

Esports Research: A Literature Review

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Abstract

Accompanying esports' explosion in popularity, the amount of academic research focused on organized, competitive gaming has grown rapidly. From 2002 through March 2018, esports research has developed from nonexistent into a field of study spread across seven academic disciplines. We review work in business, sports science, cognitive science, informatics, law, media studies, and sociology to understand the current state of academic research of esports and to identify convergent research questions, findings, and trends across fields.

Keywords

esports, competitive gaming, literature review, multidisciplinary review

As esports gain popularity, and in some cases surpass the viewership of traditional sports (Lynch, 2017), they create opportunities for studying people and systems on a massive scale. Research around esports, however, is in its nascency. Establishing a foundation for interested researchers, we review the academic esports literature published before spring 2018. The work comes from many fields that historically have not been in conversation with one another, yet we find numerous areas of common interest. In this article, we describe the methods we used to collect

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Table 1. Distribution of the Analyzed Esports Corpus Per Area of Study Through March 2018.

Discipline	Total Publications	Percentage of Corpus (%)
Media studies	37	24.7
Informatics	30	20.0
Business	26	17.3
Sports science	20	13.3
Sociology	15	10
Law	12	8
Cognitive science	10	6.7
Total	150	100

literature, summarize the research in each field publishing academic literature on esports, and identify convergent trends across those fields.

Method

Following Creswell and Creswell (2018), we developed a list of key words to guide our search, including *esports*, *competitive video games*, *electronic/virtual/digital sports*, and *electronic/virtual/digital competition*. With this set of key words, we conducted a search across multiple databases and search engines including Google Scholar, Scopus, Web of Science, and EBSCOhost. This search was restricted to peer-reviewed journals, conference proceedings, books, and doctoral theses in English through March 2018. The majority of results at this stage were still not esports related, with Google Scholar returning about 17,200 results, Scopus returning 18,429 results, Web of Science returning 23,159 results, and Academic Search Complete EBSCOhost returning 2,801 results. Once relevant papers were identified, we used the works cited within each article to expand the search and determine which academic fields are publishing in esports. Narrowing the results to those publications that pertain to esports by reading the titles and abstracts yielded 150 articles to form the final corpus. We summarized the most impactful literature and general trends in each field and organized our findings according to common themes. The academic disciplines represented in the corpus are business, cognitive science, informatics, law, media studies, sociology, and sports science (Table 1).

Resulting Data Corpus

Since 2002, there has been an increasing trend in the quantity of academic esports publications (Figure 1). The biggest change occurred in 2012, when the published literature more than doubled. The year 2014 marked a sharp dip in publication numbers, but growth continued in 2015, with increased publication in six fields, and no change in one. After 2015, publication counts have seen consistent growth.

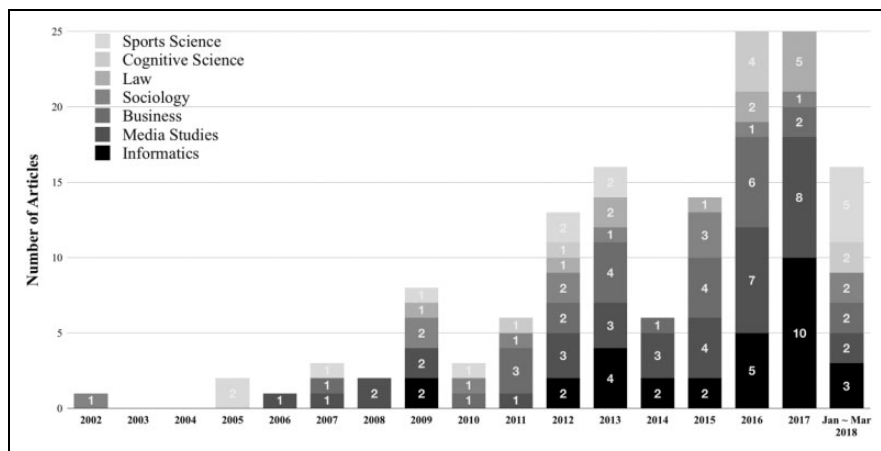


Figure 1. Total items published per year by discipline in the esports corpus through March 2018.

The publication count by March 2018 is already more than half of the total count for 2017.

The earliest literature around esports was published in 2002, with the first work coming out of sociology (Bryce & Rutter, 2002). It was joined by publications in sports science (Hemphill, 2005; Mora & Héas, 2018), media studies (Hutchins, 2008; Wagner, 2006; Weiss, 2008), and business (Zang, Wu, & Li, 2007). In 2009, informatics (Reeves, Brown, & Laurier, 2009; Weber & Mateas, 2009) and law (Thiborg, 2009) saw their first esports-related publications. Of the disciplines currently publishing work around esports, the last to begin doing so was cognitive science in 2011 with Rambusch (2011).

Esports Within the Disciplines

The fields discussed in this section each approach esports as extensions of existing theory or phenomena of interest that offer new contexts to explore familiar themes. As academia has become more familiar with esports, continuing work has shifted focus away from translating and explaining esports to an unfamiliar academic audience and toward understanding behaviors, cognitive patterns, and social interactions during and around play.

Business

The business literature dates the birth of esports back to the rise of the competitive scene of early 1980's arcades (Borowy & Jin, 2013). Its growth is attributed to the value of the experience economy for consumers, the popularity of video games, the

social recognition of video game players, and advances in technology (Borowy & Jin, 2013; Seo, 2013). The identification of these factors has helped in exploring motivations for esports consumption, understanding the networks and organizations surrounding the players, and designing effective marketing techniques (Hamari & Sjöblom, 2016; Lee & Schoenstedt, 2011; Seo & Jang, 2014; Weiss, 2011). This research is most often done in a naturalistic setting using surveys, interviews, and case studies. For example, Hamari and Sjöblom (2016) apply the Motivation Scale for Sports Consumption (MSSC) to measure motivation for esports consumption. MSSC has been used to measure motivation for traditional media and sports generally, so their results in a new context can be compared to previous work in more widely studied areas (Hamari & Sjöblom, 2016).

Esports has evolved into a complex ecosystem of consumers, players, organizations, and other stakeholders, where players and consumers are the most common subjects of study for business researchers. Seo and Jung (2014) conceptualize esports consumption as an “assemblage of consumption practices, where consumers actualise and sustain the eSports phenomenon through their engagement with the interconnected nexuses of playing, watching and governing of eSports” (p. 637).

The convergence of Western and Asian esports cultures (Seo, 2013) has led to a focus on the internationality of esports. Parshakov and Zavertiaeva (2015), for example, examine the relationship between a country’s tradition of playing esports, its country-level characteristics (e.g., Hofstede’s cultural dimensions), and the performance of players from that country by using tournament prize data. Other studies, however, have narrowed their research by analyzing both players and consumers in specific countries. The literature has expanded over the years from China being the only region analyzed (Szablewicz, 2011; Zang et al., 2007) to including research about communities in regions like South America (Menasce, 2017) and Europe (Lokhman, Karashchuk, & Kornilova, 2018; Stein & Scholz, 2016).

Sports Science

A group of sports science researchers interested in the implications of competitive video gaming are categorizing esports within the frame of traditional sports. Most publications from sports science are agenda setting—by using the standard of traditional sports, they are evaluating the potential of esports to be considered sports. Early discussion around cybersport (Hemphill, 2005) defined characteristics by which competitive computer games can be considered sports, namely how the immersion and interactivity of computer games can emulate and require skilled physicality. As work reconciling esports with traditional sports continued, Jonasson and Thiborg (2010) inserted esports in Guttmann’s (2004) model of modern sports (Figure 2). This discussion continues in sports science, as illustrated by Hallmann and Giel’s (2018) summary of previous work providing the following criteria for esports to be categorized as sports: physical activity, recreation, competitive elements, organizational structure, and social acceptance of esports.

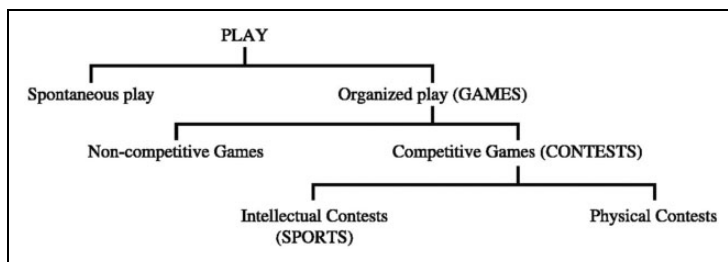


Figure 2. Guttman's (2004) model of modern sports.

Empirical studies of esports in sports science are mostly case studies utilizing qualitative methods. Rambusch, Jakobsson, and Pargman (2007), for example, conducted interviews with players at World Cyber Games (WCG) and discussed important elements shaping and influencing gameplay in *Counter-Strike* (Valve Corporation, 2000) on four analytical levels: (1) player actions during play, (2) interactions within and between teams, (3) players and fans on the Internet, and (4) the *Counter-Strike* gaming scene. These empirical studies tend to focus more on how players engage in esports competitions and less on whether participation in esports can be considered sporting.

Cognitive Science

Research in cognitive science and psychology has focused on player performance and cognitive and behavioral differences between novices and experts. Until recently, this work had relied on naturalistic observations to better understand the cognitive processes required for competitive play. The earliest research explored how competitive players understand the games they play and the contexts they play them in (Ash, 2012; Rambusch, 2011), and through these explorations, a trend developed of studying what sets the elite players apart. Huang, Yan, Cheung, Nagapan, and Zimmermann (2017), for example, collected data on habit formation in *StarCraft II* (Blizzard Entertainment, 2010) players. Expert *StarCraft II* (SC2) players, according to Huang et al. (2017), develop habits in consistent ways, yet those habits can be unique to individual players. In other words, the same methods for developing good in-game habits at a high skill level are used by many players, but which habits they develop differ by player.

Experimental work on cognition in esports is less common but growing, as noted in W. D. Gray's (2017) call for action games to be "an experimental paradigm for Cognitive Science" as a context in which to explain complex human behavior. P. B. Gray, Vuong, Zava, and McHale's (2018) experiment studying hormone levels during *League of Legends* (LoL; Riot Games, 2009) play exemplifies the foundation building required for competitive video games to become a central experimental paradigm for cognitive science. In the 26 subjects who played

against human players, P. B. Gray et al. (2018) found no significant difference in testosterone, cortisol, dehydroepiandrosterone (DHEA), androstenedione, or aldosterone levels when compared to the control group of 17 subjects who played against the computer. In both groups, aldosterone levels decreased during play, and as games against other people lengthened, testosterone, DHEA, and androstenedione levels increased. In short, these are null results. The authors, however, identify the consistent cortisol and decreasing aldosterone levels as indicators that the context of their study—“an informal, familiar location playing against known competitors” (P. B. Gray et al., 2018)—facilitated less competitive, more relaxed play. Gray and colleagues suggest future work uses a more competitive venue, highlighting the nascency of esports research.

Informatics

Esports research in informatics collects from a wide variety of data sources including game telemetry and user-generated play data (El-Nasr, Drachen, & Canossa, 2013), physiological data (Nagel, 2017), and text mining (Olshefski, 2015) in combination with observations to analyze in-game performance, team dynamics and formation, and interactions between players. Esports’ technology-mediated nature gives researchers this ability to collect massive amounts of data at various levels of analysis. For example, Low-Kam, Raissi, Kaytoue, and Pei (2013) collected player inputs from replays of 90,678 professional *SC2* matches and developed a machine learning algorithm to detect unexpected strategies in those data in the interest of informing models of player behavior.

Work that focuses on team performance tends to rely more heavily on mixed-methods approaches. S. J. Kim, Keegan, Park, and Oh (2016) demonstrate work that is representative of the team expertise research generally. They collected *LoL* game data from the Riot application programming interface (API) to access performance metrics, like kills, deaths, assists, wins, losses, and rankings, in addition to which champions each team selected in which order. The researchers also conducted interviews and focus groups with participants to provide context for their quantitative findings. Both the gameplay data and the participants’ responses supported the hypotheses that (1) team performance is correlated with how familiar team members are with their assigned role, (2) team performance is correlated with the extent to which team members’ roles complement each other, and (3) individual performance is correlated with a player’s likelihood of selecting a role that compliments their team over a role that they are more proficient with.

Some informatics work around team dynamics in esports focuses solely on social interactions between players, largely ignoring in-game performance. Freeman and Wohn (2017b) developed an interview study to understand how esports players give and receive social support among themselves. The study of team performance, approached from these varied perspectives, exemplifies of informatics’ multidisciplinary nature.

Law

Law in esports is rooted in concern for how concepts of copyright and intellectual property are applied to virtual worlds. Law papers are primarily analyses of how a certain moral concept or right is affected or applied in the esports space. By tracing existing cases and compiling tests, authors discuss how legal concepts may influence or shape the governance of esports. Writing on how the virtual–analog division in esports creates a new opportunity for shaping Internet law, Burk (2013) asserted that “copyright is likely to be the lynchpin in any dispute.” Other legal concepts such as the right to publicity or rights derived from necessary associations in the space, gambling law, or international accommodations for sports will all be relevant as well, but governance or legal thought associated with esports must address the ownership of the game and the debate of where creativity and ownership lie. These have manifested as cases debating who has the right to use player-created avatars, who owns mods to a game, who may broadcast tournaments of gameplay. Historically, ownership—and responsibility—of games and associated products have been granted to companies, with player contributions classified as adaptations or derivative works (Burk, 2013). While this leaves companies with some control over player-generated content, for instance, it also makes them at least partially responsible for the gambling, doping, and cheating that go on around esports. For this reason, classification of esports as sport or computer game is a frequent point of discussion in esports law because sports enjoy special accommodations in federal and international laws. As Holden, Kaburakis, and Rodenberg (2017) noted, the legitimacy convenience granted by classifying esports as sports would, similarly, come with oversight; there seems to be tacit agreement that esports is en route to classification and regulation similar to traditional sports, although formal litigation models have only been suggested, not established in any state at time of writing.

Media Studies

Research in media studies has focused on relationships between esports, sports, and media; the definition and delimitation of esports; the methodologies used to study esports; and the practice of live streaming gameplay. Themes such as the roles of physical exertion, spectatorship, historical precedence, and interaction are analyzed in an effort to classify esports. In these analyses, comparisons are often drawn between esports and chess, poker, and other traditional sports (e.g., Holt, 2016). The existence of esports across digital and physical spaces is possible, according to Hutchins (2008), because of media, communication, and information flow. T. L. Taylor (2012) also points out that “esports has encoded in its very nature a deep rooting in both technology and media” (T. L. Taylor, 2012).

Media studies researchers examine the esports community through the phenomenon of live streaming in the interest of exploring how the community is formed and how it interacts with streamers (e.g., Burroughs & Rama, 2015; Devia-Allen, 2017;

Hamilton, Garretson, & Kerne, 2014; Kaytoue, Silva, Cerf, Meira, & Raïssi, 2012). Based primarily on qualitative data such as interviews, observations, and content analysis, these descriptive papers examine the experience of being in various roles in the esports ecosystem. Before 2012, research took place around events celebrated in physical spaces, like the WCG (e.g., Hutchins, 2008). For example, Cheung and Huang (2011) created a taxonomy of spectators and described spectatorship not as simply watching the game but as actively engaging with the community. The spectators described here are watching either from a physical venue or on dedicated video-sharing channels. Since then, technological advances, specifically live streaming and platforms like Twitch, generated a new media phenomenon which has been the primary focus of research for the last several years (Burroughs & Rama, 2015; Kaytoue et al., 2012). The merged space between the in-person and online worlds has become a focus of the field, as seen in T. L. Taylor's (2012), Whalen's (2013), and Burroughs and Rama's (2015) works discussing the distinctions and lack thereof between what is virtual and what is real in the context of streaming.

Sociology

Much of the work in the sociology of esports has explored questions around live esports events and the interactions between audience and gameplay (Gommesen, 2012; T. L. Taylor & Witkowski, 2010). T. L. Taylor and Witkowski (2010) demonstrate the kind of generative exploration possible in a live esports context. In their own words, live events “give us an opportunity to explore the ways games can be both contained within larger cultural activities and yet can also cycle back and shape how people think about their leisure time and identity more generally.” In this vein of viewing games and esports as both a vehicle for and result of cultural change, they highlighted the growing numbers of women in competitive gaming spaces. Sociologists have focused more on gender and identity than on any other single esports research topic for its salience and social relevance to the esports community. The first of these papers on gender explored the presence of women in competitive video games (Bryce, & Rutter, 2002; N. Taylor, Jenson, & de Castell, 2009), but the field has recently adopted a focus on the perceptions of gender discourse in esports communities, as shown by J. Kim's (2017) discussion of *LoL* players' perceptions of differences between genders in video game competition and of solutions for narrowing the gender gap in esports.

Articles in this line of inquiry have approached gender by juxtaposing the roles of women and the portrayal of masculinity in esports. For instance, researchers have asked about “invisible women” in competitive gaming (Bryce & Rutter, 2002), what roles women tend to take on in esports communities (N. Taylor et al., 2009), and attitudes of professional players toward women, gender identity, and hypermasculine culture (Ruvalcaba, Shulze, Kim, Berzenski, & Otten, 2018; N. Taylor, 2009, 2011; Witkowski, 2013; Zolides, 2015). Although these questions lead researchers to conclude that gender inequality is currently a facet of esports (J. Kim, 2017), they

also see esports as an opportunity to encourage a culture of diversity (N. Taylor et al., 2009).

Trends Across Disciplines

Contested Definitions

Across disciplines, esports have been defined as competitive gaming, computer-mediated sport, or interactive spectatorship (Freeman & Guo, 2017a), with varying degrees of emphasis on physicality, computer mediation, institutional infrastructure, and spectatorship. Defining esports is a nontrivial debate that underlies scholars' framing of their research.

Competitive gaming is a widely accepted description of esports. Regardless of whether esports are classified as sports, their status as video games rooted in principles of game design is not contested. Proponents of this definition of esports do not consider the broadcast popularity and level of institutional infrastructure surrounding a game title to be factors in classifying a game as an esports (Holt, 2016). Competitions can be held between amateurs and professionals, in a garage between friends or in a stadium between world-class teams. For esports titles that afford team play, scholars often focus on the formation and practices of teams (e.g., Freeman & Wohn, 2017c) and how technology mediates team communication and gaming. Zhang, Wu, and Li (2007), for example, define esports as "a sport of wisdom between people with hi-tech software and hardware as sports equipment . . ." More recently, Hamari and Sjöblom (2016) describe esports as "a form of sports where the primary aspects of the sport are facilitated by electronic systems; the input of players and teams as well as the output of the eSports system are mediated by human-computer interfaces" (p. 213). In these definitions, communication within a team or between competing teams is possible or enhanced because of the mediating technology.

Other definitions trivialize the role of technology, instead focusing on similarities with traditional sports. For example, one of the most cited definitions of esports is Wagner's (2006): Esports is "an area of sport activities in which people develop and train mental or physical abilities in the use of information and communication technologies." While Wagner (2006) himself equated esports to competitive computer gaming, in "On the Scientific Relevance of eSports" his definition of sports is inclusive of competitive gaming. In categorizing esports as sport, the physical motion of traditional sports is given less weight than the cultural significance and formal support of the activity. Support for this view of sports is growing as governing bodies emerge to guide developments in esports spaces and as "the development of a nascent professional infrastructure [includes] features familiar from the world of physical sports of entertainment, including tournaments, leagues, fans, teams, team owners, player contracts, sponsors, and the like" (T. L. Taylor, 2012; via Burk, 2013). Similarly, systems of prize and payment within a "professionalized context"

(T. L. Taylor, 2012; via Brock, 2017) perpetuate the parallels between traditional sports and esports. These similarities make sports terminology useful for both players and researchers in talking about practices and issues in esports.

Comparisons to traditional sports are also a useful measure of the scope of spectatorship. This perspective on esports emphasizes the union of media and competitive gaming by focusing on the community and technology of spectatorship that surrounds esports (Kaytoue et al., 2012). The most precise definition is given by N. Taylor (2016):

E-sports involves the enactment of video games as spectator-driven sport, carried out through promotional activities; broadcasting infrastructures; the socioeconomic organization of teams, tournaments, and leagues; and the embodied performances of players themselves. (Borowy & Jin, 2013; Harper, 2013; T. L. Taylor, 2012; N. Taylor, 2016; Witkowski, 2012a)

Emergent platforms such as Twitch and YouTube have allowed streamers to serve not only as players but also as performers and entertainers. The levels of governance and organization that parallel that of sports is driven by a desire to establish the legitimacy of esports to the public, media, and investors because it is already “an important social and cultural instrument of the youth” (Thiborg, 2009). This view highlights the cultural significance of socializing around play.

In short, esports are often defined as games, as sports, or as mass entertainment. These definitions are not mutually exclusive but stem from different frameworks for understanding esports. They also each have unique practical implications, like leading to the regulation of esports under the same laws that govern traditional sports.

Nature of Expertise

Researchers in cognitive science, informatics, and sociology each study expertise in esports through different levels of analysis. Cognitive scientists are looking at the performance of individual players, who may or may not be nested in teams, and aim to identify constructs previously explored outside of esports that correlate with higher skill levels in competitive play. Huang and colleagues (2017) summarized in the esports within the disciplines: Cognitive Science subsection exemplify this approach relying on practice, routine, and habit formation literature from contexts as disparate as construction work and chess to understand expert *SC2* players’ in-game behavior.

In informatics, more work has been published on expert teams than on individual performance. Informatics researchers often implement gameplay data analysis in search of optimal team compositions (Sapienza, Goyal, & Ferrara, 2018) and patterns in team play that correlate with in-game performance (Leavitt, Keegan, & Clark, 2016). Pobiedina, Neidhardt, Moreno, Grad-Gyenge, and Werthner (2013) and Nascimento, Melo, da Costa, and Marinho (2017), for example, both use the

team-level data available from game publishers' APIs to test hypotheses about what makes a strong team. They identify factors like role distribution, role selection, player experience, and teammate familiarity (Pobiedina, Neidhardt, Moreno, Grad-Gyenge, & Werthner, 2013) and statistics like ward placements and neutral minion kills (Nascimento et al., 2017) as factors that correlate with how often a team wins.

Sociologists look at broader social structures to examine what goes into expertise beyond in-game performance. Witkowski (2012a), in her doctoral dissertation, includes a section on what it takes for players to make it to professional teams. While honing in-game mechanics is fundamental to professional play, she emphasizes the necessity for players to develop social, business, and tech savvy. From interviews and observations of these elite players, the author details the out-of-game work and knowledge necessary to be considered an expert:

Players spoke of the self-promotional work outside of the game that aided in their upward mobility: Recording game footage and minimally overlaying it with tactical voiceovers then placed on YouTube, winning a duelling tournament organized by a prominent blogger, participating on Arena specific forums as a knowledgeable poster, making extravagantly produced gaming movies for Warcraftmovies.com (using a video editing program and adding music, effects, and text), or attaining a spot as a regular blogger on one of the major Arena community pages are just some examples of the extracurricular busy work that experts have engaged in during their rise to the top. (Witkowski, 2012a, p. 71)

While cognitive science focuses on what expertise is for a competitive player, informatics on what it is for a team, and sociology on what it means outside the game, these differing views of what constitutes expertise are not in conflict. To encompass what an expert is in an esports community, we must account for each of these perspectives.

The State of Nascent Research

For now, much of esports research is naturalistic observation of ecosystems without intervention. As the field develops, we expect more experimentation to add to this body of exploratory and descriptive work. Surveys are common, but for many, the representativeness of their samples is difficult to assess. They are often limited in their scope to specific regions, age groups, or games in an effort to produce knowledge useful in a business context.

An advantage of this wealth of exploratory knowledge is that it has already produced research questions for experimental designs. For instance, is the relationship Leavitt, Keegan, and Clark (2016) found between ping usage and player performance in *LoL* causal? What about the correlation they found between pings and deaths? Designing experiments that might help reconcile findings that we can only

make inferences about will produce much work of interest to both the esports community and researchers' respective disciplines.

The amount of work using API data also continues to grow. The wealth of data we can capture without intervention allows for naturalistic data collection on a scale that would not otherwise be possible. Reliance on these APIs, though, means that the metrics we use to predict performance, for example, must be narrowly defined and restricted by the data available from an API. Many APIs offer massive amounts of game data but do not supply a few key statistics, like player position. Researchers have thus far either restricted their models to data that are available through an API or created their own tools for gathering more data locally, restricting their sample size to the number of players they can bring into a lab. Game publishers' fears of releasing too much data are well founded. Many have had issues with cheaters using game data to create tools that give them an unfair advantage. Finding solutions for industry to enable researchers to access richer data sets, though, would permit much less restricted models of player and team performance.

Discussion

Esports research's nascency means there are still fundamental questions about how the field is unfolding. It means researchers involved in the early work—and those introducing the space to unfamiliar fields—have an opportunity to shape its growth. We can examine the assumptions made, like how esports is defined, and how those assumptions support or exclude people, ideas, generalizability, and specificity depending on what that definition considers part of the world of esports. Fields and individual researchers cannot avoid having lines of inquiry that are only concerned with a specific aspect of the ecosystem. They can, however, contextualize that focused work so as not to make communities and practices invisible that are fundamental to the creation and continued existence of their specific interest.

If the definition of esports accounts for the entire ecosystem, studies focusing only on gameplay need not concern themselves with inconsequential factors, like how Twitch chat reacted to a play. They must, however, acknowledge the context in which play is taking place. For instance, professional teams can play differently depending on whether they are participating in an official streamed match or a friendly scrimmage. As an example of the importance of recognizing the broader context, this scenario applies to the entire field regardless of the subject.

The limitations of this literature review lie first and foremost in the construction of the corpus. Esports is groundbreaking in its use of networked technology to bring people around the world together through organized, competitive games. The literature we reviewed, though, is restricted to the English language. While most major publishing venues and international conferences publish in English, we recognize that we are losing out on a significant amount of work in a variety of languages. This limitation implies a loss of literature published in the native languages of a number of countries that have been influential in the development of esports. As the field

grows, it becomes ever more important to avoid barriers to access. We hope reviews of the remaining literature find use in the topics we have discussed and identify lines of inquiry unknown to this corpus, so that a greater audience may build on that work as well.

We also note that esports research is a rapidly growing body of work. Despite the fact that our corpus ends before spring 2018, this year is set to publish the most academic work around esports in history. Researchers must stay up to date with newly published literature to inform their own work, and this review will be a useful starting point. Thankfully, the field is still small enough to review in its entirety.

Esports research is unique in its nascency and its spread across disparate fields. There is an opportunity to integrate fields that differ in their methodological and theoretical backgrounds. Even disciplines as unlikely to converse as sociology and data analytics have potential for productive collaboration. While not all researchers in disparate fields will agree epistemologically, they can agree that understanding of context and discussion with converging work are vital to furthering our knowledge. To use the example of gender studies and data analytics, gender studies researchers have developed and practiced rigorous methods for qualitatively understanding the influence communities and spaces can have on individuals based on features of society so ingrained in our daily interactions that many of us do not notice their presence. Data analytics researchers have developed and practiced rigorous methods for collecting massive amounts of quantifiable data and analyzing them in search of patterns. The patterns found in esports data sets are often in terms of actions that correspond with skill or other widely generalizable constructs. They have not, however, been analyzed for patterns of behavior associated with the social pressures of the virtual or social world from which they were collected. That kind of collaboration necessitates deep understanding of the context in which the subjects are playing, and it allows behavior in separate spaces and communities to be compared at an incredibly fine grain of detail. Instead, current lines of inquiry in data analytics consider wide swaths of player data to be unaffected by contextual differences, and sociology relies on inherently unreproducible research. Both have strong merits, and esports provide a field in which collaboration is possible. Our goal in conducting this review is to show researchers—both those already in the field and curious outsiders—what is already happening, so that we may build on each other's work and forge collaboration where research interests align.


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Constance Steinkuehler is a professor of informatics at the University of California, Irvine, and principal investigator in the Esports Research Lab. She has published two books and more than 90 articles and chapters on thinking and reasoning related to videogames. She serves on the advisory board for the UCI Esports Program and Chairs the UCI Diversity and Inclusion in Esports Task Force. She formerly served as senior policy analyst under the Obama administration in the White House Office of Science and Technology Policy, advising on games and digital media, and she is the founder and former president of the Higher Education Video Games Alliance, an academic organization of game-related programs in higher education. Her work has been featured in *Science*, *Wired*, *USA Today*, *New York Times*, *LA Times*, *ABC*, *CBS*, *CNN NPR*, *BBC*, and *The Chronicle of Higher Education*.