Gaming- a bane or a boon-a systematic review

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ABSTRACT

Recent trends show online/video games, have shifted from being just recreational in nature, to hazardous even resulting in the gamer's death like the blue whale game. The aim of the study is to examine associations between video/online gaming and its implication on the biopsychosocial domains of the user. Online databases were studied on gaming and its effect on behaviour, general and mental health from 1997–2017. The PICO guidelines, PRISMA flow diagram and the Rayyan software was used in identifying relevant studies. Cross referencing was done with the co-authors. A total of 41 studies were included in the final analysis. The choice of the video game is influenced by age, gender, parental mediation, as well as the players' and the game's characteristics. Excessive gaming affects both the individual himself and their interpersonal relationships, with 'internet addiction' being added as a diagnosis under DSM V. Despite its several negative consequences, over the past decade, researchers have now started to acknowledge the benefits of gamification in social, educational and even in the health sector, irrespective of the individual's age. There is a need to develop cross cultural database to understand the impact of addictive and/or promotive use of games on the biopsychosocial factors of the gamer.

1. Introduction

Video games first made their appearance during the 1960s with the release of Pong. Internet revolutionized the use of technology, and gaming is now considered a normal pastime, from children to young adults. The issues faced in online gaming have changed as it has moved from being viewed as just recreational, to its having harmful or helpful effects. The standard classification of mental disorders used by mental health professionals in the US, viz Diagnostic Statistical Manual-5 (DSM-5), has recently added the description and diagnostic criteria of Internet gaming disorder (APA, 2013). Recent research indicates that 10%–15% of the younger population in several Asian countries have gaming addiction, while it is 1%–10% in some Western countries (Saunders et al., 2017). The annual revenue for 2017 is estimated to cross over $100 billion, and it is predicted the total revenue will reach $132 billion by 2021 (Graham, 2017) surpassing the movie industry revenue.

1.1. Factors influencing gaming

1.1.1. Age and gender

In 2017, a survey of gamers showed that those aged 18 years and above represented 72% of the population, their average age being 35 years (Essential Facts About the Computer and Video Game Industry, 2017). Video games are played by children as young as three years with teenage boy gamers consistently being more than girls (Wright et al., 2001). 13- or 14-years old gamers of both genders played an average of 17 h in a week. Males prefer video games involving physical action, example-action and sports, while females preferred the more traditional, thoughtful games, example-classic board games and puzzles (Greenberg et al., 2010). More females complained about interpersonal relationship with their partner because of gaming and some played to spend more time with their partners (Ogletree and Drake, 2007).

1.1.2. Personality characteristics

Gaming provides opportunity to the individual to behave in ways reflecting their ideal-self, thereby increasing the pleasure experience (Przybylski et al., 2012). Positive self-regard in females is associated with increased likelihood of selecting First Person Shooters as a favoured game, while males with internalizing difficulties are less likely to select Massively Multiplayer Online Role Playing Games (MMORPGs) (Homer et al., 2012).

1.1.3. Parental mediation

Home is the main place where children have access to internet, which can lead to less time spent with the family. However, this does not seem to affect family communications (Lee and Chae, 2007). There is a weak and negative correlation between the adolescents' age and parental mediation (Shin and Huh, 2011). Only when negative behavioural effects are expected are more restrictive and active mediation

used by parents. If positive social-emotional effect is the expected outcome, the parents often co-played with their children (Nikken and Jansz, 2006). Co-playing video games are associated with lowered internalizing and aggressive behaviours, heightened prosocial behaviour and with a marginal change in the relationship of the co-players (Coyne et al., 2011).

1.1.4. Types of video games and portrayal of game characters

Games have grown from single player mode to a guild (network of gamers) where the same experience is shared (Oliveira and Henderson, 2003). There is a tremendous difference how the two genders are characterized in video games. Female characters are portrayed as being hyper-sexualized and helpless, while male characters are represented as strong and aggressive in action roles (Burgess et al., 2007; Ogletree and Drake, 2007).

Currently, the blue whale challenge is one the most talked about online games in the media and is even discussed by the Indian Government, due to the number of deaths caused by playing the game. Over 100 people have died around the world due to this game with at least five reports from India (What's the Internet 'game' killing young people worldwide?, November 2017). Difficultly in present in curbing these games, because of their being freely available online (Fig. 1).

1.2. Theorical understanding of excessive gaming behaviour

1.2.1. Use and gratification theory

This theory originated in the 1940s as a reaction to traditional mass communication. The assumptions underlying this theory are that people actively choose one option from amongst the diverse media, depending on their need (Wu et al., 2010).

1.2.2. Self-determination theory

This theory takes into account both intrinsic and extrinsic factors that might enable or undermine motivation. Present gaming designs provide players with considerable flexibility in the game. In gaming, intrinsic motivation occurs, when the game controls are intuitive, readily mastered with continuing optimal challenging tasks and with opportunities for positive feedback (Ryan et al., 2006).

India's first technology de-addiction centre, inaugurated in 2014, SHUT Clinic (Service for Healthy Use of Technology) Clinic is located in NIMHANS, Bengaluru, caters to people with technology addiction.

2. Methods

2.1. Aim

To systematically review various scientific papers and media reports to explore the effects of gaming amongst users during the past twenty years.
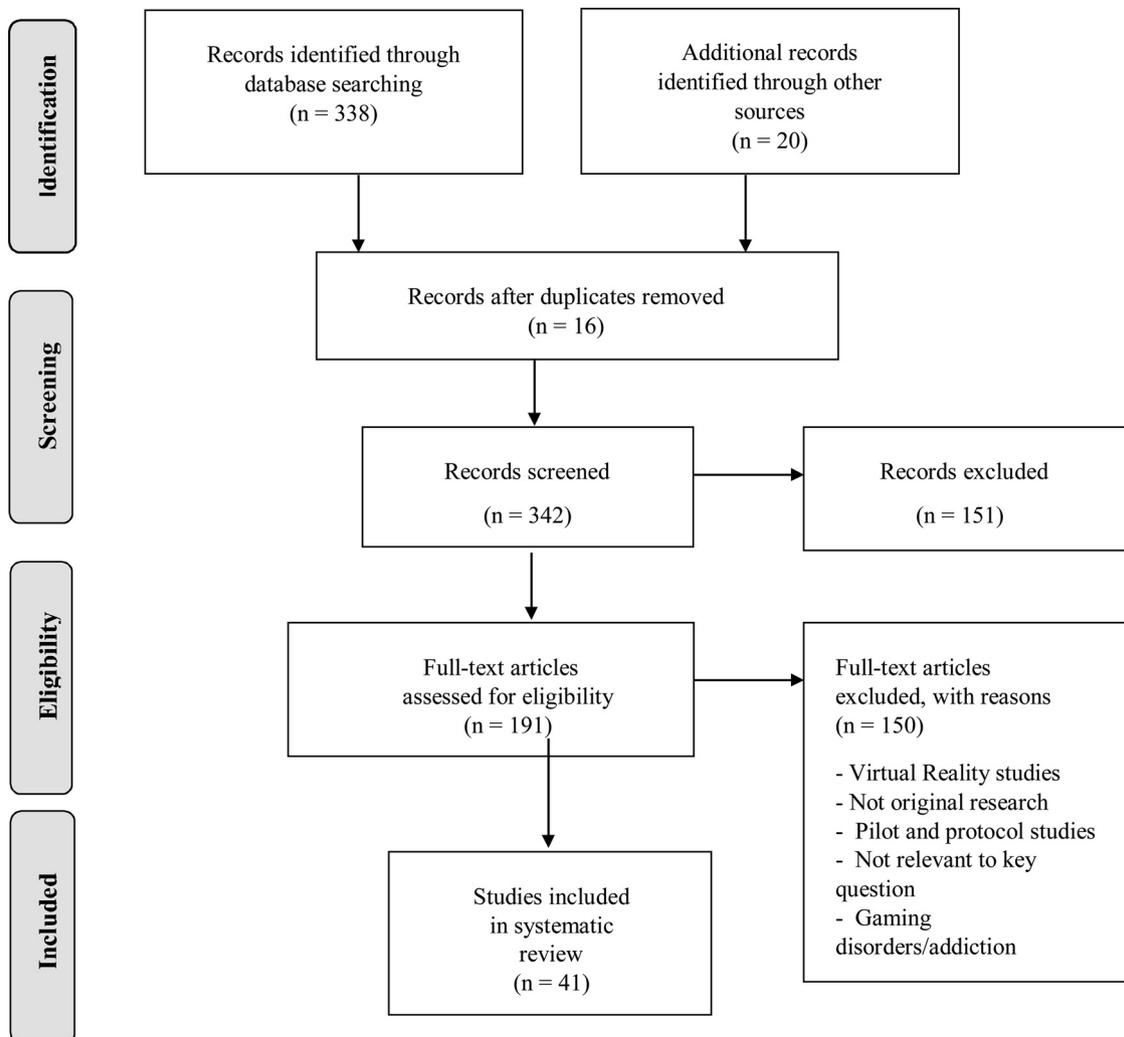

Fig. 1. PRISMA flow diagram of included studies (Moher et al., 2009).

PICO guidelines were used for the systematic review.

P	Population/patient	=	Human participants
I	Intervention/indicator	=	Gaming
C	Comparator/control	=	NIL
O	Outcome	=	General and mental health

2.2. Database Searched

The databases searched were those identified as relevant to education and social sciences. A series of keyword searches in the electronic databases were done using MEDLINE, Google Scholar and Media Publication.

2.3. Search Terms

The following keyword terms and combinations were used with bullion logic: Video Games, Online Gaming, Behaviour, General Health, Mental health and Behaviour.

2.4. Selection criteria for inclusion of papers

To narrow down the papers selected for the review, the following inclusion and exclusion criteria were used
Inclusion Criteria for the Studies

- Publications where the studies looked at the effects of online/video gaming on mental or general health aspects
- Publications where the studies solely focused on online/video gaming
- Publications selected were academic and peer reviewed studies
- Media coverage on online/video games
- Studies that used primary data
- Studies published in English

Exclusion Criteria for the Studies

- Video game addiction, internet gaming disorder and video gaming disorder, pathological and problematic use
- Published systematic review and meta-analysis studies
- Published studies on Virtual reality games
- Dissertations, pilot/ protocol/ prototype studies
- Studies published in a language other than English

2.5. Technology assisted search and screening

To assist in the database screening for inclusion criteria, Rayyan software was used (Ouzzani et al., 2016).

All the articles were reviewed and those articles that did not meet the inclusion criteria were excluded. Cross referencing of the excluded and selected studies was done with agreement of the co-authors.

2.6. Data extraction and analysis

The extraction of the data was completed by one researcher and another researcher checked the studies to see if they were consistent with the aim and inclusion criteria of the systematic review. The researchers were not influenced by either the names of author or of the journals, when selecting the studies and neither were they biased by the same.

3. Results

3.1. Main literature search

All papers chosen for this review based their findings on online/video gaming dating from 1997 till 2017. 338 papers were identified through the search terms used in the databases.

Papers Selected for Current Review- 41 papers met the inclusion criteria for the current review to explore the effects of gaming amongst users. 11 papers reported the negative consequences and 30 papers reported the beneficial use of gaming. The topics covered in the papers were heterogeneous, covering different aspects of negative consequences and of the benefits of video/online gaming by using a variety of methodological approaches.

3.2. Categorization of papers

The papers were organized into various categories according to the theme of the paper.

3.3. Excessive gaming and its consequences

Escapism was found to be the best indicator of excessive video gaming (Yee, 2006).

3.3.1. Impact on the individual-health

More than 5 h of online gaming per day seems to increase the risk of negative consequences in adolescents (Griffiths, 2005). Excessive video gamers have various developmental and behavioural issues, such as higher BMI (Weaver et al., 2009), mild increase in problematic behaviour (Allahverdipour et al., 2010), tendon rupture (Gilman et al., 2015), "Pac Man elbow", "video wrist" and "Nintendinitis (Williams et al., 2008). "eThrombosis", is the new risk to which online gamers are exposed (Lee, 2004). The negative consequence are also seen in adults, such as sleeping problems, mood disorder symptoms, suicidal ideations and alcohol/substance abuse (Wenzel et al., 2009).

3.3.2. Aggressive behaviour

Playing for nine hours or more in a week is associated with conduct problems and decreased prosocial behaviour (Pujol et al., 2016). Playing violent games causes increased aggressive thoughts, feelings and behaviours, physiological desensitization to violence, leading to less helpful behaviour (Carnagey et al., 2007), and can cause depressive symptoms amongst preadolescent youth (Tortolero et al., 2014). Aggression is seen to be more during same-sex violent games. Aggression caused by violent games may be partially because of revenge motivation (Anderson and Murphy, 2003).

3.3.3. Family and social

It is seen that adult video gamers are more reliant on the internet for social support (Weaver et al., 2009).

3.4. Online/video games usage for a better mean

3.4.1. General health

With new technology, the type of games have diversified from being food related (example- Fruit Ninja and Diner Dash) or physically active (example-Xbox Dance Central and Xbox Kinetic Sports) to those involving cognitive skills and coping skills. Advergames that promote food, help to increase the energy intake of children (Folkvord et al., 2013). Kinect play is played enthusiastically by both genders, and this can be used to increase their activity to moderate levels (Verhoeven et al., 2015). It has even been shown to have motivational benefits (Garn et al., 2012) with gaming directly affecting generalized learning and increases retention and complex motor skills (Lohse et al., 2016). A gamer playing active computer games (Nintendo Wii) uses more energy

Table 1

Represents the Primary Purpose of the Game by Study Design for the Consequence of Excessive Gaming.

Study Design	Purpose of Game			
	Health Risk	Aggression/ Violence	Family/ Social	Total
Quasi Experimental	0	1	0	1
Survey	4	1	1	6
Experimental	0	2	0	2
Case Study	2	0	0	2
Total	6	4	1	11

compared to one playing sedentary computer games (Microsoft XBOX 360), although it is not as effective as playing the sport itself (Graves et al., 2008). Interactive video dance games can be used by the elderly (Studenski et al., 2010). Exergames appear to be effective in helping adolescents achieve moderate to vigorous levels of physical activity (O'Loughlin et al., 2012) training postural control among older adults (Maillot et al., 2014) and in improving the mental health amongst the elderly (Li et al., 2016).

Serious games can also benefit health care professionals by educating and training them to avoid the occurrence of medical errors (Gago et al., 2011). Cerebrus, a new technology, is expected to benefit people with limited body movement and ability to communicate (Funk, 2005). Among older adults, cognitive plasticity could be increased by non-action video games (Ballesteros et al., 2015) and through brain train packages to increase attentional functions (Mayas et al., 2014). However, booster sessions are required to sustain the benefits.

Cancer survivors are seen to be coping and thriving with community based games (Comello et al., 2016). Motion controlled video games, which are enjoyable low impact exercises helps women with Fibromyalgia syndrome get temporary relief from pain (Mortensen et al., 2015).Attention training games have intended effects on selective attention, which in turn may help in reducing the focus on tinnitus (Wise et al., 2016).

3.4.2. Mental health

Online memory games have the potential to identify age-related cognitive decline in people and also identify those who are at risk of cognitive decline (Geyer et al., 2015). Gaming is not associated with externalizing disorder or suicidal ideation. The positive effects of serious gaming are also seen in those with mental disorders, such as Post Traumatic Stress Disorder (PTSD) (Kreutzer and Bowers, 2015). 3D Video Games have also been used as a preventive for anxiety (Scholten et al., 2016). Serious games can be used as an alternative to face-to-face therapy (Eichenberg et al., 2016) where the individual has difficulty in the traditional form of therapy (Coyle et al., 2009). This is done by increasing the therapeutic relationship and by motivating the individual by explaining CBT concepts (Brezinka, 2014). Some specific games can be preventative, and even provide feeling of well-being for people with mental health issues (Shandley et al., 2010).

3.4.3. Educational benefits

Teachers are starting to realize the advantages of using computer games as an educational tool, although there are many who are still sceptical (Can and Cagiltay, 2006). Educational games help in learning by giving clear, concise instructions and achievable goals, based on each individual's capabilities (Dempsey et al., 2002; Hamari et al., 2016) and these games have attractive animation and graphics. Learning and motivation through serious games is facilitated only if it includes features that prompt learners to actively process educational content (Erhel and Jamet, 2013). After students spent time on educational games, better scores were achieved in practical assignments, but not on written assignments or where classroom activity participation

was required. This was so even when their initial motivation was high (Domínguez et al., 2013). The key issue is how to improve the design of the educational computer game and to have better game-based classroom instructional strategies (Ke, 2008).

3.4.4. Social

Massively multiplayer online game (MMOG) gamers have an active social life and engage in meaningful interactions with other players in the game (Hussain and Griffiths, 2008). Relationships are formed through online gaming because of close proximity while playing the game, and these relationships are strengthened if gamers stay in contact subsequently when offline (Trepte et al., 2012). Even with college going male students, gaming offers a healthy place for socialization, relaxation, and coping (Wack and Tantleff-Dunn, 2009).

4. Discussion

Conclusive evidence in respect of the overall negative aspects of addiction to gaming has been established by various studies. From this systematic review of various scientific papers and media reports published between 1997–2017, it can be seen that there is a fine line between beneficial use of and negative consequences of gaming on the players. Online games are multipurpose in nature, creating an impact not just on the gamer but also on the developer, market, business, health practitioners, educationalists and the economy (Table 1).

The number of papers published in this field has seen a substantial increase from 2006 which is consistent with technological advancements of and the ease with which different forms of games can be accessed. A survey of gamers in 2017 found that those aged 18 years and above represented 72% of the population, with the average age being 35 years (Essential Facts About the Computer and Video Game Industry, 2017). Though gaming is associated more with children and adolescents, it is played even by children as young as 3 years of age (Wright et al., 2001) to the elderly. This helps in their mental strength (Li et al., 2016). Findings across studies found that games are played more by boys than girls (Wright et al., 2001).

Is this sudden epidemic called "gaming" changing the present lifestyle of gamers through the biopsychosocial factors discussed above? The amount of time parents are able to spend effectively with their children is compromised as both their parents are working. Parental mediation has increased with heightened awareness of gaming. Parental mediation, intensity and frequency is dependent on the child's age, parents' game behaviours, and frequency of playing games and engagement in deceptive gaming behaviours (Shin and Huh, 2011). The effects of gaming are also seen in biological changes, both positive and negative, which is dependent on the duration spent playing (Lee, 2004; Pujol et al., 2016; Takeuchi et al., 2016) (Table 2).

There is a fine line between the benefits achieved through gaming and its negative consequences. A few studies found that even with 5 h of gaming a week, there are benefits (Bavelier and Davidson, 2013) but more than 5 h of online gaming per day seems to increase the risk of adverse consequences in adolescents (Griffiths, 2005). Even the DSM-5 classification has recently included the description and diagnostic criteria of Internet gaming disorder (APA, 2013). Considering the apprehension about gaming amongst non-game players, both children and parents should be psychoeducated and made aware of the positive impact of moderate video gaming (Allahverdipour et al., 2010).

The theory behind a gamer's motivation to choose and play a specific video game is pertinent for the further development of any game. Psychological intervention may even use serious games as an adjunct to therapy when required (Eichenberg et al., 2016).

5. Conclusion

Video games have transitioned from being purely recreational to being either beneficial or harmful to one's life. The medium in which

Table 2

Represents the Primary Purpose of the Game by Study Design for the Beneficial consequences of Gaming.

Study Design	Purpose of Game-1 survey								Total
	Game of Learning	Serious Game	Exergame/ Dance/ Motion Controlled	Advergame	Health Benefit	Skill Competence/ Learning	Therapy	Social	
Quasi Experimental	2	0	4	0	3	0	2	0	11
Survey	1	1	1	0	2	1	0	3	9
Experimental	2	0	3	1	4	0	0	0	10
Total	5	1	8	1	9	1	2	3	30

games can be played has multiplied, as well as the impact it has on the gamers.

The strength of this systematic review is that decisions regarding the protocol were made priori to reduce the risk of bias. Rayyan software, the PICO and PRISMA guidelines were used to minimize errors. The focus is on the biopsychosocial parameters of gamers with the expectation of achieving a clear and thorough understanding of the relationship between gaming and the gamer. The limitation of this review is the limited number of databases reviewed. From the studies reviewed, it is seen that the primary research method used was the survey method for the negative consequences of gaming, while more experimental studies were used for ascertaining the beneficial effects of gaming.

The debate about the influence of gaming may continue without a clear consensus in the foreseeable future. As video games have become a part of our lives in the present age, advancements with regard to tools to assess different health factors is also necessary. It would be beneficial if future research could study longitudinal negative consequences and benefits of gaming, personality characteristics and the environmental difference between recreational, excessive, addicted and serious gamers.

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