# Computers in Human Behavior

## The influence of video games on children and adolescents

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***Abstract*—Several researches and studies have been taken out to test and verify the impacts of video games whether it brings positive or negative effects to the children and adolescents. The findings of these researches and studies are informative for psychologists, educators, parents, as well as game developers for future development and research.**

***Keywords-component: video games, influence, positive or negative effects, children and adolescents***

## I. INTRODUCTION

Ever since 20th century, video games have increasingly become one of the most widespread forms of media until now. The development and industry of video games is growing rapidly over the past decades. The rapid growing of video games can be seen through the improvement of graphic design in video games, from 8bit textures to the realistic look like textures within 50 years since video games have been existed for nearly 50 years. According to Iuemag, one thing various industry analysts have in common is that the video game industry is predicted to become worth triple-digit billions of dollars by 2025. In 2019, the video game industry as a whole generated over $138.7 billion USD. The accessibility and popularity of video games nowadays have made the video games itself becoming a routine part of children's and adolescents' lives (Olson, 2010). There are many reasons for them to play video games, such as relaxing (Reinecke, 2009), competing with an opponent (Olson, 2010), becoming immersed in the story, developing skills and learning, and experiencing pleasure and/or challenge (Martinovic et al., 2014).

Helpful and pro-social computer game content has great potential for enhancing the lives of children and adolescents, but exposure to antisocial and violent games increases the likelihood of a range of negative outcomes, with greater exposure increasing the risk (Anderson & Warburton, 2012:56). Granic, Lobel and Engels (2013) show that "the vast majority of psychological research on the effects of "gaming" has been focused on its negative impact: the potential harm related to aggression, addiction and depression". The authors argue though that "in order to understand the impact of video games on children's and adolescents' development, a more balanced perspective is needed". Considering these potential benefits is important, in part, because the nature of these games changed dramatically in the last decade, becoming increasingly complex, diverse, realistic and social in nature (Ferguson & Olson, 2013, apud Granic, Lobel & Engels, 2013:66).

There are different categories of games called video game genres. While most video games are designed as entertainment, many video games are designed with additional purposes. Different genre of games can bring different impact to the children and adolescents.

List of video game genres:

1. Action
2. Action-adventure
3. Adventure
4. Role playing
5. Simulation
6. Strategy
7. Sports
8. Massively multiplayer online game (MMO)
9. Board or card game
10. Casual games
11. Horror game
12. Idle game
13. Sandbox / open world games

It has long been determined that boys enjoy and spend more time playing video games than do girls, and that most games are designed for boys (Kinzie & Joseph, 2008; Lucas & Sherry, 2004). Boys and girls also differ in their genre preferences; boys tend to enjoy active games with physical enactment like action games, while girls enjoy strategy, creative, exploratory, and traditional games (e.g., card, trivia, puzzle, and board games. Preferences for game genres may also differ across children's and adolescents' age groups.

## II. METHODOLOGY

### *A. Purpose of study*

Most of the parents believe that video games only bring negative effect to the development of their children and the fact is kind of true that video games can cause addiction and violence to the children and adolescent. However, the video games can also be helpful and good in children's and adolescents' development. The aim of this study is to offer a broader perspective of gaming to the global. The study is all about the findings and results of researchers: access of children to a computer, time they spend at the computer and how much

of that time they play, types of favorite games, ways of child supervision, benefits and disadvantages of computer games.

### *B. Research subject field and method*

1. The first study or research carried by Claudia Sălceanua (2014) involves 1087 parents, of which 527 men and 560 women, of age between 25 and 65. They are all residents of Constanta, and work in different fields of labour, such as: commerce (10.48%), clothing (2.94%), education (15.54%), cosmetics (0.09%), medicine (6.43%), law (1.19%), finances (9.47%), navigation (1.37%), secretaryship (1.83%), scholar (0.82%), public services (3.40%), engineering (5.79%), construction (7.63%), mechanical (4.23%), military (2.94%), administration (5.15%), unemployed (19.77%). A questionnaire is used to survey. The evaluation was carried out during March-June 2013.

2. The second study carried by Cheng Chen (2020) used a survey method to examine how recovery experiences and adolescent stressors were related to the use of mobile games for stress recovery purposes among Chinese adolescents as we know mobile games is also a type of video game. A total of 735 out of the 829 students completed the survey, yielding a response rate of 88.66%. As only 638 students reported playing mobile games in the past six months, this lowers the response rate to 77%. Of the 638 mobile game players, 51.6% were males, and 61.6% fell into the age interval of 17–18 years old. A majority of them (60.7%) were in their final year of high school. Their medium family income was in the range of US$ 4427–5903 per month.

## III. FINDINGS AND RESULTS

### *C. Sample and data collection of 1st study*

The first question of the poll is concerned about the access of children and adolescents to a computer. Parents had to check one of 5 response options. Results show that

- 0.87% of children don't have access a computer
- 68.47% have only one computer in the household and usually they have to share it with their siblings or parents
- 30.12% have their own computer
- 0.52% have more than one computer in the household.

The second question refers to the programme of the children to the computer. Results show that

- 35.17% of parents are negotiating with their children an access programme to a computer
- 34.34% of parents impose a rigorous programme and
- 30.47% of children may access the computer anytime they want.

Other studies conducted by Stanger and Gridina (1999, apud Subrahmanyam et. al, 2001:9) report that children between 2 and 17 years spend approximately 1h and 37 min a day on computers, including video games.

The next question refers to the purpose the computer is especially used. The computer is mostly used for

- playing games (36.28%)
- Internet access (22.88%)
- social networks (14.44%)
- homework (26.30%).

Another question of the poll asked parents about their opinion on the ways of supervising their children's activities at the computer. We discovered that:

- 42.87% of parents supervise their children's activities only when they have spare time (some of them state that they know their children spend even more time at a computer while they are at work),
- 24.25% consistently oversee the children's activity
- 18.85% of parents get involved in those activities, playing alongside children, offering them their help and support
- 8.64% consider that their children respect the rules they impose
- 5.39% oversee their children only when they access the Internet. It is interesting that women tend to be more careful in the surveillance of children (13.58% constantly watch their children, compared to 10.66% of men).

The next question refers to the amount of time the children play daily to the computer. 50% of parents allow their children to spend 1-2 hours at computer games every day, while 28.54% allow 3-4 hours (and more) of computer games every day. There is a small group of children who play only during the weekend (2.20%), others who don't play at all (3.77%), and there is a small group of parents who don't know how much time their children play computer games (3.59%).

The next question requests the parents to indicate what are their children's favorite games. Interesting for us was the fact that most parents don't even know what games their children play (29.69%). Otherwise, the most played games are: Barbie (18.67%), Need for speed (17.32%), Counter-strike (12.26%), online games on www.miniclip.com (11.47%), FIFA (10.57%) and Grand Theft Auto (10.34%).

Need for Speed is a racing game. The player can control a racing car in a variety of races, the goal is being to win the race. The Need for Speed series features an extensive list of racing cars that need to be unlocked and available for player to use. The player can also mod their cars to look or perform better during the race.

Counter-strike is one of the world's most popular tactical first-person shooter, which has the highest number of simultaneous players recently. There are two opposing teams – the Terrorists and the Counter Terrorists compete in game modes to complete objectives, such as securing a location to plant or defuse a bomb and rescuing or guarding hostages.

Online games on www.miniclip.com are a large and varied collection. It is the world's largest privately owned online

gaming website. One of popular miniclip games is 8 Ball Pool where the player can play with friends, 1-on-1, tournaments and much more in this real-time multiplayer game. Nearly all the games on www.miniclip.com are casual based and family-friendly.

FIFA is a series of association football simulation video games, listed in Guinness World Records as the best-selling sports video game franchise in the world.

Grand Theft Auto (GTA) is a series of action-adventure games. The gameplay focuses on an open world where the player can complete missions to progress an overall story. Most of the gameplays revolves around driving, shooting, role playing and stealth elements. Each game in this series allows the player to take on the role of criminal in the big city to progress through the storylines. Assassinations and violent crimes are featured regularly in the game series.

Another question of the poll asks the parents to choose, from a predefined list, the benefits they consider the computer games have brought to their children. Results show that the biggest benefits of computer games are thinking development (9.60%), observation capacity (8.27%) and creativity (8.01%). Other benefits specified by parents are:

- faster mental connections (7.94%)
- dexterity (7.39%)
- spirit of competition (7.30%)
- learning foreign languages (7.07%)
- improved memory capacity (6.64%)
- better PC using skills (6.29%)
- focusing attention (6.17%)
- education, information, culture (6.14%)
- insight (5.52%), logic (5.17%)
- reading and writing capacity (4.61%)
- computation skills (3.50%)
- I don't know (0.30%)

We asked parents if they observed the development of certain personality traits. The most common characteristic named by parents is

- ambition (22.18%)
- dynamism (8.72%)
- perseverance (8.36%)
- self-confidence (5.81%)
- self-control (5.45%)
- independence (4%)
- dominance, impulsivity, intelligence, sociability and tenacity (each 3.63%)
- team spirit and naughtiness (each 2.54%)
- responsibility and tolerance (2.18%)
- self-acceptance, compassion, determination and stubbornness (each 1.81%)
- pragmatism, innovative spirit and self-esteem (1.45%)
- respect, capacity for analysis and optimism (1.09% each)
- safety and critical spirit (0.72% each)
- emotional stability, anger, vivacity and correct attitude regarding failure (0.36% each).

Last question of the poll refers to computer games disadvantages. Parents were asked to choose them from a predefined list. Results show that the biggest disadvantages of computer games are

- the lack of physical movement (13.37%)
- sight disorders (13.15%)
- agitation (8.58%).

But these are not the only ones. Parents associate computer games disadvantages with:

- problems of the spine (7.82%),
- computer games addiction (6.51%),
- fatigue (6.26%), strife among siblings (6.13%),
- refusal of other activities (6.13%),
- nervousness (5.91%),
- lack of socialization (5.44%),
- failure of parental authority (2.56%),
- not doing their homework (2.41%),
- poor performance at school (2.22%),
- copying the homework from colleagues (2.09%),
- violent behavior and language (1.75%),
- frequent quarrels with colleagues (1.06%),
- surfing sites forbidden to minors (0.68%),
- quarrels with teachers (0.65%).

Researchers found that over time children start to think more aggressively. And when provoked at home, school or in other situations, children will react much like they do when playing a violent video game. Repeated practice of aggressive ways of thinking appears to drive the long-term effect of violent games on aggression (Gentile et. al, 2014).

Another experimental study conducted by Hasan, Bègue, Scharkow and Bushman (2013:226) shows that violent media cause an increase in less serious forms of aggressive behaviour, like blasting a person with loud, unpleasant noise and on aggression-related thoughts and feelings, such as hostile expectations.

Three experiments conducted by Carnagey and Anderson (2005) show that rewarding violent game actions increase hostile emotion, aggressive thinking and aggressive behaviour, while punishing violent actions only increase hostile emotions. Results suggest those games that reward violent actions can increase aggressive behaviour by increasing aggressive thinking.

There were also parents who state that there are no disadvantages (4.91%) and also parents who don't know (2.09%).

There were also parents who state that there are no disadvantages (4.91%) and also parents who don't know (2.09%). We asked parents to name other negative effects of computer games that were not specified in the list above. Their answers include: incapacity of differentiation between the real life and the virtual game (0.06%), waste of time (0.06%) and laziness (0.03%).

*D. Sample and data collection of 2nd study*

1. Measures

Confirmatory factor analyses (CFA) were performed to evaluate the validity of each construct. Goodness-of-fit criteria proposed by Hu and Bentler (1999) were used to estimate the model fit. Specifically, thresholds for good fit values include: The root mean square error of approximation (RMSEA) < 0.05, standardized root mean square residuals (SRMR) < 0.05, comparative fit index (CFI) > 0.95, normed fit index (NFI) > 0.95, and goodness of fit index (GFI) > 0.95. Besides, thresholds for acceptable fit values are: RMSEA < 0.08, SRMR < 0.08, CFI > 0.90, NFI > 0.90, and GFI > 0.90.

1.1 The use of mobile games for stress recovery purposes

Adapted from Reinecke (2009a), participants were asked to report their frequency (from 1 = never to 5 = always) of mobile gameplay in the following six stressful and exhausting situations: (1) after school, (2) when under stress, (3) after an exhausting task, (4) when tired, (5) after annoying situations, and (6) when you want to recover. Given that the questionnaire was translated into Chinese, a CFA was conducted. The CFA results confirmed the one-dimensional structure of the construct, which indicates that the scale was valid for evaluating mobile games use for recovery purposes by Chinese adolescents: $\chi 2$ (5) = 16.81, $p < .01$, RMSEA = 0.06 (95% CI = [0.03–0.09]), SRMR = 0.02, CFI = 0.99, NFI = 0.99, GFI = 0.99. Thus, a composite measure was created by averaging the six items (Cronbach's alpha = 0.88, M = 2.85, SD = 0.92).

1.2 Recovery experiences

The Recovery Experience Questionnaire developed by Sonnentag and Fritz (2007) was used to measure the recovery experiences associated with mobile games. It includes four subscales: psychological detachment, relaxation, mastery, and control experience. A total of 16 items were rated on a 5-point Likert scale from 1 = strongly disagree to 5 = strongly agree. Sample items included: when playing mobile games: "I do not think about the study at all" (for psychological detachment), "I kick back and relax" (for relaxation), and "I do things that challenge me" (for mastery), and "I decide my schedule" (for control). Similarly, given that it is the first time that this scale has been translated into Chinese, CFA was conducted to validate the scale. An inspection of standardized residuals indicated that the item "I get a break from the demands of study" was problematic as all the covariances in that row were above 1.96. Thus, this item was removed from the scale. After this modification and correlating error terms due to similar wordings (Podsakoff et al., 2003), the four-factor measurement model showed good model fits: $\chi 2$ (70) = 162.29, $p < .001$, RMSEA = 0.05 (95% CI = [0.04–0.06]), SRMR = 0.03, CFI = 0.98, NFI = 0.97, GFI = 0.97. Besides, each of the four factors was found to be reliable: 0.86 for psychological detachment (M = 2.51, SD = 1.08), 0.90 for relaxation (M = 3.51, SD = 0.88), 0.88 for mastery experience (M = 3.59, SD = 0.92), and 0.87 for control experience (M = 3.50, SD = 0.87).

1.3 Adolescent stressors

Five subscales from the Adolescent Stress Scale (Byrne et al., 2007) were adopted to measure the level of stress among adolescent students. Participants were asked how stressful they felt with the following sample events in the past six months: "keeping up with schoolwork" (for school performance) "lack of freedom" (for school and leisure conflicts), "concern about your future" (for future uncertainty), "being hassled for not fitting in" (for peer pressure), "disagreements with your parents" (for home life). A total of 20 items were rated on a 5-point Likert scale from 1 = not at all stressful (or is irrelevant to me) to 5 = very stressful. CFA results showed an acceptable model fit: $\chi 2$ (156) = 561.180, $p < .001$, RMSEA = 0.06 (95% CI = [0.06–0.07]), SRMR = 0.05, CFI = 0.95, NFI = 0.94, GFI = 0.94. Also, all five subscales were reliable: 0.88 for home life (M = 3.05, SD = 0.99), 0.89 for school performance (M = 3.28, SD = 0.92), 0.90 for peer pressure (M = 2.38, SD = 1.03), 0.89 for future uncertainty (M = 3.36, SD = 0.98), and 0.85 for school/leisure conflicts (M = 2.94, SD = 0.97).

1.4 Mobile game clusters

Participants were asked to indicate whether they had played each of the following 17 game genres in the past six months. Examples for each game genre were presented to participants, so that they could match their favorite games with the respective labels. The 17 game genres include match games (e.g. Candy Crush Saga), casual games (e.g. Fishing Joy), simulation games (e.g. We Town), adventure puzzle games (e.g., Monument Valley), table games (e.g. Killers of the Three Kingdoms), chess and card games (e.g. Happy Poker), action strategy games (e.g., King of Glory), sports games (e.g. FIFA), action games (e.g., Street Fighter), music games (e.g. Rhythm Master), racing games (e.g., Crazy Cars 3D), shooter games (e.g. We Fire), parkour evasion games (e.g. WeChat Dash), flying shooting games (e.g. Thunder Raid), tower defense games (e.g. Carrot Fantasy), card role-playing games (e.g. I'm MT), and non-card role-playing games (e.g. Dragon Oath 3D). In addition, a short-answer question was presented asking participants which mobile game they played the most in the last six months, with a specific game title being required. In the data-entry phase, the author double-checked whether the corresponding game genre had been ticked. If not, the specific game genre would be answered with "yes." Using both multiple choices and open-ended questions ensured that participants' gaming experiences were fully captured. Based on the classification scheme proposed in Fig. 1, the binary responses (yes or no) for each game genre were combined to form a use intensity index for each game cluster. Given that the number of games in each cluster are not equal, the standardized Z score for each cluster was used in further data analysis.

### 1.5 Control variables

Considering that gaming experience is likely to be influenced by contextual factors (Engl and Nacke, 2013), participants were asked to report their most common (a) playing location (e.g., home, school, bus station), (b) playing style (i.e., single or multiplayer), (c) playing mode (i.e., online or offline), and (d) the average time spent on each game session in the last six months. Demographics such as gender, age, grade, and family income were also controlled.

## 2. Results

### 2.1 Mobile game use patterns

In terms of mobile game use in general, our participants reported playing mobile games three to four days a week (M = 2.03, SD = 1.21), and they spent an average playing time of 60 to 90 min per day (M = 2.26, SD = 1.36). With a possible score of 1 = never and 5 = always, adolescent students reported they occasionally used mobile games for stress recovery purposes (M = 2.85, SD = 0.92). Moreover, home (84.2%) was reported to be the most popular playing location. Solo-playing (56.4%) and online gaming (70.4%) were the most preferred playing style and playing mode.

### 2.2 Mobile game clusters and recovery experiences

To answer RQ1 about which mobile game cluster could elicit the highest recovery experience for adolescents, multiple hierarchical regression analyses were performed. In each analysis, control variables were entered first, followed by mobile game clusters.

As shown in Table 1, only social mobile games were found to be positively correlated with relaxation ($\beta = 0.10$, $p < .05$), mastery ($\beta = 0.14$, $p < .01$), and control experience ($\beta = 0.14$, $p < .01$). This finding indicates that social mobile games had the highest recovery potential for adolescent players.

To test H1a–d, a similar hierarchical regression analysis was conducted. To determine the unique contribution of recovery experiences to the use of mobile games for stress recovery purposes, four recovery dimensions were entered in the last block after controlling for demographics and contextual variables (the first block), mobile game clusters (the second block), and adolescent stressors (the third block). Results from Table 1 showed that psychological detachment ($\beta = 0.23$, $p < .001$) and relaxation ($\beta = 0.19$, $p < .001$) were positively correlated with the use of mobile games when under stress and strain, while mastery ($\beta = 0.05$, $p > .05$), and control experiences ($\beta = 0.00$, $p > .05$) were not. Therefore, H1a to H1d were all supported. It is noteworthy that 11% variance of the dependent variable was explained by recovery experiences. Last, to examine which adolescent stressors were related to the use of mobile games for stress recovery purposes, a hierarchical regression analysis was run. As presented in Table 1, only peer pressure ($\beta = 0.16$, $p < .001$) was found significantly correlated with the use of mobile games when adolescents were stressed and exhausted. This finding indicates that the more peer pressure the adolescents have, the more they would use mobile games for stress recovery purposes.

Table 1

Hierarchical regression analyses predicting each recovery experience and the use of mobile games for stress recovery purposes.

| | Detachment β | Relaxation β | Mastery β | Control β | The use of mobile games for stress recovery purposes β |
|---|---|---|---|---|---|
| Block 1: Controls | | | | | |
| Gender (Male = 1) | −0.01 | −0.06 | 0.02 | 0.00 | −0.01 |
| Age | −0.06 | 0.03 | −0.03 | 0.04 | −0.08 |
| Grade | 0.13* | −0.06 | −0.06 | −0.08 | 0.09† |
| Family income | 0.02 | 0.05 | 0.02 | 0.03 | 0.03 |
| Style (Single = 1) | −0.03 | −0.02 | −0.03 | 0.02 | −0.02 |
| Mode (Online = 1) | −0.04 | 0.07 | 0.04 | 0.11** | 0.07† |
| Location (Home = 1) | −0.02 | 0.02 | −0.01 | 0.03 | 0.02 |
| Gameplay intensity | 0.12** | 0.11* | 0.14*** | 0.13** | 0.12** |
| $\Delta R^2$ | 0.03* | 0.04** | 0.05*** | 0.06*** | 0.09*** |
| Block 2: Mobile Game Clusters | | | | | |
| Casual | −0.01 | −0.04 | 0.05 | −0.03 | 0.05 |
| Social | 0.05 | 0.10* | 0.14** | 0.14** | 0.12** |
| Skill | −0.01 | 0.07 | −0.07 | 0.06 | −0.02 |
| Role-playing | 0.05 | 0.03 | 0.04 | −0.05 | 0.06 |
| $\Delta R^2$ | 0.01 | 0.02* | 0.02* | 0.02** | 0.03** |
| Block 3: Stressors | | | | | |
| Home life | | | | | 0.01 |
| School performance | | | | | −0.06 |
| Peer pressure | | | | | 0.16*** |
| Future uncertainty | | | | | −0.01 |
| School/leisure conflict | | | | | 0.03 |
| $\Delta R^2$ | | | | | 0.03 |
| Block 4: Recovery Experiences | | | | | |
| Detachment | | | | | 0.23*** |
| Relaxation | | | | | 0.19*** |
| Mastery | | | | | 0.05 |
| Control | | | | | 0.00 |
| $\Delta R^2$ | | | | | 0.11*** |
| $R^2$ | 0.03 | 0.06 | 0.06 | 0.08 | 0.25 |
| Adjusted $R^2$ | 0.01 | 0.05 | 0.04 | 0.06 | 0.23 |
| $F$ | 1.73† | 3.42*** | 3.61*** | 4.44*** | 9.79*** |

*Notes.* †$p < .10$, *$p < .05$, **$p < .01$, ***$p < .001$. Entries were standardized regression coefficients. $N = 638$.

### *E. Future Directions*

Both of the studies actually open up many possibilities and opportunities for further study. These studies had provided a clearer view and perspective on the potential benefits and negative impacts of video games on either children or adolescents.

Based on my observations, professionals or even parents and educators can use the video game wisely as a powerful tool to unleash its maximum potential benefits for development of children and adolescent.

For example, video games provide children an opportunity to learn and practice. Educators can seek ways of using educational video games to supplement his/her supplement classroom teaching. Educational video games transform learning into an enjoyable, thrilling game without boring session and they can also stimulate creativity, focus and visual memory of children. But video games should not be the main method for educating students. They are just one of the tools available.

Another example, video game can be used as a therapy in counselling. According to Psychreg, some companies have taken therapeutic gaming to a completely new level by designing games that are intended to help people develop coping strategies for dealing with mental illness. In some cases, the research has even included input from people who have a mental health diagnosis, to make sure that the game is as useful for them as it's intended to be. Some games have been designed

by game developer to help manage depression, anxiety, relieve stress and other mental health problems.

Not every child or adolescent will benefit from every video game. Some games aren't age appropriate for children. Those games usually contain excessive violence, over-the-top sexuality, profanity, racism, and many other things that cannot be perceived by children in the right manner. The violent content can cause the children become aggressive and impatient in their behavior. By avoiding this happening, parents can monitor their children what they playing or playing together with them. They can even choose video games wisely which is beneficial for their children to ensure that their children engaging in 'safe' games. Parents should also set limits on the amount of children's video game use

The wise using of video games should be embraced and be accepted in terms of professionals and educations in the future for certain educational and developmental objectives and activities to encourage better development of children and adolescent. Society should maximize their understanding about the impact of video games as it not only brings negative effects to the children and adolescent.

### *F. Conclusion*

The studies have examined the pros and cons of video gaming on the children and adolescents. Video games can play a positive role in our lives, balancing and putting time limit is the key to possibly avoid the disadvantages of video gaming.

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