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The psychological effects of videogames on young people: A review

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Summary. *Research has indicated that most young people spend more time watching screen media than in any other activity apart from sleeping (Strasberg, 2004). In Ireland, a large longitudinal study of children has indicated that over half of nine-year old children are playing videogames daily, while the international adolescence literature indicates that the rate of game play is growing year on year (Gentile, 2008). There is a concern that the effects of videogame playing are larger than the effects observed with television and film viewing (Anderson, Gentile & Buckley, 2007), and that children and young people may be at a greater risk of negative effects as a consequence of exposure to violent videogames. This literature review aims to explore the role and impact of videogames in the lives of young people within a technological society, and how this impact can occur. The exposure of young people to violent videogames may be viewed within the context of risk factors for the development of aggression, and as such an understanding of the research within this area may be paramount to allow a full consideration of levels of "exposure" to such a risk. Variables that may impact on the usage and effects of violent video game use are discussed, such as developmental stages, gender, individual characteristics, culture and game structure and content. Recommendations from key research in relation to monitoring of video game usage are also discussed.*

Keywords: *Video games, violence, children, young people.*

Revisió: Els efectes psicològics dels videojocs entre els joves

Resum. *La literatura científica mostra que la majoria de la gent jove passa més temps davant d'una pantalla que fent qualsevol altra activitat, excepte dormir (Strasberg, 2004). A Irlanda, un estudi longitudinal amb nens va trobar que més de la meitat dels nens de 9 anys juguen amb videojocs cada dia, i la literatura internacional sobre adolescents indica que la tassa de jugar amb videojocs creix cada any (Gentile, 2008). S'observa la preocupació que els efectes dels videojocs siguin més grans que els efectes que es van observar en el seu moment amb la televisió i les pel·lícules, i que els nens i joves podrien estar exposats a un risc més gran de patir efectes negatius com a conseqüència de l'exposició a videojocs violents. Aquesta revisió de la literatura pretén explorar el rol i impacte de videojocs en la vida dels joves dins una societat tecnològica, i com aquest impacte s'expressa. L'exposició dels nens i adolescents a videojocs violents pot representar un dels factors de risc per al desenvolupament de conductes agressives, i per això la comprensió de la recerca en aquesta àrea és de gran importància per a valorar plenament la relació entre grau d'exposició i risc. Es discuteixen les variables que poden influir en l'ús i efecte dels videojocs violents, com l'estadi evolutiu, el gènere, les característiques individuals, la cultura, el tipus de joc i el contingut. Es discuteixen també les recomanacions que es poden derivar de la recerca en relació al seguiment de l'ús dels videojocs.*

Paraules clau: *videojocs, violència, nens, gent jove*

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Introduction

There is consistent evidence in video game research that video game play can lead to changes, in terms of physiological, psychological and in terms of cognitive developments. The key arguments in relation to these changes relates to whether they can be regarded as positive or negative changes, and also in relation to what factors can lead to these observed changes. In considering these effects, much of the research relates to the negative impact of video games, and in particular to the effects of the genre of violent video games. However, it seems impossible to consider these effects without considering the powerful positive effects of video games, in terms of their ability to facilitate the development of skills and learning in a range of fields. Video games have been described as powerful and persuasive tools (Gentile & Gentile, 2008) and it may be argued that it is not possible to ignore the attraction of video games, and therefore it is imperative that the impact of these mediums of learning is explored in detail.

This literature review – selective rather than systematic – is therefore designed to explore key areas of research in the field of video games (rather than every single study), with a particular emphasis on the research on violent video games. This review primarily focuses on studies published in the area of video game research between 2000 and 2012 (but makes reference to earlier studies where relevant), with a view to reviewing the key research studies in the area in an attempt to explore the impact of video games, but also to highlight the possible factors that may moderate both the positive and negative effects of game play.

The amount of time that young people are spending playing videogames is steadily increasing and this finding is evident internationally. A British study found that those aged under 16 years rank playing videogames as their most popular entertainment form (Pratchett, 2005), whilst US studies have reported similar findings with time spent playing games continuing to increase for both children and adolescents (Anderson, Gentile & Buckley, 2007; Escobar-Chaves & Anderson, 2008; Gentile & Anderson, 2003). In Ireland, research has indicated that over half of nine-year old girls were recorded as playing videogames on an average weekday, compared with only 25% of boys. Almost 30% of boys (compared with 12% of girls) were reported as spending one or more hours daily playing these games (Williams et al., 2009). With recent research indicating that children aged 8 to 11 years play on average 12 hours a week and 12 to 14 year olds play 15 hours per week, the role of videogames is ever-increasing in the world of young people (Gentile & Gentile, 2008).

There is a consistent finding in videogame research that boys tend to play videogames more frequently and for longer periods than girls (Anderson, Gentile & Buckley, 2007; Rideout, Foehr & Roberts, 2010). Padilla-Walker, et al (2009) found that 50% of women never played a game during the past year and 80% of women had never played a violent videogame during the past year. Researchers have argued that the gender differences reported in video game research may be related to (i) socialisaton factors (i.e., females not being socially rewarded for playing video games in the same way as males), (ii) the fact that video games have typically been designed by males for other male gamers, and (iii) males having better spatial ability skills than females thus aiding video game playing (Griffiths, 2008; Krahe & Moller, 2004; Olson et al, 2009). However, recent research indicates that the number of women involved in videogame play may be increasing with research indicating that 99% of teenage boys and 94% of girls in US played videogames (Lenhart et al., 2008) and that female gamers value their gaming identity and the role it plays in various aspects of their lives (McLean & Griffiths, 2013).

Based on videogames at the time, Griffiths (1993) proposed a useful videogame taxonomy comprising sports stimulations, racers, adventures, puzzlers, platformers, platform blasters, beat 'em ups, shoot 'em ups, and other miscellaneous games. Pratchett (2005) found that different genres of games offered particular attraction to people at different stages in their lives, with a marked distinction between children and adults' choice of games to play. Simulation games were favoured by 11- to 15-year olds, action-adventure games by 6- to 10 -year olds and, educational, racing, sports, puzzle and racing games by 16- to 24-year olds. Adults preferred classics and first-person shooters.

Advanced technology and changes: Implications for videogame playing

One of the most obvious and far reaching effects of the advancement in media is in the influence of the many form of media available and used by young people today (Roberts & Foehr, 2004). The accessibility of games on internet, mobile phones, as well as handheld videogame consoles has had large impact on the gaming environment, and this affects gaming on a number of different levels. Roberts, Foehr and Rideout (2005) have argued that the young people they surveyed who had access to personal media (in their bedroom or through the use of portable media) were more likely to report substantially higher exposure than those who did not have such portable media forms.

In the last four decades, the way in which games are played have changed (from being played upon arcade machines to consoles and computers, to handheld devices and smart phones online), and technology has advanced game-realism from black-and-white to colour, from 2-D to 3-D graphics. While early graphics were simplistic, and the action within the games was often described as abstract (Dill & Dill, 1998), this change can be illustrated in particular in the area of violent videogames. Early videogames such as *Pac-man* and *Space Invaders,* the enemies and the killing were seen as abstract. With the introduction of first-person shooter games in 1992, there was a turning point in

the use of violence in videogames in that the violence had taken on a more personalised form. The increases in processing power and in children's ability to use multimedia and increasingly sophisticated graphics and consoles has also allowed for, and resulted in, a desire for more realistic games. Recent research has highlighted the continued importance of realism in terms of storylines and characters for male and female gamers (McLean & Griffiths, in press).

Positive effects of videogame playing

Videogame playing has been found to help improve perceptual skills and visual attention (Green & Bavelier, 2003), visuospatial cognition (Feng, Spence & Pratt, 2007; Green & Bavalier, 2003; 2006), and spatial skills (De Lisi & Wolford, 2002; Passig & Eden, 2001). Research has explored the impact of videogames on a variety of different levels with a particular focus on learning as it appears that videogames can offer a unique avenue for learning to players. Oblinger (2004) argues that videogames are potentially powerful learning tools because they support multi-sensory, active, and experiential and problem-based learning. They also favour activation of prior knowledge to allow progression within a game and provide immediate feedback thus allowing testing of a hypothesis and immediate learning from ones actions. Videogames can also include opportunities for self-assessment, and are often becoming important social learning environments that allow for additional learning from different perspectives. The emergence of video games as a key learning tool has been highlighted by researchers due to their reinforcement ability, the emphasis on distributed practising of skills and the active involvement and motivation of the learner in the task (Gentile & Gentile, 2008).

Specialised videogames have also been used by specific business and organisations to teach specific skills training and development such as in the US military, and the US Marine Corps (Prensky, 2001). Commercially available training videogames have also been found to be effective in teaching strategic management (Lynn, Brady, Davis, 2009) teaching traditional subjects such as , algebra or biology (Corbett, Koedinger & Hadley, 2001; Ybarrondo, 1984), in improving computer skills (Subrahmanyam et al, 2000), and in skill-based learning (Gopher, Weil, & Bareket, 1994). Video game skill and past video game skill has also been found to be significant predictors of medical student's laparoscopic skills (Rosser, Lynch, Cuddihy, Gentile, Klonsky & Merrell, 2007).

Videogames have been used as a medium for physiotherapy or occupational therapy in a variety of different settings (Griffiths, 2005). They can be used to distract young patients from pain during prolonged invasive cancer treatment (Beale, Kato, Marin, Bowling, Gutherie & Cole, 2007), as a form of psychotherapy with children (Gardner, 1991) and in physical therapy and in rehabilitation following traumatic brain injury (Jannink et al., 2008). Research has suggested that the use of videogame intervention significantly improved treatment adherence and knowledge of illness, in young adults undergoing treatment for cancer (Kato,Cole, Bradlyn, Pollock, 2009), and to improve diabetes self-care management (Liberman, 2001; 2006). Videogames have also been used to work with people with disabilities to develop social skills in people experiencing social difficulties (Gaylord-Rosset et al, 1984) and to develop specific life skills (Masendorf, 1993; Hollingsworth & Woodward, 1993; Okolo, 1992).

Research has suggested that videogame playing may lead to an increase in obesity and a reduction in overall activity levels (Berkey, et al, 2000; Carvalhal, Padez, Moreira & Rosada, 2007; Subrahmanyam, et al, 2000; Vanderwater, Shim & Caplvitz, 2004). However, other recent research has disputed this claim failing to find a link between videogame play and obesity or physical activity (Wack & Tantleff-Duff, 2009). The recent introduction of active videogames ('exergames') has also become a focal point of research exploring the possible benefits.Videogames have been explored as possible avenue for the teaching of physical education to children in schools. Hayes and Silberman (2007) highlighted the possible benefits of such an approach using commercial sports games that children are attracted to. Daley (2009) conducted a meta-analytic study of all of the studies exploring health benefits of active videogames and concluded that although there are some benefits of these games, they did not involve as much as energy as the games they were simulating.

It is interesting to consider the fields of video game research that have resulted in the largest amount of research, namely the genre of violent video games. In the exploration of the positive effects of video game play, regardless of content, Bartlett, Anderson and Swing (2009) note that the reduced amount of research in this area mean that large meta-analytical studies for example are not possible. One might also consider it interesting that the early research in 1990's indicating a positive effect of game play, such as that on brain training games which have been found to affect memory decline among the elderly (Drew & Waters, 1986; Dustman, Emmerson, Steinhaus, & Dustman, 1992; Goldstein, Cajko, Oosterbroek, et al, 1997), has been uncontested. In contrast to this the research on violent video game play has constantly strived to confirm or discredit any research done in 1990's, as it can be argued that these games were less sophisticated on many levels during this time, in comparison to today's games.

An area of increasing research exploring the positive effects of video games is related to the effects of serious games as learning tools and the development of games that increase prosocial behaviour and responses amongst players. Prosocial games are games that encourage game characters to act in a helpful or prosocial manner in order to progress in the game. Gentile, et al (2009), and Greitmeyer and Osswald (2009), have conducted studies on this game genre and have argued

that their results suggest that there is a strong relationship between prosocial game playing and prosocial behaviour. The research also suggests that the short-term effects of playing these games can be explained through the use of modelling, direction, and reinforcement in the games that can lead to affective, arousal or cognitive effects. The repeated practising of these effects can then lead to long-term changes in the cognitive, emotional, and affective states of adolescents and university students. However, it is important to consider the playing of any games within a wider context and explore the other factors that may explain the behaviour portrayed by the participants in the study. The person may be playing prosocial games as this is the game genre that they were permitted to play and one would also expect that prosocial behaviour may be modelled at home. A similar argument has been given for cross-sectional research describing the relationship between any effects of game playing and observed aggression.

Recent research has explored the impact of prosocial game play on children in an experimental setting (Saleem, Anderson, & Gentile, 2012). The research involved children aged 9 to14 years (n=191) randomly assigned to play one of three types of games, either a violent video game, a neutral video game, or a prosocial video game. Despite limitations, the researchers argue that in the tangram method used in the study to assess helpful and hurtful behaviours, the results suggest that prosocial video game play led to an increase in helpful behaviour in the short-term. The results also indicated that playing a violent video game led to an increase in hurtful behaviour and a decrease in helpful behaviour. The research is the first to explore the impact of prosocial content on children's behaviour in a short-term context, and is noteworthy because of its use of children's video games. Anderson , Gentile and Dill (2012) argue that due to the limited amount of real prosocial games that presently exist, there are few studies exploring the link between these games and short-term and long-term prosocial effects. Therefore, greater research is needed in the area in order to fully understand the effects of prosocial games.

Negative effects of videogame playing

The research indicating a negative effect of video game play has focused on general video game play, but in particular on the impact of violent video game play. In terms of general adverse effects of videogame playing on health, early research in the field highlighted a link between extended video game play and the development of physical pain (Bright & Bringhurst, 1992; McCowan, 1981; Miller, 1991), including 'Nintendinitis or Nintendo thumb (Brasington, 1990; Siegal, 1991) and epileptic seizures (Chuang, 2006), joint, muscle, and skin problems (Loftus & Loftus, 1993). Videogame playing has also been argued to be related to reduced school performance (Anand, 2007; Anderson & Dill, 2000; Anderson, et al 2007; Gentile, et al, 2004; Gentile, et al, 2004) and with decreased success in college (Anand, 2007; Anderson & Dill, 2000). Bartlett, Anderson and Swing (2009) suggest this finding may be explained in terms of displacement effect, where the amount of time spent playing videogames reducing the amount of time that young people can spend studying and/or doing coursework. Chan and Rabiowiz (2006) suggested that videogame playing may be associated with self-reported lower attention spans and inattention in a college student sample. As videogame usage increases, academic performance has been found to decrease in college students in US (Anand, 2007).

One study suggested that videogame playing can be associated with risk behaviour in late adolescence and young adulthood (18 to 26 years), with those who played videogames reporting higher levels of drug use, alcohol drinking, and poorer relationships with friends and family (Padilla-Walker, et al 2009). This study also found that among females, videogame use was associated with lower self-worth. The authors argued that videogame use may be a risk factor for emergent adulthood, at a time when people forming personal identities. Pratchett (2005) reported that within British 16- to 24-year olds, racing videogames were the favourite genre. Fischer, Kubitzki, Guter and Frey (2007) argue that racing videogames are top selling games in the industry and that they are attractive across gender in both children to adults,. The results indicated a correlation between frequency of playing racing videogames and competitive/obstructive driving and increased car accidents. The research also found men were significantly more likely than women to take higher risks in computer-simulated road traffic situations than those who had played a neutral game.

There is heightened concern regarding the content of games, in particular in relation to violent games because of the explicit presence of violence in the games (Staude-Muller, et al, 2008), and the interactive nature of the violence in the games. Early research in the area of violent videogames indicated that up to 89% of games in the market contained elements of violence, and almost half of these games included a form of serious violence taking place against another character (Children Now, 2001). It may be argued that the area of violent video game research during the past ten years can be seen as one of the most contested fields of psychological research. Ferguson (2013) has recently argued that the ruling by US Supreme Court on psychological research in the field of violent video games as unpersuasive and comprised of methodological flawed research may be a real threat/shock to the psychological field. Despite this argument it seems impossible to ignore the depth of research that exists in the field of violent video game research, and as such the current review aims to set out the main findings in the field during 2000-2012. The research exploring the impact of violent videogames has focused on four main areas: (i) Desensitisation (ii) aggressive cognition iii) aggressive behaviour, and (iv) aggressive affect.

Desensitisation

Studies conducted with children and adolescents suggest that videogame exposure correlates significantly with an acceptance amongst the children of physical aggression and decresased empathy (Anderson, Gentile & Buckley, 2007; Funk, et al, 2004; Krahe & Moller, 2004; Lemmens & Bushman 2006). Similar findings have been reported with studies conducted on young adults (Bartholow, Sestir & Davis, 2005; Anderson et al, 2004). Bartholow, Bushman and Sestir (2006) explored the role of the cognitive component of desensitisation to violent media, arguing that most previous research on this area has explored the emotional component of this effect. The researchers suggested that repeated exposure to violent videogames is "reflected in the brain as blunted evaluative categorisation of violent stimuli" (p.533). Sigurdsson, Gisli , Gudjonsson , Bragason, Kristjansdottir, Sigfusdottir (2006) found no significant correlation between empathy and exposure to violent media, such as violent films and videogames, although they did find the prevalent attitudes were the most consistent predictor of violent media use. The study revealed key gender differences in relation to violent video game play and so may not be relevant to female gamers, with only 3 per cent of females reporting weekly game use, as opposed to half of the male young adult players.

Bushman and Anderson (2009) conducted an experimental study on the short-term effects of playing violent videogames on helping behaviour (considered a key element of desensitisation following exposure to violent media). Undergraduate students (n=320) were assigned randomly to play either a violent or nonviolent game in a laboratory, which preceded them hearing a simulated fight outside the laboratory, where one person was left injured. The students' reaction times to help were recorded and rated as likelihood to perform helping behaviour. The results indicated that the students who had played violent videogames took significantly longer to respond to the incident (450% longer), not to hear the incident, and/or to consider the incident as not serious. The authors argued that the results suggest exposure to violent media can become numb to pain and suffering of others. It would be interesting to consider this research in relation to additional personal variables (for example willingness to help in other situations, levels of empathy) as these were not considered in the present study.

Aggressive cognition and affect

The experimental research on children playing violent videogames has been cited as a cause for concern for parents for children, and for national policy regarding the age ratings and monitoring of these games (Olson, Kutner & Beresein, 2007). It has been argued that violent media may increase the accessibility of aggressive thoughts. Studies with children have reported significant correlations between high patterns of violent videogame play and aggressive cognition (Anderson et al, 2004; Anderson, Gentile & Buckley, 2007; Colwell & Payne, 2000; Funk, Buchanan, Myers & Jenk, 2000).

Research with adults has found a significant increase in aggressive cognitions after playing a violent videogame (Anderson et al, 2004; Bartlett, Harris & Bruey, 2008; Carnagey & Anderson, 2004; 2005; Cicchirillo & Chory-Assad, 2006; Guimetti & Markey, 2007; Markey & Sherer, 2009). Ivory and Kalyanaraman (2007) reported that violent content in video games does not lead to increased accessibility of aggressive thoughts, although technological advancement was found to lead to a significant impact on adult participants (n=120) sense of presence, involvement, and physiological and self-reported arousal.

The research on aggressive affect has explored the concept of hostility and the development of hostility after playing of violent videogames. Ihori, Sakamoto, Kobayashi and Kimura (2003) tested 10- to 12-year old children and found that those that played more videogames displayed higher levels of hostility at a later date. Anderson, Gentile and Buckley (2007) found increased hostility and anger in adolescents who were exposed to high levels of violent videogames, whereas Gentile, Lynch, Linder and Walsh (2004) found a significant effect of trait hostility with a large group of 10- to 12-year olds (n=607). Funk, Hagen and Schimming (1999) research with children aged between 7 and 9 years indicated that the children displayed higher frustration levels after playing violent videogames, and higher levels of frustration were also observed in 12- to 18-year olds after playing violent games (Ballard, et al., 2001), while Flemming and Rickwood (2001) found that violent game play increased state anger in a group of 8- to 12-year old children. Greater hostile feelings have been found to be a significant aggressive affect after playing violent videogames in adults (Arriaga, Esteves, Carneiro & Monteiro, 2006; Ballard et al, 2001; Bartlett, Harris & Baldassaro, 2007; Carnagey & Anderson, 2005; Markey & Sherer, 2009). However, Nowak, Farrar and Krcmar (2008) reported no significant increases in hostility amongst adults (n=227), who played violent video games.

Aggressive behaviour

Research with children has reported an increase in aggressive behaviour with those that play violent videogames compared to those that play non-violent videogames (Anderson, Gentile & Buckley, 2007; Durkin & Barber, 2002; Konijin, Bijvank & Bushman, 2004). Numerous cross-sectional studies have reported a correlation between children who report high levels of violent game play and self-report or peer and teacher report of aggressiveness (Colwell & Payne, 2000 ; Funk, Buchanan & Germann, 2000; Colwell and Kato, 2003; Gentile, Lynch, Linder & Walsh, 2004; Krahe & Moller, 2004; Anderson, Gentile & Buckley, 2007). Similar findings have been reported with studies of undergraduate students, with higher levels of violent video-

game play correlating with aggressive verbal and physical behaviour (Anderson & Dill, 2000; Anderson et al, 2004; Anderson, Gentile & Buckley, 2007; Bartholow, Sestir & Davis, 2005; Carnagey & Anderson, 2005; Uhlmann & Swanson, 2004).

Experimental studies conducted with adult participants have reported that those who play violent videogames demonstrated higher levels of aggressiveness than those who play non-violent videogames prior to the competitive reaction time task (Anderson & Dill, 2000; Anderson & Carnagey, 2009; Anderson et al, 2004; Anderson, Gentile & Buckley, 2007; Anderson & Murphy, 2003; Bartholow & Anderson, 2001, 2002; Bartholow, Sestir & Davies, 2005; Carnagey & Anderson, 2005). Other researchers have employed indirect aggressiveness paradigms such as the administration of hot chilli sauce to an opponent (Fischer, Kastenmuller & Greitmeyer, 2010), asking how long an opponent should hold their hands in ice water (Ballard & Linenberg, 1999), and the prisoner's dilemma game (Brady & Mathews, 2006) and on cooperative actions (Sheese and Graziano, 2005).

Longitudinal adolescent research by Hopf, Huber and Weib (2008) demonstrated that exposure to violent videogames was the strongest risk factor for violent criminality and antisocial behaviour. The research highlighted the fact that children's exposure to violent media and (in particular) videogames was found at the early stages of adolescence and felt to be a significant factor in later aggressive behaviour. Gentile and Gentile (2008) conducted a three-year study of children, teenagers and adults and argued that across all three groups, exposure to violent videogames was associated with a direct observation of an increase in direct aggressive behaviour and in hostile attribution bias, which increased aggressive behaviour over the long-term.

Anderson, et al (2008) conducted a study exploring the effects of violent videogames on children and adolescents in two different cultures, with results suggesting a relationship between violent videogame play and aggression. As the research found similar effects in both the Japanese and US samples, the researchers concluded that the effects were regardless of the levels of societal physical violence and were found in individualistic and collective cultures. Following a large longitudinal study of children (n=2,550) study exploring media violence, Slater, Henry, Swaim and Anderson (2003) suggested a downward spiral effect can be observed that may be relevant to the effects of violent videogames on young people. This can increase young people's interest in, and desire to access increased amounts of violent media and can again lead to increased aggression in youth. It could be that youth are then more attracted to violent videogames which are interactive and engaging after prior long-term exposure to violent media. Moller and Krahe's (2009) longitudinal research with adolescents in Germany (n=295) led them to argue that even with low levels of exposure to violent video games, as they found in their study, there was evidence of a significant relationship between violent video game play and aggressive cognitions and behaviours.

Explaining the effects of videogames

Structure of violent videogames

The structure of videogames can be related to that of an optimal learning environment (Gentile & Stone, 2005; Gentile, 2011). These principles can be seen to be possible explanations for the attraction to and maintenance of gaming behaviour, and also to explain some of the effects of videogames on players. Swing, Gentile and Anderson (2008) relate the structure of videogames and their attraction to the use of established instructional principles in gambling. The use of progressing levels of difficulty and of practising several problem solving-strategies, may allow for a greater transference of skills to different settings. The researchers also argue that the structure of videogames with increasing levels that require the use of specific skills as a prerequisite to move to next levels, can be similar to the learning of sounds when a person is learning to read. Gentile (2011) claims that by understanding the dimensional nature of games, researchers can move beyond the simple arguments of games being seen as either good for or bad.

Videogames are an accessible media that can be marketed to all age ranges, societal level, and gender. Therefore, gaming is an activity that anybody can potentially become good at and achieve goals in. This may be a particularly important motive for young children, who value the accomplishment and pride in game playing (Funk, Chan, Brouwer, & Curtiss, 2006). Other structural characteristics of games such as manipulation and control features (e.g., built-in breaks, lay-out of save features (may also be important in facilitating ongoing playing (King, Delfrabbo & Griffiths, 2010).

Carnagey and Anderson (2005) conducted research exploring the effect of rewarding violent actions in videogames on aggression-related variables. The researchers argue that rewarding violent actions in videogames increases aggression through increasing violent thinking. Research has indicated that the increased aggression observed in violent videogames is not due to the competitiveness (Anderson & Carnagey, 2009; Carnagey & Anderson, 2005).

Barlett, Harris and Bruey (2008) suggest that in present forms of media, the levels of visible blood are increasing, and that the presence of blood is used to indicate greater violence in a scene. Farrar, Krcmar and Novak (2006) reported that the presence of blood in a violent videogame predicted more physical aggression amongst a group of adults (a finding also reported by Ballard and Weist, 1996) while Barlett et al (2008) reported that adults playing violent videogames with increased levels of blood led to an increase in participant hostility and physiological arousal.

Individual Characteristics

Guimetti and Markey (2009) argue that it is crucial to develop an understanding of any individual factors that may moderate the effects of violent videogames in order to understand and address any observed negative effects of playing such games. The person's internal state has also been discussed as important in determining the effect of violent videogames on players (Sigurdsson, et al, 2006; Unsworth, Devillyt & Ward, 2007). The downward spiral model argues that exposure to violent media may reinforce or exacerbate aggressive behaviours, feelings, and cognition the player already exhibits (Slater, Henry, Swaim & Anderson, 2003), while Sigurdsson et al (2006) argue that their findings can also be interpreted within the downward spiral model.

Markey and Sherer (2009) argued that violent videogames may affect individuals adversely if they have elevated levels of psychoticism (Lynn, Hampson & Aggi, 1989), while other researchers have proposed that individual motivations for playing a particular genre of games may play a role in moderating the effects of that game play (Dubow, Huesman and Greenwood, 2003) Mehroof and Griffiths (2010) suggested that sensation seeking, neuroticism, aggression, and state and trait anxiety have an influence in online gaming. This research was based on suggestion that people have particular personality traits that may make them more prone to addiction (Griffiths, 2010a). Chumbley and Griffiths (2006) found that impulsivity scores were not significant predictors of players likelihood of continuing to play, although they argued that the measures used in their research may not be sufficiently reliable to conclude that personality factors do not play a role in explaining the effects of videogame playing.

Developmental stages

Gentile, Lynch, Linder and Walsh (2004) contend that an additive effect is central to understanding the increase in aggression observed in adolescents and children exposed to media violence. Their cross-sectional research conducted with 617 adolescents suggests that a combination of high rates of hostility and exposure to violent videogames may put young people at risk of exhibiting higher levels of aggression. During adolescence, young people start to develop identities and researchers argue that media role models can be central at this stage of development to allow adolescents to experience possible selves (Griffiths, Davies & Chappell, 2004a; 2004b; Oyserman, Bybee, Terry Hart-Johnson, 2004). Konijin, Bijvank and Bushman (2004) argue that popular violent videogame characters are usually in control and suggest this may be a key source of attraction for young people to violent videogames. They also note that trait aggression and sensation-seeking peak during adolescence (Slater, Henry, Swaim & Anderson, 2003), and at this stage, risk-taking is thrilling, and violent videogames comprise risk-taking and danger. Researchers have argued that adolescence is a time of increased risk taking and novelty seeking (Gardner & Steinberg, 2005; DeVane & Squire, 2008; Steinberg, 2004), and in this sense video game play may be an attempt by the young person to seek acceptable levels of arousal and adventure-seeking emotions (Olson et al., 2008).

Hopf, Huber and Weib (2008) argued that a child's developmental stage of violent media exposure is a crucial consideration when exploring causality of antisocial behaviour. The authors argued that the frequent playing of violent videogames at the start of adolescence can be directly related to later violence and delinquency at the age of 14 years. In contrast, Ferguson, San Miguel and Hartley (2009) have argued that exposure to violent media is not solely predictive of youth violence and aggression. Their research conducted with young Americans indicated that videogame exposure along with depression, negative relationship with adults, exposure to family conflict, and abuse, were found to predict bullying in young people. However, bullying behaviour was best predicted by antisocial personality traits and delinquent peers, with videogame exposure as less significant.

Bushman and Huesmann (2006) have argued that the short-term effects of media violence were stronger for adults than for children and long-term effects may be stronger for children. In adults, these scripts will be already well elaborated and may have rich networks of associations that may allow for easier and quicker priming. Bushman and Huesmann (2006) argue that long-term effects of violent media exposure are due to children's learning of scripts for aggression through observation of others violent behaviour. In this context, the authors argue that the younger children should be more susceptible to encoding these aggressive scripts as they will not have any previous scripts to replace or modify. Buckley and Anderson (2006) also suggest that children are less likely to demonstrate short-term effects to violent media as associative memory network is underdeveloped compared to young adults, and this is particularly relevant for the interpretation of violent video game research, as a large amount of the research has been conducted on college attending participants.

Character identification and game involvement

Anderson, Gentile and Buckley (2007) have argued that due to their interactive nature, videogames may be more strongly related to aggression than non-interactive violent media such as television and film violence. Markey and Sherer (2009) explored the effect of direct involvement in videogames through the use of game console controls that allow the participant to act out the actions of the characters. The research found that motion controls did not intensify the effects of violent videogames on aggression. The authors' acknowledge that the effect of the motion controls may be more apparent on the exhibiting of aggressive behaviour, and this may be important to consider in the future with the use of more sophisticated movement controlled games.

Nowak, Krcmar and Farrar (2008) explored the effect of presence on players of violent videogames. The gamers who reported more frequent play also reported higher levels of presence. Those that reported higher levels of presence exhibited more physically aggressive intentions, in terms of reported hostility, aggressive intentions and verbal aggression than those who felt lower levels of presence. However, while research has indicated that players prefer realistic videogames rather than unrealistic ones (Griffiths & Hunt, 1995; Wood, Griffiths, Chappell & Davies, 2004), technological advancement has been reported as not intensifying the negative effect of videogames (Ivory & McGee, 2009; Tamborini et al, 2004). It is worth noting however that with increasingly sophisticated graphics we have not yet reached the stage of photorealistic interactive gaming and as such there is a constant need to revisit the research once a more realistic representation of reality within a gaming environment is designed.

Researchers have argued that the ability to identify with a character and to develop an attachment to this character allows for a greater immersion whilst playing (King, Delfrabbo & Griffiths, 2010). It can be argued that the ability to personalise a character can encourage greater identification with the character, a finding which the gaming industry is eager to encourage in more recent games (Klimmt, Hefner & Vorderer, 2009). In terms of identification, research has highlighted a possible relationship between levels of identification with videogame characters and aggressive behaviour (Konijin, Bijvank & Bushman, 2007). Similar research conducted by Fischer, Kastenmuller and Greitemeyer (2010) found that players who used their own personalised characters in a violent videogame exhibited more aggressive behaviour, compared to those that used non-personalised default characters.

Parental monitoring and cultural factors

Hopf, Huber and Weib (2008) argued that lack of parental monitoring together with frequent exposure to violent media can lead to a significant risk of child demonstrating antisocial behaviour during adolescence. Research on the effect of parental monitoring has provided clear evidence for a beneficial effect of such monitoring and mediation of media messages (Austin, 1993; Austin, Pinkleton & Fujioka, 2000; Dorr & Rabin, 1995). Research conducted with Japanese children indicate that they are less likely to have own television sets and games consoles (Anderson et al, 2010), and thus are more likely to play videogames in a public place where monitoring of inappropriate games may be possible. Research conducted with children in Ireland indicates that just over one-third of all nine-year olds had videogame consoles in their bedroom (GUI, 2009).

Cultural factors have been put forward as a possible moderator of the effects of violent media. Anderson et al. (2007) have argued that particular cultures (e.g., Japan) have high levels of media violence but have low levels of crime. This suggests there may be a difference in the context of the violence portrayed and the understanding of the violence. The authors also suggest that this finding supports the notion of exposure to violence as having only one risk factor for aggression. Lemmens and Bushman (2006) argued that a violence cycle can be observed in the exploration of videogame moderators and attraction to violent games. Aggressive children from lower educated backgrounds were found to be more attracted to violent games that increased aggression, that in turn lead to an increased appreciation and use of violent games. Konijn, Bijvank and Bushman (2004) contend that Dutch low education ability boys were more vulnerable to consuming violent media (although they did not test directly for this hypothesis). Hopf, Huber and Weib (2008) explored the effects of videogames on German adolescents with particular interest in children who were enrolled in the basic school system. The authors argued that this group of adolescents were particularly relevant to study as the majority of violent adolescent criminals were found to have low educational ability.

Conclusions

Ferguson (2007) has argued that a publication bias exists within the research that is published in the area of violent videogame effects. He has argued that many of the studies that have reported significant effects of videogame violence have used unreliable methodologies and that the convenience samples used in the majority of studies do not allow for a full consideration of the effects of violent games on real-life aggression. Anderson et al (2010) argued there was no publication bias in their own recent meta-analysis of the videogame violence literature, and have argued that the inclusion of methodologically weak studies in their meta-analysis had little effect. Other criticism of research exploring the effects of violent videogames has highlighted a number of general methodological difficulties with the research such as the use of small sample sizes and the games employed, which are not always matched in terms of additional structural and other factors (Gentile, 2005). Similarly, Anderson, et al (2010) have argued that the amount of time that participants are asked to play videogames in an experimental condition is often for a far shorter time than participants would play for if choosing to play the game themselves while Ferguson and Kilburn (2010) and Ferguson (2013) have argued that much of the research in the videogame violence field have used unstandardised measures of aggression that can inflate effect size estimates.

Despite the criticisms by Ferguson (2007; 2010) of meta-analysis conducted on studies exploring the effect of violent video games, one cannot ignore the comprehensive reviews that indicate violent game play has a significant effect on aggressive behaviour, affect, cognition and empathy across work conducted with over 130,000 participants. It does appear that while there are some methodological weaknesses in some of

the studies in this area, the effects have consistently been reported as significant findings with various age groups and in a number of different cultural settings.

Following on from these findings, the issue of monitoring the amount and content of videogames young people are exposed to may then be seen to be a key consideration. Roberts, Foehr and Rideout (2005) argue that young people's access to media is a major determinant in the amount of time spent accessing various media. Children who have a videogame console in their bedroom spend at least 32 minutes more each day playing console videogames than those without one in their bedroom. Gentile (2009) recently explored young people's game playing of American 'M' (Mature: 17+ years) rated videogames, and questioned how children were able to get access to these games. Almost half of those aged between 8 and 18 years got the videogame as a gift, and only 5% of those questioned stated that their parents did not know that they had purchased or received this game. In addition, Bijank, Konijin, Bushman and Roelosfma (2009) argued that age labels and violent content labels increase attractiveness of videogames, for all age groups, and across gender.

In addition to observed effects of videogame exposure, the issue of addiction to videogames and online videogames is also a concern as children and adults spend longer amount of time playing these increasingly sophisticated games. The role of structural characteristics of games that allow for a greater attraction to play and for increased learning are considered key elements in an understanding of excessive playing of videogames. Researchers have discussed the role of psychological processes that may be involved in explaining the effects of videogame play include changes in cognition or arousal, whilst moderators of the effects may include developmental stages of players, cultural factors, and key individual factors such as levels of psychoticism, individual differences in anger prior to playing, and a person's motivation for playing. The proposed moderators of videogame effects allow for an explanation of the individual differences in the effects of videogame exposure. In this sense, the arguments of cause and effect in relation to videogame exposure needs to be extended, to consider the role of additional factors peripheral and/or in addition to the videogame playing. When working with young people in particular, the development of protective factors, and reduction of any identified risk factors can be a constant challenge.

In terms of future research in the area of video game research, researchers have called for more rigid methodology and consistently highlighted the need for standardised measures of key variables such as aggression (for example, see Barlett, Anderson & Swing, 2009; Ferguson, 2013). The key disagreement in the video game research relates to the impact of violent content on players and more long term research is needed in this area in particular, with a focus on different age groups. It can be argued that more research is also needed on the possible mediators of such an effect of video game play on the players, exploring factors that may facilitate the learning or any behavioural, cognitive or affective changes in players. This may be a field of study that is particularly relevant in the field of violent video game play as researchers are in agreement on the multidetermined origin of aggression and as such the research in this field can focus on the various processes involved. DeVane and Squire (2008) have argued that video game players create their own interpretations of violence and representations in their play, and as such there is a need to consider different cultural groups in future research.

Recently the argument has been put forward that there is a need for maximising the positive effects of gaming while simultaneously minimising any harm that such gaming could be related to (Prot et al, 2012). Researchers agree that video games are important in people's lives and offer a key learning medium. Similarly, Gentile (2011) has suggested that by recognising the fact that games are comprised of key dimensions allows us to recognise possible positive and negative impact of video games. Therefore, the authors would argue that the time has passed to deny any potential benefits that video gaming offers and the attraction that exists to gaming, and instead to recognise any potential risks to gamers and to work within this framework when considering the impact and role of gaming within society now and in the future. It appears that there is a need to engage in comprehensive consideration of the amount, type, and consequences of game play, while allowing for an appreciation of the benefits of game playing within a technologically changing society.

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Resumen

Revisión: Los efectos psicológicos de los videojuegos en los jóvenes

La literatura científica muestra que la mayoría de los jóvenes pasa más tiempo delante de una pantalla que haciendo cualquier otra actividad, con la excepción de dormir (Strasberg, 2004). En Irlanda, un estudio longitudinal con niños encontró que más de la mitad de los niños de 9 años juega con videojuegos a diario, y la literatura internacional sobre adolescentes indica que la tasa crece cada año (Gentile, 2008). Se observa una preocupación que los efectos de los videojuegos sean más grandes que los efectos que se observaron en su momento con la televisión y las películas, y que los niños y jóvenes podrían estar expuestos a un riesgo mayor de sufrir efectos negativos como consecuencia de la exposición a videojuegos violentos. Esta revisión de la literatura pretende explorar el rol y el impacto de los videojuegos en la vida de los jóvenes en una sociedad tecnológica, y como se manifiesta este impacto. La exposición de los niños y adolescentes a videojuegoes violentos puede representar uno de los factores de riesgo para el desarrollo de conductas agresivas, y por eso, la comprensión de la investigación en esta área es de gran importancia para poder valorar plenamente la relación entre grado de exposición y riesgo. Se discuten las variables que pueden influir en el uso y efecto de los videojuegos violentos, como es el estadio evolutivo, el género, las características individuales, la cultura, el tipo de juego y el contenido. Se discuten también las recomendaciones que se pueden derivar de la investigación en relación al seguimiento del uso de los videjuegos.

Palabras clave: *videojuegos, violencia, niños, jóvenes*