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**Video gaming in adolescence: factors associated with leisure time use**

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## **Video gaming in adolescence: factors associated with leisure time use**

The geographies of the current generation of young people are markedly distinct from previous generations by virtue of their access to a virtual playground. The vast majority of young people now engage in video gaming as a leisure activity. Drawing on findings from the 2009/10 WHO Health Behaviour in School-aged Children study this paper set out to investigate the factors that might be associated with higher levels of video gaming. Information was collected from 4,404 school students aged 11, 13 and 15 years, using anonymised self-completed questionnaires. Higher usage was defined as game play exceeding two hours a day. Separate analyses were conducted for boys and girls. For both genders higher levels of game playing was associated with early adolescence, opposite sex friends and minimal parental mediation. Bullying and going to bed hungry were associated with higher usage for boys only, while life satisfaction and family activities were linked to girls' game playing only. Parents were identified as effective mediators of young people's video game usage. The study identified gendered motivations for higher levels of game play, suggesting different interventions for boys and girls may be required in order for young people to create a balanced approach to video gaming.

**Key words:** Video gaming, adolescence, gender, parental mediation

## **Background**

Over the last decade there has been a significant change in how children and young people spend their free time. Young people are less likely to socialise with friends outside the home, more likely to engage in adult regulated leisure activities and overall spend more time in the home (Karsten 2005). While this shift in the geographies of young people may mean that the current generation of youth are less likely to be engaging in exploratory or health risk behaviours with peers outside the home (Brooks et al. 2011), their in-home leisure activities have become a more significant component of childhood and adolescence. The lives of the current generation of young people are also markedly distinct from previous generations by their access to a virtual playground, both as individuals or socially with peers (Kuntsche et al. 2009). The vast majority of young people now engage, to a greater or lesser extent, in video gaming as a leisure activity (Olson et al. 2007). Recent data indicate that video gaming has shifted from an occasional leisure pursuit to a central leisure activity for the majority of young people, with a steady increase over the last decade in the amount of time young people spend playing video games during their leisure time, especially those in the early-middle years of adolescence (Brooks et al. 2011). The number of adolescents gaming for two or more hours on weekdays significantly increased in both boys and girls, from 42% to 55% and from 14% to 20% respectively, over the four year survey period between 2006 and 2010. This increase in video game usage amongst children and adolescents highlights that, whether due to advances in technology and its accessibility or social changes, gaming is a widespread and distinctive feature of the leisure pursuits of the current generation of young people.

Video games emerged as a leisure activity in 1972 when Pong, a computerised table

tennis game, became available. Initially, such games appeared in public arcades; following the advent of personal computers and games consoles video gaming became largely a home-based activity (Colwell and Payne 2000). As the video game industry has evolved games have become increasingly versatile, offering a range of platforms, modes and genres (Apperley 2006). Video games have more recently become accessible through mobile apps available on phones and tablets. Active video game consoles allow users to interact with the game physically (Dixon et al. 2010), and the ability to play online has advanced the multiplayer nature of gaming. A wide variety of genres have been developed (Granic et al. 2014), including strategic planning, fantasy, sports, shooting, and racing (Bilgihan et al. 2013). Moreover, video games are now being employed outside of entertainment, for instance in educational and therapeutic settings (de Freitas and Griffiths 2008; Connolly et al. 2012; King et al. 2012).

The video game industry has become a significant sector of the economy; the Call of Duty™ multiplayer game franchise release entitled Black Ops™ logged 2.6 million people playing the title globally and over 5.9 million hours on Xbox Live™ on launch day (Reisinger 2010). In the UK, 1.4 million copies of Call of Duty Black Ops™ were bought by British gamers on launch day (Dring 2010).

### **Negative associations with video gaming**

The possibility of negative effects from game playing has been highlighted almost since video gaming first became popular; Selnow (1984) explored the risk of impaired social development for children retreating into a fantasy world of games. Numerous studies have focused on the negative effects of video gaming upon the health and wellbeing of users, including impacts on muscle stiffness in the shoulder and sleep patterns (Tazawa and Okada 2001), increased food consumption (Chaput et al. 2011) and mental health (Gentile et al.

2004). Impaired school performance has been associated with video game usage (Jaruratanasirikul et al. 2009). Based on the "displacement hypothesis", school performance is affected because time spent playing video games displaces time usually dedicated to academic studies (Anderson et al. 2001). Cummings and Vandewater (2007) showed that for video gaming this displacement occurs both on weekdays and at the weekend. Video gaming research is often encompassed within the broader scope of screen-time; Page et al. (2010) identified young people watching television or using a computer for more than two hours a day as at risk of lower psychological wellbeing.

Most contested are the potentially negative effects of violent video game use on aggressive behaviours, including a reduction in pro-social and empathetic behaviour (Colwell and Payne 2000; Olson et al. 2007). At present, the data on violence and video games are inconclusive. Two meta-analyses produced contrasting findings, with Anderson presenting support for the notion of violent video game effects (Anderson et al. 2010), while Ferguson highlighted weak effect sizes and methodological issues (Ferguson 2007).

### **Positive associations with video gaming**

In recent years, research studies have also begun to identify how video gaming may not just function as a deficit or health risk behaviour but can also have positive effects (Granic et al. 2014). They have been shown to enhance prosocial behaviour (Gentile et al. 2009), and improve skills in social cooperation (Adachi and Willoughby 2012). Video games can increase levels of motivation and the strength of perseverance in the face of failure (Sweetser and Wyeth 2005). The playing of strategic video games has also been linked to improved problem solving skills, and therefore in turn associated with higher academic grades (Adachi and Willoughby 2013). The integration of video games into the curriculum can aid the communication of new ideas and can be a useful resource for academic learning (Squire

2006), and the use of active video games by young people can increase physical activity levels (Foley and Maddison 2010).

### **Gender differences**

Gender differences in video game play, both frequency and game type, have been consistently recognised across the literature (Greenberg et al. 2010; Homer et al. 2012). Boys spend more time playing video games during their leisure time; Olson et al. (2007) identified boys were three times more likely than girls to report playing video games for more than six hours a week (14.4% vs 44.6%). However, recent research indicates that game play by girls is on the increase (Brooks et al. 2011), suggesting a potential narrowing of the gender gap (Homer et al. 2012). Gender differences in game preference are well established; in a study by Greenberg et al. (2010) boys exhibited a preference for physical video games (sports, fighting, shooting games) whereas girls preferred traditional video games (classic arcade games, puzzles, card games). Furthermore, boys are more likely than girls to play age-inappropriate video games (Olson et al. 2007; Coyne et al. 2011). Desai et al. (2010) recommended future research should examine the role of gender after the identification of gendered associations with video game playing; gaming was associated with physical fights and weapon carrying among female gamers only. This paper explores whether the leisure time video game use of boys and girls is associated with differing domains of the adolescent world.

### **Policy responses**

Young people's screen time use, including video gaming, has been recognised as a public health concern internationally. Consequently, a number of countries and associations have

responded with recommended guidelines (Sigman 2012). The American Academy of Pediatrics recommended that young people limit their entertainment screen time to less than two hours a day (Council on Communications and Media 2009, 2013). Correspondingly, the US Department of Health and Human Services (2010) have pledged to increase the proportion of young people who do not exceed these recommended limits through the national initiative Healthy People 2020. The Australian government have proposed similar guidelines of up to two hours daily electronic media use (including television and video games) for young people aged 5 – 17 years (Department of Health [of Australia] 2011). In the UK, attention in the area of adolescent health has tended over the past decade to focus on targeted actions to address specific health risk behaviours, such as alcohol consumption, smoking, and teenage pregnancy. However, the recent Public Health Outcomes Framework (Department of Health 2012) raises the issue of the negative impact that video gaming, beyond modest recreational use, may have on young people and highlights a commitment to monitor levels of game playing of two hours or more per weekday. It appears the widespread concern surrounding young people's screen time use, including time spent video gaming, is centred on a maximum time limit of two hours per day. Based on policy recommendations, the present study seeks to identify the traits of young people who are exceeding these limits for video gaming on weekdays.

### **Parental mediation**

Given that much video game playing takes place in the family home, those with parental responsibility may be ideally placed to influence the amount of time spent gaming by their children, and are likely to be crucial to the successful impact of policy guidelines concerning screen time in general and video game use specifically. The role of parents in negotiating

leisure activities with adolescents has been under-researched to date when compared to peer influences, although there is an increasing awareness of the continued significance of both parental mediation and shared leisure activities during adolescence (Marshall 2014). Many parents have expressed concerns about the impact of gaming on young people and consequentially monitor their own children's use of video games (BBC 2007; Nikken et al. 2007). Often referred to as parental mediation, the three main approaches are 'restrictive mediation', 'evaluative/ active mediation' and 'conscious co-playing' (Nikken and Jansz 2006).

Restrictive mediation involves the use of time limits, assessment of the content of games before purchase, and the operation of 'rewards and punishment' systems in which, for instance, gaming may be allowed if homework is completed. Active mediation is less authoritative and includes joint discussion of the content of particular video games and parental expressions of approval or disapproval. With co-playing, parents play the video games with their children in order to assess the content. Many parents employ a mix of these methods (Nikken and Jansz 2006).

A Kaiser Family Foundation survey raised concerns that only 20% of children had parental rules about which video games to play, but in comparison nearly 50% of children reported having parental rules concerning television viewing (Roberts et al. 2005). However, in recent times, parental monitoring appears to have become more common. This may be due to high profile examples of extreme violence associated with intense playing of violent video games (e.g. The Telegraph 2013; Mail Online 2012). Lenhart et al. (2008) found that 90% of parents were concerned about the content of the video games played by their children, 46% had sometimes stopped play due to the nature of the material, and 57% of those who co-played with their children did so at least partly in order to monitor game content. Another study found that time limits on video game playing are exercised by around 80% of parents,



and a similar proportion expect parental permission to be obtained before a game is rented/purchased (Entertainment Software Association 2013).

Gentile et al. (2004) established influential findings which indicate parental influence mediates the effects of violent video game exposure on aggressive behaviour in the real world. Parental monitoring was negatively associated with arguments with teachers and physical fights. Moreover, the parents of adolescents who have been involved in fights were less likely to have checked rating of video games or put time limits on their video game playing. Parental monitoring has also been associated with positive outcomes such as academic achievement (Gentile et al. 2004; Gentile et al. 2011) and the enhancement of pro-social behaviours (Gentile et al. 2011). The literature suggests those with parental responsibility may be an important contributing factor to young people's video gaming; we will explore the association between parental monitoring and varying levels of game play among boys and girls.

### **Aims and objectives**

The present study set out to further advance existing work identifying the factors associated with video gaming in adolescents during self-directed leisure. Almost all recent reports have considered the average number of hours spent playing per day or week (Roberts et al. 2005; Olson et al. 2007) although some earlier studies also investigated the length of play per session (Colwell and Payne 2000). Typically the degree of the impact on the player, whether harmful or beneficial, is positively associated with the extent of use, be it in terms of prolonged periods of play or substantial daily engagement. More recently, Przybylski (2014) identified the nuanced nature of video game play, providing a broader perspective of video gaming in adolescence. Video gaming cannot be polarised as positive or negative; low levels

(< 1 hour) of video game play were beneficial for young people whereas higher levels (> 3 hours) were associated with negative outcomes.

In light of this recent development, it is imperative the structures underpinning young people's leisure time use of video games are explored. The aim of this paper is to identify factors that may influence the duration of time young people are engaging with video games for leisure on weekdays. This paper seeks to investigate whether the weekday degree of involvement of boys and girls is associated with different domains of the adolescent world among a large representative sample of young people in England. Drawing on the literature, levels of weekday video gaming among adolescent boys and girls are explored in relation to health and wellbeing, health behaviours and social factors. In particular, the impact of parental control over free time will be explored in relation to duration of weekday video gaming. In the present paper video gaming is defined as the playing of any video game for entertainment purposes during self-directed leisure time on either a computer or console, excluding game playing in other contexts such as educational or therapeutic settings.

In line with the national and international policy recommendations, the findings are intended to shed light on the characteristics of young people exceeding the stipulated guidelines of up to two hours game play on weekdays. Henceforth, game play of more than two hours on weekdays will be referred to as 'higher use' in line with policy recommendations.

## **Methodology**

The Health Behaviour in School-aged Children (HBSC) study is an international World Health Organization (WHO) collaborative project focusing on the determinants of the health and well-being of young people, primarily focused on those aged between 11 and 15 years (Brooks et al. 2011). Information is gathered through anonymised self-completed

questionnaires. For the research conducted in England, these are targeted at adolescents aged 11, 13 and 15 (UK school years 7, 9 and 11). Survey questions are generally scored as either binary (e.g. gender) or as a Likert scale (e.g. strongly disagree, disagree, neither agree nor disagree, agree, strongly agree).

The findings reported in this paper are based on the HBSC England survey conducted in 2009/10. A random sample of all secondary schools in England (state and independent) stratified by region, school type and school size was involved. An additional booster sample targeting schools with high proportions of students from ethnic minority backgrounds was also drawn. Prior to participation, informed consent was obtained from each student and those with his/ her parental responsibility (Brooks et al. 2011). Following data cleaning, responses from 4,404 students grouped in 197 school classes were available for analysis. The final sample was representative of regional spread, school type and size; and was comparable with census data. The response rate at the student level exceeded 90%.

For the 2009/10 survey, involvement in video gaming was assessed by the question “About how many hours a day do you usually play games on a computer or games console (Play station, Xbox, GameCube etc.) in your free time?” the options being based on whole numbers of hours. Participants were asked to respond separately for weekdays (i.e. school nights) and days at the weekend. The present study explores weekday use only. Responses were categorised into “up to about one hour a day”, “about 2 or 3 hours a day” and “about 4 or more hours a day”.

The exploratory variables involved in the present analysis encompass demographics, the social context and health and wellbeing of young people. Demographic factors involved in the analysis were age, family structure (mother and father in main home) and proxy measures of social economic status including the Family Affluence Scale (Currie et al. 2008), self-reported perception of the family being well-off and frequency of going to bed hungry.

Indicators of the young person's social relationships and environment within the family domain include participation in activities with family members, ease of communication with family members and parental input into free time. Social networks were examined in terms of the numbers of same sex and opposite sex friends, ease of communication with friends, influence on friends regarding activities undertaken together and involvement in physical fights. Young people's school life was assessed through bullying involvement as either perpetrator or victim in the previous two months, perceived sense of achievement and degree of liking school. Issues relating to health and wellbeing were assessed by self-reported life satisfaction, perception of body size, perceived level of health and number of times injured in the past year. Health behaviours included the use of cigarettes, alcohol and cannabis. The HBSC study uses internationally validated measures to assess key elements of adolescent health and wellbeing, health behaviours and the social environment (Roberts et al. 2009); including the Cantril ladder to assess life satisfaction on a whole number scale from 0 - 10 (Cantril, 1965) and bullying measures derived from the revised Olweus Bully/Victim Questionnaire (Olweus,1996). (See Currie et al. 2011 for full discussion of HBSC measures).

Separate analyses were conducted for girls and boys, as it was thought factors associated with video gaming might differ between boys and girls. Analyses were adjusted for age and a range of additional health indicators and social factors.

### **Statistical methods**

Since daily involvement in video gaming was assessed in terms of three categories (up to 1, 2 to 3, 4 or more hours), analyses were conducted using multinomial logistic regression (Hosmer and Lemeshow 2000), an extension of the multiple logistic regression technique used with binary outcome variables. Ideally, the analysis would have been carried out using multilevel modelling because the data are organised in a hierarchical manner (i.e. students grouped into

classes which are grouped into schools). However, software to undertake multinomial logistic regression and also allow for the weights in the dataset is not readily available (standard software such as SPSS does not provide this option, nor does specialist multilevel modelling software such as MLwiN or the statistical programming language R that was used for this analysis). Previous investigations that undertook similar analyses to those presented here indicated that the multilevel effects were negligible; very small intraclass correlation coefficients have been found in other classroom based studies, e.g. Gámez-Guadix et al. (2013). Thus, in order for the analyses presented here to be made feasible, the multilevel component has been omitted. Stepwise regression was used to identify from the original set of explanatory variables those factors that had a significant association with the outcome variable. As the variables being considered for inclusion in the model were all being treated on an equal basis, with no prior assumptions being made about their relative importance, stepwise regression was considered a more appropriate method than others where such assumptions would be needed. Possible interactions involving the explanatory variables were also investigated. The software R (version 2.14.1) was used with the multinom command of the nnet package (version 7.3-1).

Variables considered for inclusion in the model had been chosen because it was plausible that they would be associated with the amount of daily involvement in video gaming. This meant that it was unlikely that any variables in the final models would be suppressor effects. To provide additional confidence in this regard, the univariate associations between the variables in the final models and the dependent variable were checked (no evidence of suppressor effects were detected).

## Results

### *Overall findings*

For girls, the following variables were identified as being significantly associated with daily involvement in video gaming: age (11, 13, 15); number of opposite sex friends (0, 1, 2, 3+); life satisfaction (as a continuous variable); number of family activities undertaken at least once a week (as a continuous variable); level of own involvement in decision making regarding free time outside school (I decide, all discuss but I decide, all discuss but parents decide, parents decide).

For boys, the variables identified as being significantly associated with daily involvement in video gaming were: age (11, 13, 15); number of opposite sex friends (0, 1, 2, 3+); being bullied in the past 2 months (haven't, once or twice, 2 to 3 times per month, once a week, several times a week); bullied others in the past 2 months (haven't, once or twice, 2 to 3 times per month, once a week, several times a week); going hungry to bed (never, sometimes, often, always); level of involvement in decision making outside school (I decide, all discuss but I decide, all discuss but parents decide, parents decide).

An overview of the findings from this study is presented in Table 1. Students aged 15 years were least likely to engage in higher levels of video gaming whereas boys aged 13 were particularly prone. Higher use was also associated with having one or more opposite sex friends and freedom from parental input regarding use of free time. For girls, lower life satisfaction and a higher number of weekly family activities increased the risk. For boys, bullying on at least a weekly basis and going to bed hungry often (but not always) heightened the likelihood of a substantial level of video gaming.

[Table 1 near here]

### ***Detailed findings***

The results are given in tables as odds ratios (ORs) with 95% confidence intervals (CIs), and the associated *P*-values. Due to the large number of comparisons, only those for which the *P*-value is less than 0.01 have been highlighted. For the comments below, the comparison group is “up to about 1 hour per day” except where indicated.

Results by age are shown in Table 2. For girls, the odds of those aged 15 years engaging in video playing for “about 2 or 3 hours a day” were lower than for those aged 11 or 13. In a similar pattern, the odds were reduced for “about 4 hours or more a day” compared to those aged 11 or 13. For boys, the odds of those aged 15 playing for “about 2 or 3 hours a day” were much lower than for those aged 13 (OR 0.67; 95% CI 0.51-0.89). A similar reduction was found regarding gaming for “about 4 or more hours a day” (OR 0.56; 95% CI 0.40-0.77).

[Table 2 near here]

Relative to girls with only same sex friends, the odds of playing “about 2 or 3 hours a day” for girls who were friends with at least 3 boys were higher (OR 2.32; 95% CI 1.36-3.96), and were further pronounced for “about 4 or more hours a day” (OR 4.30; 95% CI 1.43-12.89). Compared to boys with only same sex friends, the odds of playing “about 2 or 3 hours a day” for boys who had at least one female friend were higher. However, consistent findings were not evident for the category “about 4 or more hours a day” (see Table 3).

[Table 3 near here]

For the level of involvement in decision making for time outside school, the odds of girls who responded “My parents and I decide but I usually can do what I want” or “My parents and I decide but I usually do what my parents want” gaming for “about 4 or more hours a day” were lower relative to those who decided for themselves. With boys, for the level of involvement in decision making for time outside school, the odds of those who

responded “My parents and I decide but I usually can do what I want” or “My parents and I decide but I usually do what my parents want” gaming for “about 2 or 3 hours a day” were lower relative to those who decided for themselves. There was a similar reduction in the odds for the “about 4 or more hours a day” category (see Table 4).

[Table 4 near here]

Table 5 shows that for girls, for a one unit increase in the life satisfaction score, the odds of “about 2 or 3 hours a day” play were reduced (OR 0.89; 95% CI 0.82-0.96), with a greater reduction for “about 4 hours or more a day” (OR 0.77; 95% CI 0.68-0.86). In addition, for girls for each increase of one in the number of family activities, the odds of being in the “about 2 or 3 hours a day” category as opposed to the “up to about 1 hour a day” category were raised (see Table 6).

[Table 5 near here]

[Table 6 near here]

With boys, the odds of those who “often” went to bed hungry being in the “about 4 or more hours a day” category were much higher relative to those who “never” or just “sometimes” went to bed hungry (see Table 7).

[Table 7 near here]

Being bullied once a week resulted in higher odds of gaming for “about 4 or more hours a day” (OR 2.91; 95% CI 1.52-5.60) compared to those who had not been bullied. For those who had been bullied several times a week, the increase was even more striking (OR 5.17; 95% CI 2.18-12.24) (see Table 8). For boys who had bullied others once a week, the odds of being in the “about 4 or more hours a day” category were considerably higher than for those who had not bullied (OR 4.98; 95% CI 1.87-13.22). A similar trend was found when considering those who bullied others several times a week (see Table 9).



[Table 8 near here]

[Table 9 near here]

## **Discussion**

The findings of this study identify characteristics of young people who are most likely to be higher users of video gaming on weekdays; both positive and negative factors influencing higher video gaming were established. Moreover, while boys and girls share a number of characteristics predicting game use, this study also highlights important gendered associations.

Across both genders, two or more hours of gaming on a weekday was less common with students aged 15 compared to those aged 11 or 13. Our findings are consistent with other studies which indicate game playing is most popular with younger teenagers (Greenberg et al. 2010). Therefore this study may provide evidence that gaming to excess is part of the adolescent maturation process and becomes less important as the time committed to further study or employment increases. However, those who continue to commit higher amounts of time to game playing in later adolescence may be more likely to experience negative consequences such as low educational attainment (Wolfe et al. 2014). The experiences and outcomes for adolescent gamers during the key public examination years within the UK and European educational systems warrant further attention.

Gaming of 2 to 3 hours per day for both boys and girls was associated with having several opposite sex friends. This strengthens the evidence that gaming is frequently played in groups, contrary to the stereotype of the lone socially isolated individual who games in preference to mixing with others (Selnow 1984). This social nature of video game playing has also been identified in the US, where in 2008 only 25% of game players were found to always play alone (Lenhart et al. 2008). Recent technological advancements have no doubt

improved the social nature of video gaming; the ability to play online creates virtual worlds where gamers can play simultaneously and collectively thereby facilitating a shift in the way that gamers relate both to the virtual world of the game but also to other gamers. This social aspect of gaming and impact on social networks and the maintenance and establishment of adolescent friendship groups is likely to be an important factor shaping the nature of adolescent friendships.

In terms of making choices about the use of free time outside school, those who reported parental input into the decision making were less likely to engage in higher video game usage than those who had complete autonomy. However, this difference was smaller for those who had to adhere to their parents' decisions i.e. parents who had more authoritarian control over decision-making processes in the family. It is possible that for some, a degree of resentment occurred towards parental control and that this level of control was counterproductive leading to greater covert playing. This finding was true for both genders and both levels of engagement, suggesting that a tactful rather than authoritarian approach might be more effective. Shin and Huh (2011) established a similar "boomerang effect", where adolescents who received greater levels of parental mediation played video games more frequently.

Boys who reported that they often went hungry to bed were more likely to play for 4 or more hours a day. The specific measure in the HBSC study was designed to address food poverty (Currie et al. 2011), but interpretation of the findings may indicate more complex nuances. Of interest, this increase was not found for those who always went to bed hungry. It could be assumed those who always went to bed hungry are demonstrating food poverty and the lack of higher gaming indicates insufficient resources to purchase gaming equipment, whereas those who reported often going to bed hungry may have engaged in meal skipping deliberately or inadvertently as a result of intensive focus on video game playing. Meal

skipping is a recognised consequence of gaming; it is most common among boys and those who play video games at least four times a week are nine times more likely to skip a meal than those who never play (Van den Bulck and Eggermont 2006).

For boys, both bullying victimisation and perpetration on a regular basis were associated with the highest levels of video gaming. There has been significant research regarding aggressive behaviour as a consequence of video gaming, in particular in relation to the playing of violent video games (e.g. Gentile et al. 2004); but there is little in the research literature on whether or not higher gaming involvement can result from being bullied or bullying others.

It is challenging to disentangle the interrelationships between being bullied, bullying, and higher levels of video gaming; this study did not measure the use of violent video games specifically. Only a few anecdotal reports exist of bullied children resorting to video games as a form of escape (Another Castle 2013) although peer victimisation has been associated with extreme internet use (Strittmatter et al. 2014). Adolescents have indicated that game playing can be used as a form of emotional regulation because it helps them to relax, forget their problems and to manage their anger, which may explain higher video gaming among victims of bullying (Olson et al. 2007). It is intriguing that both the victims and perpetrators had a tendency to be higher game users and knowing whether these individuals play alone or with acquaintances might assist in the understanding of this observation. These seemingly opposing findings may be explained in part by the circular nature of bullying; the different roles within bullying are not distinct and there exists the bully-victim who can be both the instigator and the receiver.

Of concern, girls with lower levels of life satisfaction were more likely to engage in higher video gaming. Similarly to victims of bullying, it is credible that these girls may see engagement in a virtual world as an escape from the stressors and challenges of everyday life.

This finding is in line with the association that has been reported for adolescents between video game exposure time and subjective motivations such as a wish to escape from the worries of everyday life (Wallenius et al. 2009).

The number of family activities undertaken on at least a weekly basis was positively associated with extended video gaming among girls. This difference between the sexes has been reported elsewhere; Cummins and Vandewater (2007) also found that the time spent playing video games with parents and the time spent with parents in other activities were positively associated for girls but not for boys. Some of the family activities listed in the questionnaire may in themselves encourage the initiation of a gaming session (e.g. watching TV together, visiting friends or relatives together, sitting and talking about things together) although why this association might exist only for girls but not boys is unclear. Potentially it could be that girls are more likely to engage in games that lend themselves to physical shared game play across generations, such as, dance or singing games. In contrast, boys may be more likely to play games that have a greater appeal to their peers, such as first person shooter games. Game type would be worthy of further exploration given that time spent in family activities and interaction has been found to be associated with well-being (Maynard and Harding 2010), and such gendered differences could have important implications for the role of family life in the promotion of well-being among adolescents.

Specific information on the use of virtual games was not collected via the questionnaire, although the family activities section referred to the frequency of playing indoors games together. Traditionally board games may have featured strongly, but it is likely that video gaming now predominates. The co-playing of video games with parents by girls has been associated with a number of positive outcomes including lowered depression and increased parent-child connectedness (Coyne et al. 2011); it is possible that these positive associations encourage more co-playing time among parents and daughters. Studies

conducted in the US have shown that more than 30% of parents play at least weekly with their children (Lenhart et al. 2008; Entertainment Software Association 2013). Video gaming is likely to not only be shaping parental child time spent together but also sibling interactions; co-playing between siblings no doubt contributes substantially to family based video gaming. The Entertainment Software Association report for 2013 stated that 16% of all gamers, including adults and children, play with parents, whereas 32% play with other family members, and 42% play with friends. How families may be engaging with video gaming together and the impact on family interactions requires further attention.

Despite the contributions of this research, it is not without its limitations. The self-report nature of the data relies on young people's perception of video gaming, and the breadth of the HBSC England survey prevents video gaming from being studied in detail. The cross sectional design of this study prevents causal relationships from being inferred; the direction of these relationships is open to consideration. The characteristics identified may be both predictors and/or outcomes of video gaming; it is feasible that low life satisfaction may propel girls into the higher video gaming culture but equally high usage may indirectly impact upon life satisfaction through feelings of loneliness and isolation. A longitudinal study would allow the temporal nature of these relationships to be explored. It must also be acknowledged that while this paper identifies the characteristics of high video game users, this study does not address video game addiction. Video game addiction is not officially recognised as a clinical disorder, but studies have demonstrated pathological symptoms among small numbers of gamers (Gentile 2009). While video game addicts undoubtedly play frequently, an addiction involves more than just high game play; pathological gaming results in impaired social and psychological functioning (Lemmens et al. 2011). Consequently, identifying pathological gaming was outside of the scope of this study.

Despite these limitations, this study identified important characteristics of those young people who are most at risk of exceeding the recommended guidelines of no more than 2 hours of screen time including specific recommendations of video game play on weekdays (Council on Communications and Media 2009; Department of Health 2012); and consequently those who may be prone to the negative effects of video gaming. Across both genders, early adolescents are most vulnerable to higher levels of gaming, especially those who perceive no parental input into the decision making regarding the use of their free time. Of great importance, it is becoming increasingly evident that parents and other family members can act effectively as mediators in the use of video games. It is concerning that in this study a significant number of young people reported no parental involvement in deciding on the use of their free time. The UK Department of Health guidelines and other similar international recommendations (Council on Communications and Media 2009; US Department of Health and Human Services 2010; The Department of Health 2011) are more likely to be attained if parents and other role models within the family take an active interest in the leisure activities of those members who are in the transition from childhood to adulthood. Teachers may also play a role in addressing higher levels of video gaming by highlighting their concern on the records of individual students.

Crucially, this study identified gender differences in associations with high video game usage; low life satisfaction was identified as a characteristic of higher game users among girls while bullying perpetration and victimisation was associated with boys. Gender also appears to be associated with both amount of play and game type (Homer et al. 2012). In addition, as already noted, gaming in boys is not associated with as many health factors as for girls (Desai et al. 2010). These gender differences may be a reflection of the male dominated culture of video gaming; gaming is a predominately male phenomenon with females comprising a minority of players.

## **Conclusion**

This study has further added to the identification of the nuanced nature of video game play found by others (Przybylski 2014). Factors associated with young people's gaming involvement were both positive and negative, including greater social relations with both peers and family but also increased likelihood of reduced life satisfaction. Young people, especially boys, who reported playing video games for 4 or more hours a day on weekdays may be of particular concern, as this highest level of game play was associated with negative experiences such as bullying and going to bed hungry.

The role of families and parents during adolescence represents an area of increasing interest for researchers. The findings presented in this paper highlight the significance of parental involvement in new forms of adolescent leisure activities, in terms of both regulating and structuring young people's game play.

The present research suggests gendered interventions may be necessary to address successfully those who are engaging in very high levels of gaming with the associated negative consequences to their overall well-being. Further work is necessary to understand fully the different determinants of higher and continued video game use among boys and girls throughout adolescence.

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Table 1: Summary of overall findings for prolonged video gaming

Variable	Girls		Boys	
	2 or 3 hours per day <sup>#</sup>	4 or more hours per day <sup>#</sup>	2 or 3 hours per day <sup>#</sup>	4 or more hours per day <sup>#</sup>
Age (years)	Most likely for students aged 11	Least likely for students aged 15	Most likely for students aged 13	Most likely for students aged 13
Number of opposite sex friends	More likely for those with opposite sex friends	More likely for those with opposite sex friends	More likely for those with opposite sex friends	No overall pattern
Involvement in free time decision making with parents	Less likely if parents involved in decision making	Less likely if parents involved in decision making	Less likely if parents involved in decision making	Less likely if parents involved in decision making
Life satisfaction	More likely with low life satisfaction	More likely with low life satisfaction	N/A	N/A
Number of family activities undertaken weekly	More likely with a high number of family activities	N/A	N/A	N/A
Going hungry to bed	N/A	N/A	No overall pattern	More likely if often going hungry
Been bullied	N/A	N/A	No overall pattern	Much more likely with at least weekly bullying

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Initiated bullying	N/A	N/A	No overall pattern	Much more likely with at least weekly bullying
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Key

# Relative to “up to about 1 hour a day”

N/A Not applicable



Table 2: Video gaming on weekdays by age

<b>Odds ratios (with 95% CIs and <i>P</i>-values)</b>						
<b>Time spent</b>	Age 13 compared with		Age 15 compared with		Age 15 compared	
	age 11		age 11		with age 13	
	Girls	Boys	Girls	Boys	Girls	Boys
“About 2 or 3 hours a day” compared with “Up to about 1 hour a day”	0.757, (0.550, 1.043), <i>P</i> =0.089	1.159, (0.876, 1.535), <i>P</i> =0.301	<b>0.424,</b> <b>(0.291,</b> <b>0.616),</b> <b><i>P</i>&lt;0.001</b>	0.782, (0.585, 1.044), <i>P</i> =0.096	<b>0.559,</b> <b>(0.386,</b> <b>0.811),</b> <b><i>P</i>=0.002</b>	<b>0.674,</b> <b>(0.509,</b> <b>0.894),</b> <b><i>P</i>=0.006</b>
“About 4 or more hours a day” compared with “Up to about 1 hour a day”	1.078, (0.658, 1.766), <i>P</i> =0.766	1.218, (0.887, 1.673), <i>P</i> =0.222	<b>0.350,</b> <b>(0.185,</b> <b>0.666),</b> <b><i>P</i>=0.001</b>	0.678, (0.484, 0.951), <i>P</i> =0.024	<b>0.325,</b> <b>(0.179,</b> <b>0.592),</b> <b><i>P</i>&lt;0.001</b>	<b>0.557,</b> <b>(0.403,</b> <b>0.768),</b> <b><i>P</i>&lt;0.001</b>

Table 3: Video gaming on weekdays by number of opposite sex friends

Odds ratios (with 95% CIs and <i>P</i> -values)						
	“One” compared with “None”		“Two” compared with “None”		“Three or more” compared with “None”	
	Girls	Boys	Girls	Boys	Girls	Boys
“About 2 or 3 hours a day” compared with “Up to about 1 hour a day”	1.869, (0.948, 3.686), <i>P</i> =0.071	<b>1.938,</b> <b>(1.180,</b> <b>3.183),</b> <b><i>P</i>=0.009</b>	2.162, (1.156, 4.043), <i>P</i> =0.016	<b>2.074,</b> <b>(1.265,</b> <b>3.401),</b> <b><i>P</i>=0.004</b>	<b>2.318,</b> <b>(1.358,</b> <b>3.959),</b> <b><i>P</i>=0.002</b>	<b>1.703,</b> <b>(1.153,</b> <b>2.517),</b> <b><i>P</i>=0.007</b>
“About 4 or more hours a day” compared with “Up to about 1 hour a day”	4.370, (1.262, 15.128), <i>P</i> =0.020	0.801, (0.426, 1.506), <i>P</i> =0.491	1.511, (0.381, 5.991), <i>P</i> =0.557	1.789, (1.027, 3.116), <i>P</i> =0.040	<b>4.292,</b> <b>(1.429,</b> <b>12.891),</b> <b><i>P</i>=0.009</b>	1.512, (0.979, 2.333), <i>P</i> =0.062

Table 4: Video gaming on weekdays by level of involvement in decision making regarding free time outside school

<b>Odds ratios (with 95% CIs and <i>P</i>-values)</b>						
<b>Time spent</b>	“My parents and I decide but I usually can do what I want” compared with “I usually decide”		“My parents and I decide but I usually do what my parents want” compared with “I usually decide”		“My parents usually decide” compared with “I usually decide”	
	Girls	Boys	Girls	Boys	Girls	Boys
“About 2 or 3 hours a day” compared with “Up to about 1 hour a day”	0.675, (0.493, 0.926), <i>P</i> =0.015	<b>0.504,</b> <b>(0.389,</b> <b>0.653),</b> <b><i>P</i>&lt;0.001</b>	0.653, (0.421, 1.013), <i>P</i> =0.057	<b>0.514,</b> <b>(0.347,</b> <b>0.762),</b> <b><i>P</i>=0.001</b>	0.775, (0.358, 1.679), <i>P</i> =0.518	0.539, (0.303, 0.959), <i>P</i> =0.036
“About 4 or more hours a day” compared with “Up to about 1 hour a day”	<b>0.400,</b> <b>(0.235,</b> <b>0.683),</b> <b><i>P</i>=0.001</b>	<b>0.448,</b> <b>(0.333,</b> <b>0.602),</b> <b><i>P</i>&lt;0.001</b>	<b>0.339,</b> <b>(0.151,</b> <b>0.759),</b> <b><i>P</i>=0.009</b>	<b>0.281,</b> <b>(0.163,</b> <b>0.482),</b> <b><i>P</i>&lt;0.001</b>	0.529, (0.150, 1.867), <i>P</i> =0.322	0.429, (0.219, 0.840), <i>P</i> =0.014

Table 5: Video gaming on weekdays and life satisfaction (girls)

Time spent	Odds ratios (with 95% CIs and <i>P</i> -values)per one unit change
“About 2 or 3 hours a day” compared with “Up to about 1 hour a day”	<b>0.887,(0.818, 0.961),<i>P</i>=0.003</b>
“About 4 or more hours a day” compared with “Up to about 1 hour a day”	<b>0.766,(0.682, 0.861),<i>P</i>&lt;0.001</b>

Table 6: Video gaming on weekdays and number of family activities undertaken at least once a week (girls)

<b>Time spent</b>	<b>Odds ratios (with 95% CIs and <i>P</i>-values) per one unit change</b>
“About 2 or 3 hours a day” compared with “Up to about 1 hour a day”	<b>1.159,(1.078, 1.246),<i>P</i>&lt;0.001</b>
“About 4 or more hours a day” compared with “Up to about 1 hour a day”	1.138,(1.018, 1.273), <i>P</i> =0.023

Table 7: Video gaming on weekdays by frequency of going hungry to bed (boys)

<b>Odds ratios (with 95% CIs and <i>P</i>-values)</b>						
<b>Time spent</b>	“Often” compared with “Always”	“Sometimes” compared with “Always”	“Never” compared with “Always”	“Sometimes” compared with “Often”	“Never” compared with “Often”	“Never” compared with “Sometimes”
“About 2 or 3 hours a day” compared with “Up to about 1 hour a day”	1.624, (0.366, 7.202), <i>P</i> =0.524	0.818, (0.239, 2.799), <i>P</i> =0.750	1.047, (0.313, 3.501), <i>P</i> =0.941	0.504, (0.200, 1.272), <i>P</i> =0.147	0.645, (0.262, 1.587), <i>P</i> =0.339	1.279, (0.952, 1.718), <i>P</i> =0.102
“About 4 or more hours a day” compared with “Up to about 1 hour a day”	3.028, (0.788, 11.631), <i>P</i> =0.107	0.520, (0.166, 1.631), <i>P</i> =0.262	0.538, (0.176, 1.642), <i>P</i> =0.276	<b>0.172,</b> <b>(0.075, 0.391),</b> <b><i>P</i>&lt;0.001</b>	<b>0.178,</b> <b>(0.081, 0.392),</b> <b><i>P</i>&lt;0.001</b>	1.035, (0.750, 1.429), <i>P</i> =0.835

Table 8: Video gaming on weekdays by bullying victimisation in the past 2 months (boys)

<b>Time spent</b>	<b>Odds ratio (with 95% CIs and <i>P</i>-values)</b>			
	“Once or twice” compared with “Haven’t”	“2 to 3 times per month” compared with “Haven’t”	“Once a week” compared with “Haven’t”	“Several times a week” compared with “Haven’t”
“About 2 or 3 hours a day” compared with “Up to about 1 hour a day”	1.113, (0.822, 1.508), <i>P</i> =0.489	1.007, (0.539, 1.882), <i>P</i> =0.981	0.723, (0.318, 1.646), <i>P</i> =0.440	2.498, (1.030, 6.057), <i>P</i> =0.043
“About 4 or more hours a day” compared with “Up to about 1 hour a day”	1.451, (1.039, 2.025), <i>P</i> =0.029	0.542, (0.234, 1.256), <i>P</i> =0.153	<b>2.913,</b> <b>(1.517, 5.595),</b> <b><i>P</i>=0.001</b>	<b>5.168,</b> <b>(2.183, 12.235),</b> <b><i>P</i>&lt;0.001</b>

Table 9: Video gaming on weekdays by bullying others in the past 2 months (boys)

Time spent	Odds ratios (with 95% CIs and <i>P</i> -values)			
	“Once or twice” compared with “Haven’t”	“2 to 3 times per month” compared with “Haven’t”	“Once a week” compared with “Haven’t”	“Several times a week” compared with “Haven’t”
“About 2 or 3 hours a day” compared with “Up to about 1 hour a day”	1.181, (0.885, 1.578), <i>P</i> =0.259	1.535, (0.790, 2.986), <i>P</i> =0.206	0.784, (0.214, 2.872), <i>P</i> =0.714	2.221, (0.520, 9.490), <i>P</i> =0.282
“About 4 or more hours a day” compared with “Up to about 1 hour a day”	1.461, (1.063, 2.009), <i>P</i> =0.020	2.350, (1.200, 4.603), <i>P</i> =0.013	<b>4.978,</b> <b>(1.874,</b> <b>13.223),</b> <b><i>P</i>=0.001</b>	3.930, (0.967, 15.969), <i>P</i> =0.056