team-Based Digital Games (Hudson & Cairns, 2016)
- P7 “I’m Just Here to Play Games”: Social Dynamics and Sociality in an Online Game Site (McEwan, Gutwin, Mandryk, & Nacke, 2012)
- P8 Gaming Social Capital: Exploring Civic Value in Multiplayer Video Games (Molyneux, Vasudevan, & Gil de Zúñiga, 2015)
- P9 Designing for Social Play in Co-Located Mobile Games (Goddard, Garner, & Jensen, 2016)
- P10 Social interaction in a virtual environment: Examining socio-spatial interactivity and social presence using behavioral analytics (McCreery, Vallett, & Clark, 2015)
- P11 Recognizing Affiliation: Using Behavioral Traces to Predict the Quality of Social Interactions in Online Games (Frommel et al., 2020)
- P12 A Content Analysis of Interviews with Players of Massively Multiplayer Online Role-Play Games (MMORPGs): Motivating Factors and the Impact on Relationships (Taylor & Taylor, 2009)
- P13 It Was not Really about the Pokémon: Parents’ Perspectives on a Location-Based Mobile Game (Sobel et al., 2017)
- P14 Behavioral Game Play: Social Narrative of Peer Group Observations (Chandler & Noriega, 2005)

- P15 Massively Multiplayer Online Role-Playing Games (MMORPGs) and Socio-Emotional Wellbeing (Zhang & Kaufman, 2017)
- P16 The “S” in Social Network Games: Initiating, Maintaining, and Enhancing Relationships (Wohn et al., 2011)
- P17 Engaged by Boos and Cheers: The Effect of Co-Located Game Audiences on Social Player Experience (Kappen et al., 2014)
- P18 Social Interaction in Mobile Games: Priming Opponents’ Presence and Haptic Feedback (Lee, Bang, & Sundar, 2014)
- P19 Channels matter: Multimodal connectedness, types of co-players and social capital for Multiplayer Online Battle Arena gamers (Meng, Williams, & Shen, 2015)
- P20 Team Participation and Online Gamer Loyalty (Teng & Chen, 2014)
- P21 Social Support in ESports: Building Emotional and Esteem Support from Instrumental Support Interactions in a Highly Competitive Environment (Freeman & Wohn, 2017)
- P22 Social Architecture and the Emergence of Power Laws in Online Social Games (Ben et al., 2011)
- P23 A Sense of Belonging: Pokémon GO and Social Connectedness (Vella et al., 2019)
- P24 Player Communities in Multiplayer Online Games: A Systematic Review of Empirical Research (Harald & Marko, 2011)
- P25 Friends and Console-Gaming Aggression: The Role of Friendship Quality, Anger, and Revenge Planning (Wright, 2019)
- P26 The Social Network Gamer’s Experience of Play: A Netnography of Restaurant City on Facebook (García-Álvarez, López-Sintas, & Samper-Martínez, 2017)
- P27 Self and selfishness in online social play (David, 2007)
- P28 Network patterns and social architecture in Massively Multiplayer Online Games: Mapping the social world of EverQuest II (Shen, 2014)
- P29 Play Together, Stay Together? Community Cohesion and Stability in an MMO (Poor & Skoric, 2016)
- P30 The Digital Dollhouse: Context and Social Norms in The Sims Online (Martey & Stromer-Galley, 2007)
- P31 Socialeyes: Social Gaze in Collaborative 3D Games (Lankes, Rajtár, Denisov, & Maurer, 2018)
- P32 Enhancing Collaboration in Tabletop Board Game (Zhang, Liu, & Shi, 2012)
- P33 Social Praxis Within and Around Online Gaming: The Case of World of Warcraft (Herodotou, 2010)
- P34 Stirring up Experience through Movement in Game Play: Effects on Engagement and Social Behavior (Lindley, Le Couteur, & Berthouze, 2008)
- P35 Families, resources, and learning around Pokémon Go (Tran, 2018)
- P36 Exploring the Relationship Between Game Content and Culture-Based Toxicity: A Case Study of League of Legends and MENA Players (Sengün et al., 2019)
- P37 Virtual “Third Places”: A Case Study of Sociability in Massively Multiplayer Games (Ducheneaut, Moore et al., 2007)
- P38 Online Gaming, Loneliness and Friendships among Adolescents and Adults with ASD (Sundberg, 2018)
- P39 Social Play? A study of social interaction in temporary group formation (PUG) in World of Warcraft (Lina & Magnus, 2010)
- P40 Communication, Coordination, and Camaraderie in World of Warcraft (Chen, 2009)
- P41 Correlation Between Personality and Social Interactions in Online Strategy Games (Yang et al., 2020)
- P42 The strenuous task of maintaining and making friends: Tensions between play and friendship in MMOs (Lina & Kristine, 2014)
- P43 Designing Meaningful Play within the Psycho-Social Context of Older Adults (De Schutter & Vanden Abeele, 2010)
- P44 Trust Me: Social Games Are Better than Social Icebreakers at Building Trust (Depping, Mandryk et al., 2016)
- P45 Intercultural Socializing via Mobile Games for Backpackers (Wong, Chu, Khong, & Paul, 2009)
- P46 Underlying Factors of Social Capital Acquisition in the Context of Online-Gaming (Reer & Krämer, 2014)
- P47 Social Benefits of Playing Wii Bowling for Older Adults (Schell, Hausknecht, Zhang, & Kaufman, 2016)
- P48 “It Was More Than Just the Game, It Was the Community”: Social Affordances in Online Games (Crenshaw & Nardi, 2016)
- P49 Proximity-Based Automatic Exchange of Data in Mobile Gaming: Studying the Experiences of StreetPass Users (Paasovaara & Olsson, 2016)
- P50 People, Places, and Play: Player Experience in a Socio-Spatial Context (De Kort & Ijsselstein, 2008)
- P51 Rise and Fall of Online Game Groups: Common Findings on Two Different Games (Kang, Park, Lee, & Kim, 2015)
- P52 Playing Alone, Playing With Others: Differences in Player Experience and Indicators of Wellbeing (Vella, Johnson, & Hides, 2015)
- P53 Video-Mediated and Co-Present Gameplay: Effects of Mutual Gaze on Game Experience, Expressiveness and Perceived Social Presence (Shahid, Krahmer, & Swerts, 2012)
- P54 Helping behaviors during video game play (Velez & Ewoldsen, 2013).
- P55 Public DISPLAY: Social Games on Interactive Public Screens (Cox, Carter, & Velloso, 2016)
- P56 Playing games: The salience of social cues and group norms in eliciting aggressive behavior (Hughes & Louw, 2013)
- P57 An Eye for an Eye: Gaze Input in Competitive Online Games and Its Effects on Social Presence (Lankes, Maurer, & Stiglbauer, 2016)
- P58 Designing for Friendship: Modeling Properties of Play, In-Game Social Capital, and Psychological Well-Being (Depping et al., 2018)
- P59 Audience Participation Games: Blurring the Line Between Player and Spectator (Seering et al., 2017)
- P60 An Analysis of Socioemotional and Task Communication in Online Multiplayer Video Games (Peña & Hancock, 2006)
- P61 Hold My Hand: Impact of Intimate Controllers on Player Experience (Canossa, Azadvar, & Andersen, 2020)
- P62 CountMeIn: Evaluating Social Presence in a Collaborative Pervasive Mobile Game Using NFC and Touchscreen Interaction (Wolbert, Ali, & Nack, 2014)
- P63 Mobility and Social Interaction as Core Gameplay Elements in Multi-Player Augmented Reality (Mulloni, Wagner, & Schmalstieg, 2008)
- P64 The Evolution of Social Ties Online: A Longitudinal Study in a Massively Multiplayer Online Game (Shen, Monge, & Williams, 2014a)
- P65 GEMS: The Design and Evaluation of a Location-Based Storytelling Game (Procyk & Neustaedter, 2014)
- P66 The Social Context of Video Game Play: Challenges and Strategies (Vella, Klarkowski, Johnson, Hides, & Wyeth, 2016)
- P67 Sociable Killers: Understanding Social Relationships in an Online First-Person Shooter Game (Xu, Cao, Sellen, Herbrich, & Graepel, 2011)
- P68 Involvement shield or social catalyst: Thoughts on sociospatial practice of Pokémon GO (Humphreys, 2017)
- P69 Why Game Studies Now? Gamers Do not Bowl Alone (Williams, 2006)
- P70 In-Game and Out-of-Game Social Anxiety Influences Player Motivations, Activities, and Experiences in MMORPGs (Dechant, Poeller, Johanson, Wiley, & Mandryk, 2020)
- P71 /hide: The aesthetics of group and solo play (David, 2005)
- P72 Improving Social Game Engagement on Facebook through Enhanced Socio-Contextual Information (Kirman et al., 2010)

- P73 From text to talk: multiplayer games and voiceover IP (John, Yvonne, & Geraldine, 2003)
- P74 Renegade Gaming: Practices Surrounding Social Use of the Nintendo DS Handheld Gaming System (Szentgyorgyi, Terry, & Lank, 2008)
- P75 SPLASH: Perspectives on Mobile Socializing, Playing and Content Sharing (Razikin, Tan, Goh, Chua, & Lee, 2011)
- P76 Social network games in an aging society: Co-designing online games with adults aged 50 and over (Velooso & Costa, 2015)
- P77 Astaire: A Collaborative Mixed Reality Dance Game for Collocated Players (Zhou et al., 2019)
- P78 Online-Only Friends, Real-Life Friends or Strangers? Differential Associations with Passion and Social Capital in Video Game Play (Perry et al., 2018)
- P79 Gendered Gaming Experience in Social Space: From Home to Internet Café (Holin, 2005)
- P80 Cooperation and Interdependence: How Multiplayer Games Increase Social Closeness (Depping & Mandryk, 2017)
- P81 Designing for Collaboration: A Study in Intergenerational Social Game Design (Derboven, Gils, & De Grooff, 2012)
- P82 Relating Online: Managing Dialectical Contradictions in Massively Multiplayer Online Role-Playing Game Relationships (Li, Jackson, & Trees, 2008)
- P83 Here's Looking At You Anyway! How Important is Realistic Gaze Behavior in Co-Located Social Virtual Reality Games? (Seele, Misztal, Buhler, Herpers, & Schild, 2017)
- P84 Maintaining long distance togetherness Synchronous communication with Minecraft and Skype (Choo, Karamnejad, & May, 2013)
- P85 Project Massive 1.0: Organizational Commitment, Sociability and Extraversion in Massively Multiplayer Online Games (Fleming, Jerome, Sang, & Robert, 2003)
- P86 Gaze-Based Onlooker Integration: Exploring the In-Between of Active Player and Passive Spectator in Co-Located Gaming (Maurer, Aslan, Wuchse, Neureiter, & Tscheligi, 2015)
- P87 Identification processes in online groups: Identity motives in the virtual realm of MMORPGs (Gabbadini, 2014).
- P88 A contextual account of the psychosocial impacts of social identity in a sample of digital gamers (Kaye, Carlisle, & Griffiths, 2017).
- P89 Computing, Social Activity, and Entertainment: A Field Study of a Game MUD (Muramatsu & Ackerman, 2004)
- P90 Gender Swapping and User Behaviors in Online Social Games (Lou et al., 2013)
- P91 Older Adults' Social Interactions in Massively Multiplayer Online Role-Playing Games (MMORPGs) (Zhang & Kaufman, 2016)
- P92 Can Playing Massive Multiplayer Online Role Playing Games (MMORPGs) Help Older Adults? (Kaufman & Zhang, 2015)
- P93 A Three Person Poncho and a Set of Maracas: Designing Ola De La Vida, A Co-Located Social Play Computer Game (Love & Bozdog, 2018)
- P94 Presence in the Age of Social Networks: Augmenting Mediated Environments with Feedback on Group Activity (Martino, Baù, Spagnolli, & Gamberini, 2009)
- P95 Understanding Collocated Social Interaction between Pokémon GO Players (Paasovaara, Jarusriboonchai, & Olsson, 2017)
- P96 The Individual and the Group in Console Gaming (Voida et al., 2010)
- P97 Social Capital, Coplaying Patterns, and Health Disruptions (Shen & Chen, 2015)
- P98 BragFish: Exploring Physical and Social Interaction in Co-Located Handheld Augmented Reality Games (Xu et al., 2008)
- P99 Walk 2 Win: Towards Designing a Mobile Game for Elderly's Social Engagement (Mubin, Shahid, & Al Mahmud, 2008)
- P100 Playing your network: gaming in social network sites (Luca, 2009)
- P101 Beyond Entertainment: Motivations and Outcomes of Video Game Playing by Older Adults and Their Younger Family Members (Osmanovic & Pecchioni, 2016)
- P102 Social Gaming, Lonely Life? The Impact of Digital Game Play on Adolescents' Social Circles (Kowert et al., 2014)
- P103 The Impact of Agency and Familiarity in Cooperative Multiplayer Games (Vella, Koren, & Johnson, 2017)
- P104 Influencers in Multiplayer Online Shooters: Evidence of Social Contagion in Playtime and Social Play (Canossa, Azadvar, Hartevelde, Drachen, & Deterding, 2019)
- P105 The Road Rager: Making Use of Traffic Encounters in a Mobile Multiplayer Game (Brunnberg, 2004)
- P106 Social Heroes: Games as APIs for Social Interaction (Simon, 2008)
- P107 Exploring the Experiences Concerning Leadership Communication in Online Gaming Groups (Siitonen, 2009)
- P108 The Shared Social Space as a Basic Factor for the Design of Group-Ware (Rauterberg, Dätwyler, & Sperisen, 1995)
- P109 Designing Unconventional Use of Conventional Displays in Games: Some Assembly Required (William & Alexander, 2016)
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## Appendix B. Supplementary data

Supplementary material related to this article can be found online at <https://doi.org/10.1016/j.chb.2023.107851>.

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