

Studying the Long Term Effects of Video Games on Logical Thinking and Creativity

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Abstract— This paper studies the effects of video games on cognitive development with special focus on logical thinking and creativity. This is done by examining a collection of data from an online survey with 10 multiple choice style questions dedicated to testing logical thinking and 39 3-point Likert Scale questions. The research shows that, on average, people who play video games tend to have higher logical thinking abilities and a higher level of creativity than those who do not play video games. It's also noticed that those who spend too much time playing video games have a lower score on both tests as compared to those who spend moderate amounts of time playing.

Index Terms— Long Term Effects of Video Games.

I. INTRODUCTION

Video games - a healthy hobby or a complete waste of time? It's been a long standing question which parents and children fight over. Is there any way to finally settle this argument? Video games have become an integral part of most kids' day to day lives, even making its way into pop culture. With something for everyone, video games have a universal appeal. Video games have reached a point where there are major e-sports leagues and many people dedicated their lives to and making careers out of video games. Everything comes with supporters and critics. Critics are quick to dismiss anything that supporters of video games have to say and state that video games are in fact bad for us. Supporters, on the other hand, believe that video games, if played in moderation, have a wide array of benefits, which are discussed in depth in this paper.

II. REVIEW OF LITERATURE

Ever since video games blew up in the 90s, there have been concerns on the effects of them on the human brain. In the past couple of decades, there has been an ample amount of research. Ever since then, the accessibility of various types of video games catering to different audiences has increased dramatically, therefore increasing the amount of players and the time spent daily on video games has only been increasing. According to an article from the WIRED[1], there are more than 2.5 billion active gamers around the world today. They can be someone's hobby, profession, or simply a way to destress. Either way, video games have had some presence in everyone's lives.

There exists a wide variety of genres of video games -

action, adventure, creative, simulation, sports, strategy, and hyper-casual, just to name a few. There are a lot more genres and sub genres, but most of them can still be categorised into the main ones mentioned above. These various genres are stimulating in their own ways.

Action games are generally quite intensive. They include fast paced battles with guns, swords, and various other weapons. They can have highly complicated mechanics and can take years of practise to master. These games are sometimes so intense that they have entire e-sports leagues dedicated to them. Playing action games also involves team work in most cases. They are the perfect combination of strategy, planning, and application of logic. They're extremely mentally stimulating and can actually improve hand-eye coordination and reaction times (as seen in a research conducted by professors at the University of Rochester)[2].

Adventure games are more long and drawn out as compared to action games. They have more long term goals which are achieved by the player only after spending hours on the game. The mechanics of adventure games are much easier than the mechanics of action games and can be understood better through gameplay. The player is required to explore the game, solve puzzles, collect resources and items, and other carry out other activities that are directly connected to the story of the game. These types of games can improve the patience of the player because of the long hours involved.

Creative games are games like Roblox, Minecraft, and Terraria. The only limit in these games is your imagination. They give you a free platform to create whatever you want. The mechanics are fairly easy to understand and get a grip on. You're given a set of resources and an open world to create whatever you can picture. These games boost creativity and can even be used as learning tools.[5]

Simulation games are games where you're put in a very specific role. For example, you can be controlling a car or an airplane. These games are largely targeted towards enthusiasts but can be enjoyed by anyone. Simulation games can also be games like SimCity, where you have to control a group characters and build and run your own city. These games can improve organisational skills and logical planning.

Sports games are games that are, again, targeted towards enthusiasts, but can be enjoyed by anyone. The most sports games are football games like FIFA or PES.

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Strategy games require very careful management of resources. These games require a lot more careful thought and planning than any other type of video games, and can sometimes be very slow paced.

Hyper-casual games are a genre of games that are generally played on mobile devices. The mechanics of these games are limited to only a few clicks or taps. They focus on hooking players by making them complete quick tasks, finishing small levels, or rewarding them with certain prizes when they reach certain stages, which gives the player the instant gratification of completing something. A perfect example of this genre would be a game like Subway Surfers or Angry Birds.

While exploring the number of genres of video games, a pattern of advantages begins to emerge. Before focusing on the pattern, we should understand the true scope of the cognitive benefits of video games. A variety of other benefits are explored in Psychology Today[3] article, citing various research papers. According to the article, video games can:

- Benefit in basic visual processes like improved contrast sensitivity and treatment of amblyopia
- Lead to improved spatial attention, improved ability to track moving objects in a field of distractors, more accurate detection fo target stimuli, and overcoming dyslexia
- Improve executive functions of our brains. It can improve multi tasking skills, allocating mental resources, and mental flexibility.

These large number of benefits are only seen when video games are played in moderation. If played in excess, video games can have some horrible side effects. They can lead to an unhealthy addiction. As seen in an article written by Brainandlife[4] discussing The Effects of Video Games on the Brain, if a child gets addicted to video games, it can have serious negative consequences on the development of their brain. Researchers in China used Magnetic Resonance Imaging(MRI) to compare the amount of gray matter present in students who spent more than 10 hours online playing video games to students who spent less than 2 hours. They found that the students who played for more than 10 hours had less gray matter than those who spent less than 2 hours. This shows the adverse effects of video game addiction. The prefrontal cortex of the brain is in charge of decision making, controlling impulses, and passing judgement. This part of the brain matures fully around the age of 25-30. This is why younger people can focus on video games for hours on end, without worrying about the negative side effects of the long hours and basic needs such as food, sleep, and hygiene. In some cases, the dopamine released from being addicted to video games can almost entirely shut down the prefrontal cortex, allowing certain people to play video games for an excess of 15 hours in a day.

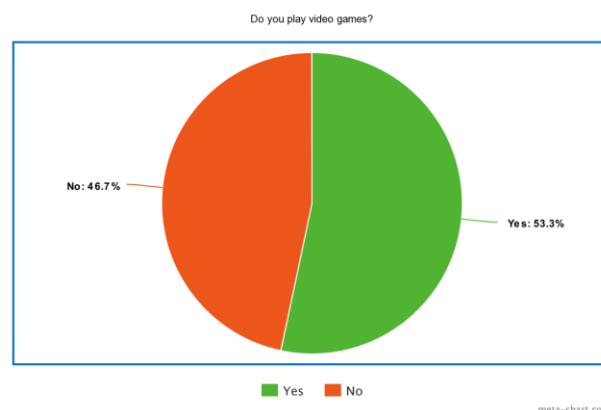
Video games have been found to affect our creativity too. Creativity can be a bit of an abstract concept. It is defined in the Oxford English Dictionary as the use of skill and

imagination to produce something new or to produce art. To be creative, you need to be able to look at things from a different perspective. You need to be able to think of new possibilities and alternatives. Most types of video games push you to think of new solutions and think outside the box, hence forcing you to be creative in your outlook. Video games might be one way to do this.

A study by the Glasgow Caledonian University in 2017 published in the International Journal of Game-Based Learning found that video games do in fact affect creativity. The study went much further in depth and found that different video games affect creativity to different levels. Surprisingly, they found that action video games boosted creativity more than video games which gave players creative freedom. One drawback of the study is that the participants were not necessarily long term gamers, rather were asked to play games on the spot and then tested. This could be one possible reason that the effects of the video games on the participants' creativity was only temporary. If long term gamers are tested, there can be a more permanent correlation between increased levels of creativity and gaming.

III. DATA ANALYSIS

In the following section, all the data from the survey will be analysed. Both the survey and the statistical representation



were done using Google Forms.

The first question was about whether the participant was a gamer or not. Out of the 60 participants, 53.3% were gamers.

On average, the gamers spent around 11 hours per week playing video games.

Most players were playing action, adventure, and sports games. Most gamers were of the belief that video games can have a positive impact on players - providing experiences that can't be achieved in real life and providing a fun pass time and recreation.

A series of 10 questions were asked to test logical thinking. On average, non gamers scored 5.21, with scores ranging from 3 to 7. Gamers scored an average of 5.93, with scores ranging from 3 to 8.

A series of 39 questions were asked to test creativity. A

scale was used, on which higher marks directly corresponded to a higher level of creativity. Non gamers scored an average of 37.89, with scores ranging from 17 to 65. Gamers scored on average 46.25, with scores ranging from 30 to 75.

IV. RESULTS AND DISCUSSION

Most of the gamers believe that gaming does have a positive impact on gamers, while only 3 said that gaming has no positive impact. Majority of the answers that supported gaming having a positive impact on players centred around the fact that games are more stimulating than any other pastime which require nothing but people to sit idle and consume content. Players also believed that video games can improve hand eye coordination, improved cognitive abilities, and critical thinking. Most gamers are aware of the fact that these benefits are only seen when the video games are played in moderation and excess time spent on video games can actually lead to negative side effects. Some gamers believe that video games only act as breaks from the work and stress of daily life and give them a good chance to socialise with friends and meet new people.

The average amount of time spent by gamers who participated in the research was 10 hours per week, with only 2 major deviations - 30 and 40 hours per week respectively.

The most played genre was Action, with everyone except for 2 gamers playing that genre, followed by Adventure, and then a mix of Simulation, Sports, Horror, and Strategy. The main reason for playing said genres is relaxation and experiencing things that cannot ordinarily be experienced in our day to day lives. This shows that gamers are always searching for new and out of the box experiences.

Most of the results matched up accurately with the hypothesis. On average, non gamers had a lower score on the logical thinking test, reaching about 5.21. Gamers, on the other hand, had a relatively higher score, reaching about 5.93. For both gamers and non gamers, the range of scores was between 3 to 8, with no outliers.

In accordance with the Brainandlife article about the Chinese researchers, a participant who spent around 30 hours a week playing video games scored relatively low on the logical thinking test.

On the creativity test, there was a much more stark difference between the gamers and non gamers. The average score for the non gamers was 39.53 while the average score for gamers was 46.25. The range of scores for non gamers was 17 to 65, with only 6 scoring higher than 50. As for gamers, the range of scores was 30 to 75, with about 11 scoring above 50. In the 2017 Glasgow Caledonian University study on the temporary effects of video games on creativity, it was found that there is a distinct temporary effect, and the researches stated that there could be a long term effect seen on chronic gamers. This data seems to be in line with that theory.

V. LIMITATIONS

The subjects of this experiment were not tested in a controlled environment. Since this experiment was carried out in order to test the long term effects of video games on cognitive development in terms of logical thinking and creativity, the subjects were tested randomly instead of after a session of playing video games. All the subjects were within the age category of 15 to 20 years old, and hence it is not possible to determine the effects of video games on older or younger people based on the results of this research.

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