Video Gaming and Its Effects on Children and Adolescents: Research Priorities and Recommendations

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1 Background

Video gaming is a multi-billion-dollar global industry that is projected to continue to grow. The popularity of gaming is fueled by its high accessibility and affordability, particularly in relation to "free to play" casual games on smartphones and other portable devices. Some important elements underlying the appeal of modern video games include their seemingly endless designs and repeatability, complex narratives and role-playing, and opportunities to share experiences and socialize with others [1]. Video games are highly diverse in that they differ according to genre (e.g., shooting, role-playing, and strategy), platforms (e.g., home console, virtual reality), modes (e.g., single-player, competing against others), online connectivity (i.e., playing online or offline), and objectives (e.g., overcoming challenges using violence, persuasion, or stealth tactics). Therefore, they attract and cater to many different interests and motives [2].

Like other digital media, game design and business models are constantly changing. Over the last decade, many game developers have adopted a "games as a service" revenue model whereby games receive regular content updates, which may involve an extra premium or a paid

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D. A. Christakis, L. Hale (eds.), *Handbook of Children and Screens*,
https://doi.org/10.1007/978-3-031-69362-5_78

subscription. Gaming has also become monetized via the rise of esports, or professional leagues and tournaments where players compete against each other, individually or in teams, for prize money, sponsorships, and prestige [3]. Similarly, many online games have become connected to online social networks and have attracted young audiences who watch others play the game rather than play the game themselves. Spectating and paying or donating money to other gamers (e.g., *YouTube* and *Twitch* personalities who "stream," meaning to broadcast live) has become an extremely popular activity in gaming culture [4]. A 2018 survey reported that 78% of US children aged 10–12 years who play video games also watch online gaming videos. These technological innovations and social structures have contributed to gaming becoming more engaging, immersive, and socially connected, and are important considerations for stakeholders in evaluating the social, psychological, and physical effects of gaming on children and adolescents.

Gaming devices are commonplace in most homes with children. In the United States, three out of four households have a "gamer" and 64% of American households own a gaming device [5]. Although gaming may have once been considered primarily an underage activity, only an estimated 1 in 10 US gamers are aged under 20 years old. This reflects the ever-increasing average age of gamers over time, which is cited to be around 35 years of age [6]. However, younger individuals, particularly male adolescents, tend to play more often than other demographic groups, and their usage has increased over time. The Generation M2 study in the United States, for example, reported that average daily gaming usage among individuals aged 8–18 years increased from 24 to 73 minutes between 2004 and 2009, and a recent estimate reported by Alanko (2023) [7] of 150–240 minutes further demonstrates this steady increase over time.

Recent Australian data indicate that males aged 15–24 years play games for an average of 128 min/day [8] and 4.1% of males aged 11–17 years play games for 9 hours or more on an average weekday [9]. Gaming among children and adolescents is often supported or facilitated by parental figures, as over 70% of US parents believe playing video games has educational benefits, and nearly 60% of parents play video games with their children at least once a week [5].

This chapter will summarize some recent developments in the literature on the effects of gaming on young people and highlight some of the challenges and limitations in this work. Then, this chapter will identify some important research questions and future directions for research studies to better understand the role of gaming technologies in young people's lives.

2 Current State

There is growing international interest in understanding the potential effects and implications of gaming among children and adolescents. However, recreational gaming encompasses a wide range of products and experiences, and gaming often intersects with other online activities and experiences (e.g., online social networking, web browsing). Therefore, it has been challenging to study gaming holistically [10]. Much literature on gaming media effects has involved studies focusing either on investigating potential positive effects [11], such as visual attention and memory benefits, or ones examining potential negative effects, such as effects of violent video games on aggression and prosocial/antisocial behaviors [12]. Thus, many studies have not applied overarching frameworks conceptualizing both potential positive and negative effects of gaming on children and adolescents. Research into media effects has also been specialized in discrete areas (e.g., cognition, mental health, social networks), with few studies synthesizing data across subfields. Another limitation has been studies of gaming media effects have often tested for direct effects, rather than indirect relationships [13] and reciprocal effects [14].

Studies of effects of gaming have reported mixed findings [12], consistent with reviews of "screen time" among young people that have reported relatively small to negligible effects [15]. The effect of gaming is reported to be com-

plex and dependent on patterns, content, and context of gaming activities [16]. Other pre-existing vulnerabilities, such as social anxiety and attention deficits, may contribute [17]. Among 2442 children aged 7–11 years, Pujol et al. reported that playing video games for 1 hour per week was associated with better performance on certain visuomotor tasks [18]. In contrast, weekly time spent gaming was associated with conduct problems, peer conflicts, and reduced prosocial tendencies, and that these concerns were most apparent among children at an extreme end of the game-time spectrum (i.e., more than 9 hours per week). Using fMRI, the authors also observed changes in basal ganglia white matter and functional connectivity associated with time spent gaming. However, a limitation of the study, as in other studies of media effects, was its correlational design that could not determine directionality.

An important recent development has been the recognition of problem gaming as a mental health disorder in international clinical and public health nomenclature. This recognition has followed several decades of research reporting that specific types/patterns of gaming may be harmful and addictive [19, 20]. In 2013, "internet gaming disorder" was included in Section III (for research purposes) of the DSM-5 and it retains this status in the current DSM-5-TR. In 2019, "gaming disorder" (GD) and "hazardous gaming" were included by the World Health Organization as official designations in the latest revision of the International Classification of Diseases (ICD-11). GD is characterized by persistent gaming behavior, impaired control over gaming, and functional impairment due to gaming for a period of at least 12 months in most instances, but a shorter period may be considered sufficient for young people [21]. Young people with GD play games to the exclusion of other activities, resulting in missed life opportunities and interference with normal routine and basic self-care (i.e., sleep, eating, personal hygiene); real-world social interaction (i.e., meeting friends, family interaction); and important responsibilities (i.e., school, household chores). For further information on gaming disorder, readers are encouraged to consult the chapter dedicated to gaming disorder in this text.

3 Future Research

As the gaming industry continues to innovate and its products become increasingly embedded into young people's lives, investigating the psychosocial effects of gaming is a priority area of research. The effects of gaming on young people appear complex and multidirectional. Effectively studying these effects requires sophisticated and holistic research approaches that account for features of gaming, player characteristics, and the social environment. Researchers should investigate the short- and long-term educational, social, and mental and physical health consequences of gaming for children and adolescents, including those involved in professional (esports) gaming activities and streaming via social media.

Researchers should consider how new designs, such as large online games linked to social media profiles and games employing artificial intelligence-driven designs, may leverage player and population data to present more responsive, individually tailored, and immersive playing experiences and how these experiences may affect gaming involvement, including in terms of player investment of time and money. The ethical and social responsibilities of gaming companies in providing a gaming service to underage consumers require further critical exploration in this regard. The literature is lacking academia-industry collaborations committed to understanding and improving player protection and identifying at-risk players.

Recent technological developments enable underage players to engage in betting activities within and in connection with high-profile online games, including those promoted via esports and social media. Some of these activities may be purely "simulated" (i.e., not involving winning real money) [22] whereas others may involve betting systems that enable players to use virtual goods that can be exchanged for real money via a secondary market (e.g., *"skins betting"*). There is a need to delineate specific reinforcing and

behavior-shaping elements of gaming (e.g., endlessness, reward schedules, avatar creation), including monetized, gambling-like components, to gain insights into how these activities may promote persistent engagement.

Further research on interventions to manage gaming behavior to directly address problematic gaming is needed. To date, there have been few studies examining the effect of technological measures (e.g., parental locks, time restrictions, consumer messages) on gaming behavior and as a means of reducing problematic gaming among young people. Some research suggests that there are only very limited benefits of restrictive policies targeting children, such as the "Cinderella law" [23] in South Korea, which one study reported was only effective for reducing gaming and spending on gaming among less regular or excessive gamers [24]. Although there is a growing clinical literature, there is a need to identify and develop effective identification methods and interventions, including prevention measures and clinical therapies, for vulnerable children and adolescents and their families. Further, there is a need to examine the neurobiological changes, genetic markers, and epigenetic changes associated with problematic engagement in gaming.

It is important that researchers also evaluate the positive aspects of gaming and the conditions that support the positive aspects of game play. It may be valuable, for example, to consider and contextualize certain frequent patterns of gaming that have benefits alongside the opportunity cost (e.g., spending money on games and less time on other hobbies) as being distinct from harmful gaming or gaming that interferes with daily functioning. This includes studying the potential benefits of "serious" games and "exergames" in therapeutic settings. Such games include those designed to complement cognitive therapy approaches, such as supporting exposure techniques [25]; games for training working memory to reduce symptoms of attention-deficit/hyperactivity disorder [26]; "exergames" for promoting physical exercise [27]; and, virtual reality games for pain management [28]. Research should identify and verify types of gaming activities that help develop cognitive abilities and prosocial behaviors.

Another area of research is the refinement of measurement approaches [29]. Studies of gaming among young people have often relied on self-report data fraught with bias and error. Many individuals misestimate their gaming behaviors. It is recommended that researchers leverage more objective sources of data to measure gaming involvement, including player tracking data that are stored online. It may be possible, for example, to identify patterns of gaming that may indicate a "turning point" from non-problematic to problematic use [30]. Such work may inform early detection and intervention for youth and others. At the same time, gaming activity as a unit of analysis should be treated, where possible, in psychological and social terms and not simply as a form of "screen time" [31]. Screen time and other conventional frequency measures convey a passive and homogenous experience that belie the complexity of gaming.

4 Recommendations

An important step forward for research into excessive gaming has been the WHO's recognition of hazardous gaming and gaming disorder in the ICD-11 [32]. These diagnostic categories should enable greater consistency in the conceptualization and assessment of gaming-related problems. Further, these diagnostic categories provide needed clarity of terminology for guiding recommendations in health agendas.

- For policymakers, it is important that the ICD-11 and DSM-5-TR taxonomic developments in gaming disorder and hazardous gaming are reflected by acknowledgment in health policies. Recognizing gaming disorder as a risk to public health is an important step toward achieving health goals, including supporting efforts for consumer awareness and advice. The promotion of healthy and safe online gaming (and other online activities) requires active support from governments. Public health agendas and consumer advice have

tended to emphasize restrictions on time spent gaming [33]. This advice could be improved by adding references to the warning signs and symptoms of problem gaming as a mental disorder, and highlighting desirable qualities and social conditions of gaming experiences for children and adolescents.

- Relatedly, there is a need for *regulators* to evaluate the range of gaming products available to young people, including monitoring and considering restrictions on products that are known to be associated with problematic gaming, and which contain features that converge with gambling and/or employ predatory or questionable tactics to target young people. Transparency in game design features and experiences, such as odds associated with paid randomized content, should be considered in regulatory approaches.
- The evidence base on gaming disorders and other problematic online behaviors requires further original research undertakings. The study of gaming disorders is significantly hindered by the lack of resources in many regions, particularly in countries outside of East Asia. *Major funding bodies* should provide the investment necessary to advance the evidence base on problem gaming and other technology-driven problematic behaviors. National agencies with a research focus should coordinate population-level monitoring to study the prevalence of problem gaming and emerging trends in gaming. This includes adding problem gaming measures into epidemiological surveys to monitor the incidence and progression of cases over time in the wider population.
- As gaming products marketed for children and adolescents have incorporated risky features that have drawn attention internationally from regulators, such as predatory monetization (e.g., loot boxes) resembling gambling products [17], it is important for researchers to have access to industry data and other information to better understand risks associated with involvement [34]. Such knowledge should help to better inform young people and their families about these activities, prevention approaches and psychological therapies, cyber-safety programs, and consumer advice on online gaming products. The barriers to industry-academia collaborations require further examination, as it is unclear whether major gaming companies perceive any benefit or incentive to directly supporting research into problematic gaming.
- *Academics and institutions* with a clinical and/or research specialty in problem gaming should develop consumer information and expert workshops to inform the allied health fields. For health practitioners, it is important that they are vigilant to technology use among young people, and screen and assess for these issues in mental health and well-being evaluations. Sharing experiences in delivering treatments with the wider research and clinical community (e.g., via papers, conferences, informal communications) would be valuable to improving the evidence base. Parents and teachers can support public health efforts to reduce problematic gaming by ensuring screen time recommendations are followed and support participation in alternative activities that promote child development, and by supporting research efforts that seek their valuable insights and experiences.
- Finally, *gamers* can share their knowledge with researchers to provide needed lived experience perspectives that can assist, for example, in making interventions more authentic and engaging. The gaming community is also influential in terms of publicly voicing its views and preferences for the types of gaming experiences it values, and making purchasing decisions that support games with more ethical designs that respect the player's time and autonomy.

Conflict of Interest and Funding Disclosures None.

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