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AP® Research Academic Paper

Sample Student Responses and Scoring Commentary

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AP® RESEARCH — ACADEMIC PAPER
2019 SCORING GUIDELINES

The Response…

Score of 1 **Report on Existing Knowledge**	Score of 2 **Report on Existing Knowledge with Simplistic Use of a Research Method**	Score of 3 **Ineffectual Argument for a New Understanding**	Score of 4 **Well-Supported, Articulate Argument Conveying a New Understanding**	Score of 5 **Rich Analysis of a New Understanding Addressing a Gap in the Research Base**
Presents an overly broad topic of inquiry.	Presents a topic of inquiry with narrowing scope or focus, that is NOT carried through either in the method or in the overall line of reasoning.	Carries the focus or scope of a topic of inquiry through the method **AND** overall line of reasoning, even though the focus or scope might still be narrowing.	Focuses a topic of inquiry with clear and narrow parameters, which are addressed through the method and the conclusion.	Focuses a topic of inquiry with clear and narrow parameters, which are addressed through the method and the conclusion.
Situates a topic of inquiry within a single perspective derived from scholarly works **OR** through a variety of perspectives derived from mostly non-scholarly works.	Situates a topic of inquiry within a single perspective derived from scholarly works **OR** through a variety of perspectives derived from mostly non-scholarly works.	Situates a topic of inquiry within relevant scholarly works of varying perspectives, although connections to some works may be unclear.	Explicitly connects a topic of inquiry to relevant scholarly works of varying perspectives **AND** logically explains how the topic of inquiry addresses a gap.	Explicitly connects a topic of inquiry to relevant scholarly works of varying perspectives **AND** logically explains how the topic of inquiry addresses a gap.
Describes a search and report process.	Describes a nonreplicable research method **OR** provides an oversimplified description of a method, with questionable alignment to the purpose of the inquiry.	Describes a reasonably replicable research method, with questionable alignment to the purpose of the inquiry.	Logically defends the alignment of a detailed, replicable research method to the purpose of the inquiry.	Logically defends the alignment of a detailed, replicable research method to the purpose of the inquiry.
Summarizes or reports existing knowledge in the field of understanding pertaining to the topic of inquiry.	Summarizes or reports existing knowledge in the field of understanding pertaining to the topic of inquiry.	Conveys a new understanding or conclusion, with an underdeveloped line of reasoning **OR** insufficient evidence.	Supports a new understanding or conclusion through a logically organized line of reasoning **AND** sufficient evidence. The limitations and/or implications, if present, of the new understanding or conclusion are oversimplified.	Justifies a new understanding or conclusion through a logical progression of inquiry choices, sufficient evidence, explanation of the limitations of the conclusion, and an explanation of the implications to the community of practice.
Generally communicates the student's ideas, although errors in grammar, discipline-specific style, and organization distract or confuse the reader.	Generally communicates the student's ideas, although errors in grammar, discipline-specific style, and organization distract or confuse the reader.	Competently communicates the student's ideas, although there may be some errors in grammar, discipline-specific style, and organization.	Competently communicates the student's ideas, although there may be some errors in grammar, discipline-specific style, and organization.	Enhances the communication of the student's ideas through organization, use of design elements, conventions of grammar, style, mechanics, and word precision, with few to no errors.
Cites **AND/OR** attributes sources (in bibliography/ works cited and/or in-text), with multiple errors and/or an inconsistent use of a discipline-specific style.	Cites **AND/OR** attributes sources (in bibliography/ works cited and/or in-text), with multiple errors and/or an inconsistent use of a discipline-specific style.	Cites **AND** attributes sources, using a discipline-specific style (in both bibliography/works cited **AND** in-text), with few errors or inconsistencies.	Cites **AND** attributes sources, with a consistent use of an appropriate discipline-specific style (in both bibliography/works cited **AND** in-text), with few to no errors.	Cites **AND** attributes sources, with a consistent use of an appropriate discipline-specific style (in both bibliography/works cited **AND** in-text), with few to no errors.

AP® RESEARCH
2019 SCORING COMMENTARY

Academic Paper

Overview

This performance task was intended to assess students' ability to conduct scholarly and responsible research and articulate an evidence-based argument that clearly communicates the conclusion, solution, or answer to their stated research question. More specifically, this performance task was intended to assess students' ability to:

- Generate a focused research question that is situated within or connected to a larger scholarly context or community;

- Explore relationships between and among multiple works representing multiple perspectives within the scholarly literature related to the topic of inquiry;

- Articulate what approach, method, or process they have chosen to use to address their research question, why they have chosen that approach to answering their question, and how they employed it;

- Develop and present their own argument, conclusion, or new understanding while acknowledging its limitations and discussing implications;

- Support their conclusion through the compilation, use, and synthesis of relevant and significant evidence generated by their research;

- Use organizational and design elements to effectively convey the paper's message;

- Consistently and accurately cite, attribute, and integrate the knowledge and work of others, while distinguishing between the student's voice and that of others;

- Generate a paper in which word choice and syntax enhance communication by adhering to established conventions of grammar, usage, and mechanics.

The Effect of Fortnite's Increasing Popularity on the Playeship and Viewership of Other Popular

Video Games.

Word Count: 5461

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I. Abstract

In this research, a mixed method was utilized to analyze Fortnite's effect on the playership and viewership on other video games including: Player Unknown BattleGrounds, Tom Clancy's Rainbow Six Siege, Counter Strike: Global Offensive, Call of Duty, and Grand Theft Auto V. For the meta analysis, Fortnite was compared to each of the other games for average monthly players, average monthly viewers, and hours spent viewing a game from September 2016 to September 2018, one year before and after Fortnite's release. From there, 15 regression tests were performed. Two different surveys were conducted of students and their guardians in the Morris Hills Regional District. Students were asked questions about their playing and viewing habits before and after Fortnite while parents were asked about their general opinion of video games. A total of 4 Chi Squared tests were performed on the questions that resulted in numerical data while the rest was analyzed generally. The conclusions of the research was that Fortnite did not have a significant negative effect on the playership and viewership of the other popular video games.

II. Introduction

Video games are a large part of today's society in America. Many popular video games throughout history have created mass attention, but Fortnite is one of a select few that has drawn more attention than any other game.

Due to Fortnite's popularity however, other video games may have been affected in terms of their playership and viewership. To determine if Fortnite has had any sort of affect, this research investigates Fortnite's monthly players, average viewers and hours viewed on a popular streaming site from one year before its release in September 2016 up until September 2018 compared to other popular first and third person shooter video games. Because Fortnite is categorized as a shooter game, the games chosen in this study include Fortnite, Player Unknown BattleGrounds, Tom Clancy's Rainbow Six Siege, Counter Strike: Global Offensive, Grand Theft Auto V, and Call of Duty. Furthermore, a majority of the games mentioned are mostly played on the computer which is why the study will focus on computer playership. In addition, a survey will be conducted to analyze the player habits of teenagers and their parents opinions of the games. Thus, the question this research investigates is: How has Fortnite's growth from its release in September 2017 to September 2018 affected the number of players and viewers of other games?

III. Literature Review

Because the topic this paper is on is relatively new and the number of published papers regarding the topic is limited, there is little to no research or peer reviewed sources on this topic.

For this reason, the literature review will focus on background information pertaining to Fortnite and the data that will be used to conduct the meta-analysis.

What is Fortnite?

Fortnite is an online video game that was released in July 2017 by Epic Games, a game developer based in North Carolina. At the time, they released their first game mode called "Save the World." This game mode however, was only available for purchase and never really became popular. The battle royale mode, the free game mode of Fortnite, was released two months later on September 26th. Fortnite's battle royal is a survival game where 100 players fight against each other in player versus player combat to be the last one standing (Webwise, 2018).

How is it Played?

Fortnite can be played solo, in pairs, or in groups of four, allowing users the freedom to play alone or with others. The game begins as players jump out of a flying bus onto an island. The island contains many different sections that players can land in. Once players choose where they land, they can begin searching for items such as weapons and materials.

Weapons and materials can be found in both chests and the ground. Chests are boxes that can be opened to release a random consortium of weapons and materials. According to PCGamesN, a website that specializes in video game information, there are a variety of weapons and materials that can be picked up and each is categorized by rarity. (PCGamesN, 2018). All of these weapons, items, and materials are scattered around the map and can be found in all of the different locations on the island. Players can use their items and weapons to try and win. The better the items and materials a player has, the higher the advantage a player has. With a higher advantage, a player has a better opportunity to win.

Viewership of Video Games

At present, the largest platform for watching video games being streamed is Twitch.tv or Twitch for short. Twitch is a streaming platform owned by Amazon that allows for anyone to watch people play video games live (Twitch, 2018). Watching streamers (people who are playing the game) is an activity that many gamers have become more and more interested in. People have the option to watch a variety of streamers and a variety of games. Streamers can choose to play any game they wish and can make money doing so. According to Twitch's website, streamers make money for every subscriber they have. For every new subscription that costs $4.99, the streamer makes approximately $2.50 and the remaining $2.44 is revenue for Twitch. They can also make money on donations which can be any amount which goes directly to the streamer (Twitch 2018). If a streamer is not making sufficient revenue when playing a certain game, they may switch to a more popular game which can lead to an increased revenue.

Websites exist that collect data on viewing habits of Twitch, one being SullyGnome. SullyGnome is a website that uses an API (Application Program Interface) to collect data from Twitch's website. The API records various different data sets on both streamers and games including monthly viewers, hours watched, and hours streamed (Sullygnome 2018). This is important to this study as the website provides the average monthly viewers and the amount of time the game was streamed for all of the selected games for the time period this study is analyzing.

Playership of Video Games

At the moment, the most effective method to measure the success of a video game is the amount of players that the game has. However, there are a plethora of platforms ranging from

cell phones to Xbox's that games can be played on which makes measuring the number of players difficult. According to Jamie McKane, an author that specializes in video game platforms, the most popular platform is PC. PC is a personal computer and anything from a laptop to a desktop falls under that category (McKane, 2016). In order to measure the number of players, a website called SteamCharts uses an API, similar to that of SullyGnome, to collect data from the Steam, which is the platform most pc games run on. The API is programmed so that it collects the number of concurrent players every hour and then compiles it into data tables that measures the average monthly players. This website is important to the study as almost all of the games are available on the Steam platform which means the average monthly players is able to be used.

Application to Study

As highlighted above, Fortnite is an extremely simple game, but is popular nonetheless. Exploration of this game's popularity will close the gap on a topic that no one has done research on. Research was sought in the development of the topic & question, but no research has thus been conducted comparing the viewership, playership, and teen & parent opinions of this novel game. Factors affecting Fortnite's popularity have also not been studied. Therefore, this study aims to determine Fortnite's effect on other game's playership and viewership.

IV. Method
Overview

The method for this research will be mixed as it consists of both a meta-analysis and a survey. The motivation for this was because though quantitative data from websites could be

collected, the use of survey would allow for a study of the habits of teens and the opinions of

their parents.

Experiment

For the experimental part of the project, a survey was created for both students and their

parents. The participants of this study were students of the Morris Hills Regional District from

ages 14-18, who were chosen from a variety of classes and academic levels. Upon signing a

parental consent form, each participant and their guardian was sent an online survey through

their given email. The students were asked about their playing and viewing habits and whether

they changed after Fortnite was released, while the parents were asked about their opinions of

certain video games.

For the student surveys (n=30), three chi squared tests with a confidence level of 95%

were conducted to test if a change occurred for students in their playership and viewership habits

before and after fortnite. To analyze the rest of the survey, the results from before Fortnite were

compared to the results after Fortnite. This was done as this data was categorical and no

statistical test could be used to analyze the data.

For the parent surveys (n=17), one chi squared test with a confidence level of 95% was

conducted to measure the change in the number of hours their children play video games. To

analyze the rest of the survey, an analysis that looked at the results of the parents was done to

make conclusions. This was done as the data was categorical and no statistical test could be used

to analyze this dad.

Meta Analysis

For the meta analysis, data was collected from three different online statistics websites; SullyGnome.com, STEAMCHARTS.com, and Statistica.com. This data consisted of monthly players, viewers, and hours viewed on the following video games: Fortnite, Player Unknown Battlegrounds, Tom Clancy's Rainbow Six Siege, Counter Strike: Global Offensive, Grand Theft Auto V, and Call of Duty. SullyGnome.com provided data on the average monthly twitch viewers and number of hours people spent watching those game. STEAMCHARTS.com provided the average monthly steam players for all of the games except for Fortnite while Statistica.com provided the average monthly Fortnite players. The data was collected and compiled and then a correlation analysis was performed to see if Fortnite has changed the number of player and viewers and length of viewership of other games. In addition, 15 scatter plots were created; 5 for each of the categories.

Photographs of method

Student Survey

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Of the following games, which have you played? (Check multiple boxes if applicable) *

☐ Fortnite

☐ Player Unknown Battlegrounds

☐ Counter Strike: Global Offensive

☐ Tom Clancy's Rainbow Six Siege

☐ Call of Duty

☐ Grand Theft Auto V

☐ None of the above

Of the following games, which have you watched on Twitch or YouTube? (Check multiple boxes if applicable) *

☐ Fortnite

☐ Player Unknown Battlegrounds

☐ Counter Strike: Global Offensive

☐ Tom Clancy's Rainbow Six Siege

☐ Call of Duty

☐ Grand Theft Auto V

☐ None of the above

Prior to the release of Fortnite, which of the following video games did you play most? *

○ Player Unknown Battlegrounds

○ Counter Strike: Global Offensive

○ Tom Clancy's Rainbow Six Siege

○ Call of Duty

○ Grand Theft Auto V

○ Did not play any of these

Prior to the release of Fortnite, which of the following video games did you watch most? *

○ Player Unknown Battlegrounds

○ Counter Strike: Global Offensive

○ Tom Clancy's Rainbow Six Siege

○ Call of Duty

○ Grand Theft Auto V

○ Did not watch any of these

After the release of Fortnite, which of the following video games did you play most? *

○ Player Unknown Battlegrounds

○ Counter Strike: Global Offensive

○ Tom Clancy's Rainbow Six Siege

○ Call of Duty

○ Grand Theft Auto V

○ Fortnite

○ Did not play any of these

After the release of Fortnite, which of the following video games did you watch most? *

○ Player Unknown Battlegrounds

○ Counter Strike: Global Offensive

○ Tom Clancy's Rainbow Six Siege

○ Call of Duty

○ Grand Theft Auto V

○ Fortnite

○ Did not watch any of these

Do you feel that watching Youtubers and streamers affects the games you play? *

○ Yes

○ No

○ I do not watch Youtubers and streamers

Before Fortnite was released (September 2017), how many hours a week did you spend watching Youtubers and Streamers play games? (If you do not watch any games, please select none) *

○ 0-2 hours

○ 2-4 hours

○ 4-6 hours

○ 6-8 hours

○ 8-10 hours

○ 10-12 hours

○ 12-14 hours

○ 14-16 hours

○ 16-18 hours

○ 18-20 hours

○ More than 20 hours

○ None

Of all the video games that you played prior to the release of Fortnite, approximately what was the combined number hours a week you played? *

○ 0-2 hours

○ 2-4 hours

○ 4-6 hours

○ 6-8 hours

○ 8-10 hours

○ 10-12 hours

○ 12-14 hours

○ 14-16 hours

○ 16-18 hours

○ 18-20 hours

○ More than 20 hours

Of the video games you played prior to the release of Fortnite (September 2017), what single game did you play most? *

Short answer text

Of the video game that you played the most, (answered in the previous question) approximately how many hours did you play a week? *

○ 0-2 hours

○ 2-4 hours

○ 4-6 hours

○ 6-8 hours

○ 8-10 hours

○ 10-12 hours

○ 12-14 hours

○ 14-16 hours

○ 16-18 hours

○ 18-20 hours

○ More than 20 hours

After Fortnite was released (September 2017), how many hours a week did you spend watching Youtubers and Streamers play games? (If you do not watch any games, please select none) *

○ 0-2 hours

○ 2-4 hours

○ 4-6 hours

○ 6-8 hours

○ 8-10 hours

○ 10-12 hours

○ 12-14 hours

○ 14-16 hours

○ 16-18 hours

○ 18-20 hours

○ More than 20 hours

○ None

Of the video games that you primarily played after Fortnite's release (September 2017), approximately how many hours did you play a week? *

○ 0-2 hours

○ 2-4 hours

○ 4-6 hours

○ 6-8 hours

○ 8-10 hours

○ 10-12 hours

○ 12-14 hours

○ 14-16 hours

○ 16-18 hours

○ 18-20 hours

○ More than 20 hours

What single video game did you play most after the release of Fortnite (September 2017) to one year after (September 2018)? *

Short answer text

Of the video game that you primarily played (Answered in previous question), * approximately how many hours a week did you play? ○ 0-2 hours ○ 2-4 hours ○ 4-6 hours ○ 6-8 hours ○ 8-10 hours ○ 10-12 hours ○ 12-14 hours ○ 14-16 hours ○ 16-18 hours ○ 18-20 hours ○ More than 20 hours	**Even if Fortnite was not the game you most frequently played, approximately** * how many hours a week of Fortnite did you play? (If Fortnite was the game you played the most and answered for it in the above question, answer the same in this question) ○ 0-2 hours ○ 2-4 hours ○ 4-6 hours ○ 6-8 hours ○ 8-10 hours ○ 10-12 hours ○ 12-14 hours ○ 14-16 hours ○ 16-18 hours ○ 18-20 hours ○ More than 20 hours
If Fortnite was your favorite game from September 2017 to September 2018, * what aspects of the game did you enjoy most? (If it was not your favorite game, please select the last option: Not Favorite game) ○ Challenge (Competing against other players, leveling up) ○ Choice (Customization of Skins, Emotes, Gliders, Pickaxes) ○ Change (Frequent updates ex. new characters, new weapons, new locations, new modes) ○ Chance (Every player has an equal chance to win due to randomness of weapons and supplies) ○ Visuals (Graphics of the game, cartoon characters, no blood) ○ Playability (Does not get old) ○ Not Favorite game	If Fortnite was not your favorite game or you did not enjoy Fortnite in general, please give a short sentence why. (If you did enjoy Fortnite, skip this question) Short answer text
Do you feel that once Fortnite was released, you stopped playing other * games? ○ Yes ○ No	Do you feel that once Fortnite was released, your viewing habits changed? (If * did not watch Youtubers and Streamers, select other) ○ Yes ○ No ○ Other...

This table shows screenshots of every question that was included in the survey emailed to the students who participated in the research.

Parent survey

Do you feel it is okay for your child to play video games that include violence? *
(First or third person shooter games)

○ Yes

○ No

○ Maybe

Please provide a short explanation for your answer to the previous question *

Long answer text

Have you heard of the game Fortnite? *

○ Yes

○ No

Do you feel that parents are okay with their kids playing Fortnite because of the lack of blood and gore in the game? *

○ Yes

○ No

○ Maybe

Below are a few unnamed screenshots of fighting in different video games. Based on the screenshots, which game would you be MOST comfortable with your child playing? *

○ Game 1

○ Game 2

○ Game 3

○ Game 4

○ Game 5

○ Game 6

Please provide a short explanation as to why you would be more comfortable with your child playing the video game you chose as compared to the other in the previous questions *

Long answer text

Below are a few unnamed screenshots of fighting in different games. *
Based on the screenshots, which game would you be LEAST
comfortable with your child playing?

○ Game 1

○ Game 2

○ Game 3

○ Game 4

○ Game 5

○ Game 6

To the best of your knowledge, what video games did your child play most *
prior to the release of Fortnite (September 2017)? (Please list below with
games separated by commas)

Long answer text

To the best of your knowledge, approximately how many hours a week did *
your child spend playing video games prior to the release of Fortnite
(September 2017)? (Please select from the list below)

○ 0-2 hours

○ 2-4 hours

○ 4-6 hours

○ 6-8 hours

○ 8-10 hours

○ 10-12 hours

○ 12-14 hours

○ 14-16 hours

○ 16-18 hours

○ 18-20 hours

○ More than 20 hours

To the best of your knowledge, what video games your child play after the *
release of Fortnite (September 2017)? (Please list below with games
separated by commas)

Long answer text

To the best of your knowledge, approximately how many hours a week did   *
your child spend playing video games after the release of Fortnite
(September 2017)? (Please select from the list below)

○ 0-2 hours

○ 2-4 hours

○ 4-6 hours

○ 6-8 hours

○ 8-10 hours

○ 10-12 hours

○ 12-14 hours

○ 14-16 hours

○ 16-18 hours

○ 18-20 hours

○ More than 20 hours

Do you feel that after Fortnite was released, your child primarily played   *
Fortnite (Versus other video games)?

○ Yes

○ No

○ Maybe

This table shows screenshots of every question that was included in the survey emailed to the parents who participated in the research.

V. Results

Table 1.1 Student survey response

Participant number	Game played most from list before Fortnite *	Game played most from list after Fortnite *	Total hours played per week before Fortnite	Total hours played per week after Fortnite
1	Call of Duty	Call of Duty	4-6 hours	6-8 hours
2	Tom Clancy's Rainbow Six Siege	Fortnite	12-14 hours	10-12 hours
3	Counter Strike: Global Offensive	Counter Strike: Global Offensive	12-14 hours	12-14 hours
4	Grand Theft Auto V	Grand Theft Auto V	More than 20 hours	12-14 hours
5	Call of Duty	Fortnite	10-12 hours	6-8 hours
6	Tom Clancy's Rainbow Six Siege	Fortnite	6-8 hours	0-2 hours
7	Call of Duty	Fortnite	4-6 hours	2-4 hours
8	None	Fortnite	4-6 hours	8-10 hours
9	Call of Duty	Fortnite	More than 20 hours	16-18 hours
10	Call of Duty	Fortnite	More than 20 hours	16-18 hours
11	Tom Clancy's Rainbow Six Siege	Tom Clancy's Rainbow Six Siege	More than 20 hours	More than 20 hours
12	None	None	6-8 hours	6-8 hours

13	Player Unknown Battlegrounds	Fortnite	0-2 hours	0-2 hours
14	Grand Theft Auto V	Fortnite	6-8 hours	6-8 hours
15	Counter Strike: Global Offensive	Counter Strike: Global Offensive	0-2 hours	0-2 hours
16	Tom Clancy's Rainbow Six Siege	Tom Clancy's Rainbow Six Siege	6-8 hours	2-4 hours
17	None	Fortnite	0-2 hours	0-2 hours
18	Counter Strike: Global Offensive	Fortnite	8-10 hours	8-10 hours
19	Counter Strike: Global Offensive	Fortnite	10-12 hours	0-2 hours
20	Tom Clancy's Rainbow Six Siege	Tom Clancy's Rainbow Six Siege	4-6 hours	0-2 hours
21	Call of Duty	Call of Duty	2-4 hours	2-4 hours
22	None	Fortnite	0-2 hours	0-2 hours
23	Counter Strike: Global Offensive	Counter Strike: Global Offensive	2-4 hours	4-6 hours
24	Call of Duty	Fortnite	0-2 hours	4-6 hours
25	Call of Duty	Fortnite	4-6 hours	0-2 hours
26	None	None	0-2 hours	0-2 hours
27	None	Fortnite	10-12 hours	16-18 hours
28	Call of Duty	Fortnite	10-12 hours	12-14 hours
29	Call of Duty	Call of Duty	14-16 hours	16-18 hours
30	Tom Clancy's Rainbow Six Siege	Tom Clancy's Rainbow Six Siege	16-18 hours	18-20 hours

The above data tables record the answers of four questions of the student survey

Table 1.2 Student survey responses

Participant number	Hours favorite video game played per week before Fortnite	Hours favorite video game played per week after Fortnite	Game played most before Fortnite	Game played most after Fortnite	Does Fortnite change playing habits?
1	2-4 hours	2-4 hours	Call of Duty	Call of Duty	No
2	8-10 hours	8-10 hours	Fifa	Fifa	Yes
3	12-14 hours	12-14 hours	CS:GO	CS:GO	No
4	14-16 hours	16-18 hours	CS:GO	Final Fantasy XV	No

5	10-12 hours	6-8 hours	Call of Duty	Fortnite	Yes
6	6-8 hours	6-8 hours	Rainbow six siege	Fortnite	No
7	2-4 hours	2-4 hours	Fifa	Fortnite	Yes
8	6-8 hours	8-10 hours	Fifa	Fortnite	Yes
9	16-18 hours	16-18 hours	Rocket League	Fortnite	Yes
10	16-18 hours	16-18 hours	Rocket League	Fortnite	Yes
11	10-12 hours	10-12 hours	Rainbow six siege	Rainbow six siege	No
12	2-4 hours	2-4 hours	Pokemon Black 2	Legend of Zelda Breath of the Wild	No
13	0-2 hours	0-2 hours	Fifa	Fifa	Yes
14	4-6 hours	4-6 hours	Fifa	Fortnite	No
15	0-2 hours	0-2 hours	League of Legends	League of Legends	No
16	4-6 hours	2-4 hours	Rainbow six siege	Rainbow six siege	No
17	0-2 hours	10-12 hours	madden 18	Fortnite	Yes
18	6-8 hours	6-8 hours	CS:GO	Destiny 2	No
19	12-14 hours	12-14 hours	CS:GO	Rust	No
20	2-4 hours	2-4 hours	Rainbow six siege	Call of Duty	No
21	2-4 hours	2-4 hours	Injustice 2	Injustice 2	No
22	0-2 hours	0-2 hours	None	Fortnite	No
23	6-8 hours	4-6 hours	Dota 2	CS:GO	No
24	4-6 hours	4-6 hours	Call of Duty	Fortnite	Yes
25	4-6 hours	2-4 hours	NBA 2k	NBA 2K	No
26	0-2 hours	0-2 hours	Destiny 2	Destiny 2	No
27	8-10 hours	14-16 hours	minecraft	Fortnite	Yes
28	6-8 hours	12-14 hours	Call of Duty	Fortnite	Yes
29	10-12 hours	12-14 hours	Call of Duty	Call of Duty	Yes
30	10-12 hours	16-18 hours	Rainbow six siege	Rainbow six siege	Yes

The above data tables record the answers of five questions of the student survey

Table 1.3 Student survey responses

Participant number	Does viewing effect playing	Hours per week spent watching before Fortnite	Hours per week spent watching after Fortnite	Game watched most before Fortnite	Game watched most after Fortnite	Does Fortnite change viewing habits?
1	No	0-2 hours	0-2 hours	Call of Duty	Call of Duty	No
2	Yes	4-6 hours	8-10 hours	FIFA	Call of Duty	No
3	No	0-2 hours	0-2 hours	Counter Strike: Global Offensive	Counter Strike: Global Offensive	No
4	No	10-12 hours	12-14 hours	Counter Strike: Global Offensive	Counter Strike: Global Offensive	No
5	Yes	4-6 hours	4-6 hours	Grand Theft Auto V	Counter Strike: Global Offensive	Yes
6	Yes	0-2 hours	0-2 hours	Fifa	Fortnite	No
7	Yes	2-4 hours	2-4 hours	Call of Duty	Fortnite	Yes
8	Yes	6-8 hours	4-6 hours	Fifa	Fortnite	Yes
9	Yes	More than 20 hours	More than 20 hours	Rocket League	Fortnite	Yes
10	Yes	More than 20 hours	More than 20 hours	Rocket League	Fortnite	Yes
11	No	10-12 hours	More than 20 hours	Tom Clancy's Rainbow Six Siege	Fortnite	No
12	Yes	6-8 hours	6-8 hours	Minecraft	Fortnite	No
13	No	None	None	None	Fortnite	No
14	Yes	4-6 hours	4-6 hours	Call of Duty	Fortnite	Yes
15	Yes	0-2 hours	0-2 hours	League of Legends	Fortnite	No
16	No	0-2 hours	0-2 hours	Tom Clancy's Rainbow Six Siege	Fortnite	No
17	Yes	0-2 hours	0-2 hours	NBA 2K18	Fortnite	No
18	No	8-10 hours	8-10 hours	Grand Theft Auto V	Fortnite	No
19	Yes	4-6 hours	4-6 hours	Counter Strike: Global Offensive	Fortnite	Yes

20	Yes	2-4 hours	2-4 hours	Tom Clancy's Rainbow Six Siege	Fortnite	No
21	Yes	2-4 hours	2-4 hours	Call of Duty	Fortnite	No
22	No	0-2 hours	0-2 hours	None	Fortnite	No
23	Yes	0-2 hours	0-2 hours	Counter Strike: Global Offensive	Fortnite	Yes
24	Yes	4-6 hours	0-2 hours	Call of Duty	Grand Theft Auto V	No
25	Yes	0-2 hours	0-2 hours	Minecraft	League of Legends	No
26	No	0-2 hours	0-2 hours	Destiny 2	Minecraft	No
27	No	2-4 hours	2-4 hours	none	None	Yes
28	Yes	4-6 hours	8-10 hours	Call of Duty	Tom Clancy's Rainbow Six Siege	Yes
29	Yes	4-6 hours	6-8 hours	Call of Duty	Tom Clancy's Rainbow Six Siege	Yes
30	Yes	6-8 hours	8-10 hours	Tom Clancy's Rainbow Six Siege	Zelda Breath of The Wild	Yes

The above data tables record the answers of seven questions of the student survey

Table 2.1 Parent survey responses

Participant number	Have you heard of the following games from list*	Does your child play any of the following games?	Do you feel it is okay for your child to play video games that include violence?	Please provide a short explanation for your answer to the previous question
1	Fortnite, Call of Duty, Grand Theft Auto V	Fortnite, Call of Duty	Maybe	He plays the games but I am unsure if it negatively affects him.
2	Fortnite, Call of Duty, Grand Theft Auto V	I am unsure if my child plays any of the above games	Yes	Because they know what is real and what is a game
3	Fortnite, Call of Duty, Grand Theft Auto V	Fortnite, Tom Clancy's Rainbow Six Siege, Call of Duty, Grand Theft Auto V	Yes	Because I know that he knows the difference between

				video games and reality
4	Fortnite, Call of Duty	I am unsure if my child plays any of the above games	Maybe	It is just a game
5	Fortnite, Player Unknown Battlegrounds, Call of Duty, Grand Theft Auto V	Fortnite, Call of Duty, Grand Theft Auto V	Yes	I dont like censuring my kids
6	Fortnite, Call of Duty, Grand Theft Auto V	Fortnite, Call of Duty	Maybe	I dont like but he is old enough
7	Fortnite, Call of Duty, Grand Theft Auto V	Fortnite, Call of Duty, Grand Theft Auto V	Maybe	depends on the age. My kids are all teens now, but prior to that it was NOT ok
8	Fortnite, Call of Duty	I am unsure if my child plays any of the above games	Maybe	As long as it is under control and no signs of mood changes are present
9	Fortnite	Fortnite	Maybe	It depends on the game. If some games are bloody or shows violence that can be done in real life. I'm afraid it might influence my child to repeat those behaviors seen.
10	Fortnite, Player Unknown Battlegrounds, Counter Strike: Global Offensive, Tom Clancy's Rainbow Six Siege, Call of Duty, Grand Theft Auto V	Fortnite, Tom Clancy's Rainbow Six Siege, Call of Duty	Yes	I think it's a good way to connect with his friends

11	Fortnite, Player Unknown Battlegrounds, Counter Strike: Global Offensive, Tom Clancy's Rainbow Six Siege, Call of Duty, Grand Theft Auto V	Fortnite, Tom Clancy's Rainbow Six Siege, Call of Duty	Yes	I think it's a good way to connect with his friends
12	Fortnite, Tom Clancy's Rainbow Six Siege, Call of Duty, Grand Theft Auto V	Fortnite, Tom Clancy's Rainbow Six Siege, Call of Duty, Grand Theft Auto V	Maybe	He is old enough he can make his own decisions
13	Fortnite, Player Unknown Battlegrounds, Counter Strike: Global Offensive, Tom Clancy's Rainbow Six Siege, Call of Duty, Grand Theft Auto V	Fortnite	Maybe	We discussed prior to playing reality vs what goes on within the game. Time spent playing is restricted, not permitted during school week/ school nights (Sunday). Also not allowed to spend long blocks of time playing during the day, night time playing of electronics is banned.
14	Fortnite, Call of Duty, Grand Theft Auto V	Fortnite	Maybe	I believe if there is limited play time and parents are aware and informed of games it is ok
15	Fortnite, Call of Duty, Grand Theft Auto V	Fortnite	Maybe	Only certain games that do not contain blood
16	Fortnite, Call of Duty	Fortnite, Call of Duty	Yes	They can play what game they want

The above data tables record the answers of four questions of the parent survey

Table 2.2 Parent survey responses

Participant number	Have you heard of the game Fortnite?	Do you feel that parents are okay with their kids playing Fortnite because of the lack of blood and gore in the game?	Based on screenshots* , which game would you be MOST comfortable with your child playing?	Explanation to previous question answer	Based on screenshots*, which game would you be LEAST comfortable with your child playing?
1	Yes	Yes	Game 3	It seems very colorful and appears less violent than the other games	Game 5
2	Yes	Maybe	Game 3	Looks less real	Game 1
3	Yes	Yes	Game 3	Don't know	Game 3
4	Yes	Yes	Game 3	It is colorful, this is something I would play.	Game 5
5	Yes	Yes	Game 3	it has lots of color in it	Game 4
6	Yes	Yes	Game 3	Not realistic	Game 5
7	Yes	Yes	Game 2	everyone is wearing armor	Game 1
8	Yes	Maybe	Game 3	Cartoony	Game 1
9	Yes	Yes	Game 3	It does not show real guns, explosions, blood or people dying in front of you.	Game 2
10	Yes	Yes	Game 3	It is the least graphic from all of them	Game 1
11	Yes	Yes	Game 3	It is the least graphic from all of them	Game 1
12	Yes	Maybe	Game 3	It is a cartoon	Game 5
13	Yes	Yes	Game 3	Does not appear to be as dark, realistic as the others.	Game 5
14	Yes	Maybe	Game 1	Honestly it is hard to answer because I'm unsure of intention of games	Game 4
15	Yes	Yes	Game 3	It is played by everyone	Game 4

| | 16 | Yes | Yes | Game 3 | Most colorful | Game 6 |

The above data tables record the answers of six questions of the parent survey. For the third question the games are: game 1: PUBG, game 2: COD, game 3: Fortnite, game 4: Rainbow, game 5: GTA V, game 6: CS:GO.

Table 2.3 Parent survey responses

Participant number		What video games did your child play most prior to the release of Fortnite	How many hours a week did your child spend playing video games prior to the release of Fortnite	What video games your child play after the release of Fortnite	How many hours a week did your child spend playing video games after the release of Fortnite	Do you feel that after Fortnite was released, your child primarily played Fortnite
	1	Call of Duty	8-10 hours	Call of Duty, Fortnite	8-10 hours	Maybe
	2	Pokemon, Zelda, Mario	4-6 hours	Same as above. They do not play fortnite	4-6 hours	No
	3	Don't know	10-12 hours	Don't know	4-6 hours	No
	4	I don't know	10-12 hours	Call Duty	12-14 hours	Yes
	5	Rocket league	12-14 hours	Fortnite	More than 20 hours	Yes
	6	Fifa	10-12 hours	Fifa, fortnite	10-12 hours	No
	7	GTA	2-4 hours	fortnite, gta, minecraft, spiderman, all marvel games	2-4 hours	No
	8	clash of clans, league of legends, clash royale	0-2 hours	league of legends, clash of clans	0-2 hours	No
	9	Madden 17, NBA 2k16, NBA 2K17	0-2 hours	None	0-2 hours	Maybe
	10	Fifa,NBA2K,BO2	8-10 hours	BO4,Brawhalla,Seige	12-14 hours	No
	11	Fifa,NBA2K,BO2	8-10 hours	BO4,Brawhalla,Seige	12-14 hours	No
	12	Rainbow Six Siege	4-6 hours	Fortnite	6-8 hours	Yes
	13	Minecraft,	4-6 hours	Minecraft,	4-6 hours	No

		NBA2k, Madden NFL		Madden NFL, WWE 2k, NBA 2k		
	14	Sports videos	0-2 hours	My child, for this survey, only played minecraft	0-2 hours	No
	15	Minecraft	12-14 hours	Fortnite	14-16 hours	Yes
	16	Call of Duty	8-10 hours	Fortnite	12-14 hours	Yes

The above data tables record the answers of five questions of the parent survey

Table 3. Average monthly Twitch viewers

Month	Fortnite	PUBG	Rainbow	CS:GO	GTA V	COD
September 2016	0.00	0.00	3,944.00	42,783.00	2,071.00	15,283.00
October 2016	0.00	0.00	2,675.00	47,707.00	3,042.00	5,876.00
November 2016	0.00	0.00	5,300.00	45,798.00	2,697.00	8,878.00
December 2016	0.00	0.00	4,721.00	41,152.00	3,956.00	3,374.00
January 2017	0.00	0.00	7,148.00	97,411.00	5,778.00	173,499.00
February 2017	0.00	0.00	9,665.00	60,328.00	3,380.00	3,862.00
March 2017	0.00	63,399.00	6,349.00	49,624.00	4,142.00	2,857.00
April 2017	0.00	69,010.00	5,419.00	50,861.00	21,458.00	1,901.00
May 2017	0.00	59,450.00	5,028.00	31,446.00	26,755.00	1,455.00
June 2017	0.00	52,139.00	5,055.00	30,360.00	19,372.00	1,934.00
July 2017	0.00	59,495.00	6,009.00	91,707.00	20,900.00	2,112.00
August 2017	0.00	47,752.00	6,110.00	27,138.00	14,414.00	2,540.00
September 2017	6,541.00	101,630.00	8,330.00	37,956.00	12,373.00	831.00
October 2017	2,173.00	82,007.00	6,040.00	38,207.00	10,156.00	931.00
November 2017	32,532.00	69,021.00	6,823.00	35,748.00	13,768.00	25,351.00
December 2017	43,242.00	74,514.00	7,856.00	25,068.00	14,500.00	9,175.00
January 2018	61,825.00	72,400.00	7,379.00	93,678.00	17,411.00	6,298.00
February 2018	97,904.00	64,654.00	16,950.00	55,866.00	21,800.00	3,789.00
March 2018	159,342.00	63,399.00	12,678.00	37,790.00	14,045.00	3,326.00
April 2018	178,935.00	69,010.00	11,183.00	31,855.00	13,714.00	4,516.00
May 2018	194,619.00	59,450.00	12,669.00	35,571.00	15,718.00	2,948.00
June 2018	176,439.00	52,139.00	12,324.00	30,455.00	16,945.00	3,338.00
July 2018	204,692.00	59,495.00	17,640.00	35,019.00	21,755.00	3,812.00

August 2018	176,899.00	47,752.00	19,082.00	29,203.00	20,556.00	4,441.00
September 2018	147,879.00	37,497.00	15,022.00	98,142.00	18,300.00	520.00

The above chart shows the average monthly viewership on Twitch.Tv, a streaming site, for Fortnite, Player Unknown Battlegrounds (PUBG), Tom Clancy's Rainbow Six Siege (Rainbow) , Counter Strike: Global Offensive (CS:GO), Grand Theft Auto V (GTA V), and Call of Duty (COD). Retrieved from SullyGnome.

Table 4. Average hours spent watching per month

Month	Fortnite	PUBG	Rainbow	CS:GO	GTA V	COD
September 2016	0.00	0.00	2,835,752.00	30,761,358.00	1,489,213.00	10,988,908.00
October 2016	0.00	0.00	1,987,765.00	35,446,861.00	2,260,843.00	4,365,949.00
November 2016	0.00	0.00	3,810,746.00	32,928,974.00	1,939,768.00	6,383,993.00
December 2016	0.00	0.00	3,507,819.00	30,576,246.00	2,939,916.00	2,506,904.00
January 2017	0.00	0.00	5,311,227.00	72,376,812.00	4,293,651.00	2,599,848.00
February 2017	0.00	0.00	6,485,229.00	40,480,425.00	2,268,502.00	2,591,580.00
March 2017	0.00	24,877,888.00	4,717,856.00	36,870,753.00	3,078,141.00	2,123,261.00
April 2017	0.00	46,239,261.00	3,895,844.00	36,569,260.00	15,428,827.00	1,366,917.00
May 2017	0.00	47,210,587.00	3,736,235.00	23,364,660.00	19,879,433.00	1,081,092.00
June 2017	0.00	45,650,866.00	3,635,168.00	21,829,455.00	13,928,987.00	1,390,965.00
July 2017	0.00	60,967,100.00	4,465,118.00	68,139,030.00	15,528,826.00	1,569,825.00
August 2017	0.00	73,809,309.00	4,540,326.00	20,163,803.00	10,709,895.00	1,887,307.00
September 2017	4,703,330.00	73,072,371.00	5,989,945.00	27,290,465.00	8,896,769.00	597,707.00
October 2017	16,155,246.00	60,931,920.00	4,487,755.00	28,388,369.00	7,545,910.00	691,966.00
November 2017	23,390,963.00	49,626,208.00	4,906,093.00	25,703,362.00	9,899,556.00	18,227,493.00
December 2017	32,129,147.00	55,364,282.00	5,837,519.00	18,625,865.00	10,773,689.00	6,817,135.00
January 2018	45,936,666.00	53,793,909.00	5,483,250.00	69,603,467.00	12,936,876.00	4,679,599.00
February 2018	65,693,934.00	43,383,131.00	11,373,605.00	37,486,546.00	14,628,223.00	2,543,014.00
March 2018	118,391,174.00	47,105,925.00	9,420,334.00	28,078,226.00	10,435,918.00	2,471,431.00
April 2018	128,654,925.00	49,618,853.00	8,041,028.00	22,925,690.00	9,860,431.00	3,247,110.00
May 2018	144,602,326.00	44,171,705.00	9,413,483.00	26,429,452.00	11,678,663.00	2,190,669.00
June 2018	126,859,989.00	37,488,642.00	8,951,426.00	21,897,817.00	12,183,806.00	2,400,670.00

July 2018	152,086,231.00	44,205,504.00	13,106,837.00	26,762,517.00	16,164,631.00	2,832,608.00
August 2018	131,436,549.00	35,480,394.00	14,177,937.00	21,697,899.00	15,273,574.00	3,299,907.00
September 2018	106,325,201.00	26,960,453.00	10,801,179.00	70,564,750.00	13,158,117.00	374,464.00

The above chart shows the average number of hours people spent watching certain games per month on Twitch.Tv, a streaming site, for Fortnite, Player Unknown Battlegrounds (PUBG), Tom Clancy's Rainbow Six Siege (Rainbow) , Counter Strike: Global Offensive (CS:GO), Grand Theft Auto V (GTA V), and Call of Duty (COD). Retrieved from SullyGnome.com.

Table 5. Average monthly players

Month	Fortnite	PUBG	Rainbow	CS:GO	GTA V	COD
September 2016	0.00	0.00	10,411.70	322,525.90	31,643.90	6,233.10
October 2016	0.00	0.00	10,591.90	333,076.50	42,084.50	6,913.70
November 2016	0.00	0.00	15,355.50	329,045.30	42,991.30	3,905.40
December 2016	0.00	0.00	17,176.90	342,195.70	61,843.70	3,586.80
January 2017	0.00	0.00	20,706.70	393,109.50	63,178.70	4,000.80
February 2017	0.00	0.00	30,568.30	402,385.70	53,271.00	3,590.60
March 2017	0.00	17,551.10	26,079.60	386,908.70	48,616.90	3,267.20
April 2017	0.00	69,795.00	24,976.00	392,199.20	49,108.30	3,433.70
May 2017	0.00	107,441.60	23,804.10	371,829.30	42,879.60	4,714.20
June 2017	0.00	139,902.20	24,083.70	374,388.00	60,285.40	5,663.40
July 2017	0.00	229,701.70	28,378.60	377,589.00	60,840.10	4,842.40
August 2017	0.00	389,527.40	33,923.20	374,425.70	54,028.70	3,788.30
September 2017	Null	660,192.70	36,448.90	354,402.10	45,842.90	3,026.90
October 2017	Nul	1,086,638.90	31,618.80	341,861.30	39,774.50	2,766.10
November 2017	Null	1,334,170.10	41,483.70	321,131.40	41,915.20	20,487.20
December 2017	30,000,000.00	1,436,158.50	59,411.70	340,876.90	78,066.90	10,548.10
January 2018	45,000,000.00	1,584,886.80	63,474.80	382,030.50	77,566.80	7,571.00
February 2018	Null	1,391,015.30	68,796.20	382,457.10	53,395.70	5,999.70
March 2018	Null	1,295,408.60	83,112.30	354,270.30	46,028.20	4,842.10
April 2018	Null	1,107,181.80	64,263.40	289,076.70	42,779.50	3,915.00
May 2018	Null	876,180.60	63,092.80	262,170.90	41,278.70	3,799.60
June 2018	125,000,000.00	800,668.20	66,376.80	266,862.20	48,927.50	3,364.70

July 2018	Null	688,620.40	68,241.00	273,307.30	80,395.30	3,100.50
August 2018	Null	619,320.50	73,816.40	283,531.30	68,312.10	2,706.40
September 2018	Null	542,607.10	73,676.90	333,164.00	49,147.70	2,502.00

The above chart shows the average monthly players on computer platform for Fortnite, Player Unknown Battlegrounds (PUBG), Tom Clancy's Rainbow Six Siege (Rainbow) , Counter Strike: Global Offensive (CS:GO), Grand Theft Auto V (GTA V), and Call of Duty (COD). The cells highlighted in red represent months that data for Fornite was unavailable and was not used in the statistical analysis. Retrieved from STEAMCHARTS.com and Statistica.com.

Statistical analysis of student surveys

For the student survey, the data collected was analyzed using chi squared tests. Three tests were for changes in hours spent playing or viewing video games. For the changes in hours, the null hypothesis for each was that the number of hours spent playing or watching before Fortnite was released is equal to the number of hours after Fortnite. The alternative for each was that the number of hours spent playing or watching games before Fortnite was released was different from the number of hours after Fortnite. The null hypothesis is represented mathematically by H_0: $P_{before\ Fortnite}$= $P_{after\ Fortnite}$ and the alternate hypothesis used was H_A: $P_{before\ Fortnite}$ < $P_{after\ Fortnite}$. For the changes in game category, instead of doing a statistical test, a general analysis was done for the categorical data found in table 1.

Chi Squared Tests for student survey

H_0: $P_{before\ Fortnite}$= $P_{after\ Fortnite}$
H_A: $P_{before\ Fortnite}$ < $P_{after\ Fortnite}$
α = 0.05
(Reject H_0 if x^2 > Critical Point, meaning that H_A is supported, and vice versa)

Changes Category	Chi Squared Test Results	Conclusion
Changes in hours spent watching streamers	$n = 30$ $Df = 29$ $x^2 = 19.138$ Crit = 42.56 $X^2 < $ Crit $\therefore$ **Fail to reject H_0**	At the 5% level of significance, the data did not provide sufficient evidence (with 95% confidence) that the number of hours teens spent watching streamers per week was greater after the release of Fortnite. **Therefore, it cannot be concluded that Fortnite may have caused teens to spend more time watching streamers.**
Changes in total hours played of all games	$n = 30$ $Df = 29$ $x^2 = 63$ Crit = 42.56 $X^2 > $ Crit $\therefore$ **H_0 is rejected**	At the 5% level of significance, the data does provide sufficient evidence (with 95% confidence) that the number of hours teens spent playing video games per week was greater after the release of Fortnite **Therefore, it can be concluded that Fortnite may have caused teens to spend more time playing video games in general.**
Changes in hours played of favorite video game	$n = 30$ $Df = 29$ $x^2 = 117.23$ Crit = 42.56 $X^2 > $ Crit $\therefore$ **H_0 is rejected**	At the 5% level of significance, the data did provide sufficient evidence (with 95% confidence) that the number of hours teens spent playing their favorite video game per week was greater after the release of Fortnite **Therefore, it can be concluded that Fortnite may have caused teens to spend more time playing their favorite video game.**

General analysis for student survey.

The results will show the number of students who play or watch a certain game. A total of 30 students participated.			
Question	Result before Fortnite release	Result after Fortnite release	Conclusion
From the list*, which have you heard of	Not Applicable	Fortnite: 30 PUBG: 27 CS:GO: 25 Rainbow: 23 GTA V: 30 COD: 30	This question demonstrates that everyone who had participated had heard of the game Fortnite
From the list*, which have you	Not applicable	Fortnite: 28 PUBG: 5 CS:GO: 12 Rainbow: 13	This question demonstrates that Fortnite was the game that was played by the most participants of the survey

played		GTA V: 18 COD: 22 None: 2	
From the list*, which have you watched on Twitch	Not applicable	Fortnite: 25 PUBG: 9 CS:GO: 14 Rainbow: 16 GTA V: 13 COD: 16 None: 3	This question demonstrates that Fortnite was the game that was watched by the most participants of the survey
From games on list*, which did you play the most	PUBG:1 Rainbow: 6 CS:GO: 5 GTA V: 2 COD: 10 Don't play any: 6	Fortnite: 17 PUBG: 0 Rainbow: 4 CS:GO: 3 GTA V: 1 COD: 3 Don't play any: 2	This question demonstrates that Fortnite was the game that was the most played by the most participants of the survey from a selected group of games
What game do you play the most?	PUBG: 0 Rainbow: 5 CS:GO: 4 GTA V: 0 COD: 5 Fifa: 5 Destiny 2: 1 Dota 2: 1 Injustice 2: 1 LOL: 1 Madden: 1 Minecraft: 1 NBA 2k: 1 Pokemon: 1 Rocket League: 2	Fortnite: 12 PUBG: 0 Rainbow: 5 CS:GO: 2 GTA V: 0 COD: 3 Fifa: 2 Final Fantasy XV: 1 Destiny 2: 2 Dota 2: 1 Injustice 2: 1 LOL: 0 Madden: 0 Minecraft: 0 NBA 2k: 1 Pokemon: 0 Rocket League: 0 Zelda: 0	This question demonstrates that Fortnite was the game that was the most played by the most participants of the survey
Game most watched	PUBG:1 Rainbow: 4 CS:GO: 4 GTA V: 2 COD: 7 Destiny 2: 1 Fifa: 3 LOL: 1	Fortnite: 18 Rainbow: 2 CS:GO: 3 GTA V: 1 COD: 2 LOL: 1 Minecraft: 1 NBA 2k: 1	This question demonstrates that Fortnite was the game that was the most watched by the most by the most participants of the survey

	Minecraft: 2 NBA 2k: 1 Don't watch any: 3 Rocket League: 2	Don't watch any: 1 Zelda: 1	
Did Fortnite change viewing habits	Not Applicable	Yes: 12 No: 18	This question demonstrates that the participants in general did not feel Fortnite changed their viewing habits
Did Fortnite change playing habits	Not Applicable	Yes: 13 No: 17	This question demonstrates that there were mixed opinions on whether Fortnite changed their playing habits
Does the games you watch affect the games you play	Not Applicable	Yes: 20 No: 10	This question demonstrates that the participants in general felt that the games they watch affect the games they play

Statistical analysis of parent surveys

For the parent survey, one chi squared test was used to measure the change in how much they feel their child plays video games. The null hypothesis was that the number of hours spent playing before Fortnite was released is equal to the number of hours after Fortnite. The alternative for each was that the number of hours spent playing video games before Fortnite was released is different from the number of hours after Fortnite. The null hypothesis is represented mathematically by $H_0: P_{\text{before Fortnite}} = P_{\text{after Fortnite}}$ and the alternate hypothesis used was $H_A: P_{\text{before Fortnite}} < P_{\text{after Fortnite}}$. For the changes in game category, instead of doing a statistical test, a general analysis was done for the categorical data found in table 1.

Chi Squared Tests for parent survey

H_0: $P_{before\ Fortnite}$ = $P_{after\ Fortnite}$
H_A: $P_{before\ Fortnite}$ < $P_{after\ Fortnite}$
$\alpha = 0.05$
(Reject H_0 if $x^2 >$ Critical Point, meaning that H_A is supported, and vice versa)

Changes Category	Chi Squared Test Results	Conclusion
Changes in total hours played of all video games	n = 17 Df = 16 x^2 = 13.845 Crit = 26.296 X^2 < Crit ∴ **H_A is rejected**	At the 5% level of significance, the data did not provide sufficient evidence (with 95% confidence) that the parents knowledge of the number of hours teens spent playing video games per week was greater after the release of Fortnite. **Therefore, it cannot be concluded that Fortnite may have caused parents to think their children spent more time playing video games.**

General analysis for parent survey.

The results will show the number of parents who answered for each question. A total of 17 parents participated.		
Question	Result after Fortnite release	Conclusion
From the list*, which have you heard of	Fortnite: 17 PUBG: 5 CS:GO: 4 Rainbow: 5 GTA V: 13 COD: 16	This question demonstrates that everyone who had participated had heard of the game Fortnite
From the list*, which does your child play	Fortnite: 13 PUBG: 0 CS:GO: 0 Rainbow: 4 GTA V: 4 COD: 9 Unsure: 2	This question demonstrates that Fortnite was the game that a majority of the parents knew their children played
Are violent video games ok for children	Yes: 10 No: 0 Maybe: 7	This question demonstrates that parents are generally ok with their children playing violent video games
Have you	Yes: 17	This question demonstrates that Fortnite was the game that was the most played by

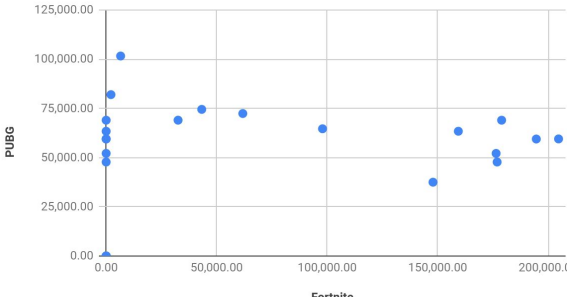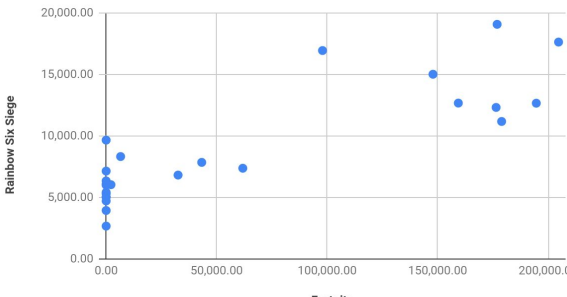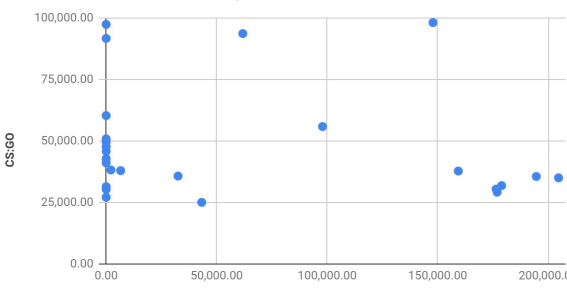| heard of Fortnite	No: 0	the most participants of the survey from a selected group of games
Do you feel parents are ok with Fortnite due to lack of blood and gore.	Yes: 12 No: 0 Maybe: 5	This question demonstrates that a majority of parents feel that Fortnite is ok because of the lack of blood and gore
Which game would you be most comfortable with your child playing	Fortnite: 15 PUBG: 1 CS:GO: 0 Rainbow: 0 GTA V: 0 COD: 1	This question demonstrates that a majority of parents felt most comfortable with their children playing Fortnite based on a unlabeled screenshot
Which game would you be least comfortable with your child playing	Fortnite: 1 PUBG: 5 CS:GO: 1 Rainbow: 3 GTA V: 5 COD: 2	This question demonstrates that a majority of parents felt least comfortable with their children playing GTA V and PUBG based on a unlabeled screenshot
Do you feel Fortnite caused your child's video game habits to change	Yes: 5 No: 10 Maybe: 2	This question demonstrates that a majority of parents feel that their child's video game habits did not change as a result of Fortnite.

Statistical Analysis of Meta analysis'

For the data collected from the different websites, a correlation test was used to compare the number of players, viewers, and hours spent viewing for six different games mentioned in the literature review. Fortnite was plotted on the x-axis and the other game was plotted on the y-axis. The resulting r value shows the correlation between games with a r value close to 1 or -1 being a strong correlation and a r value being close to 0 being a weak correlation.
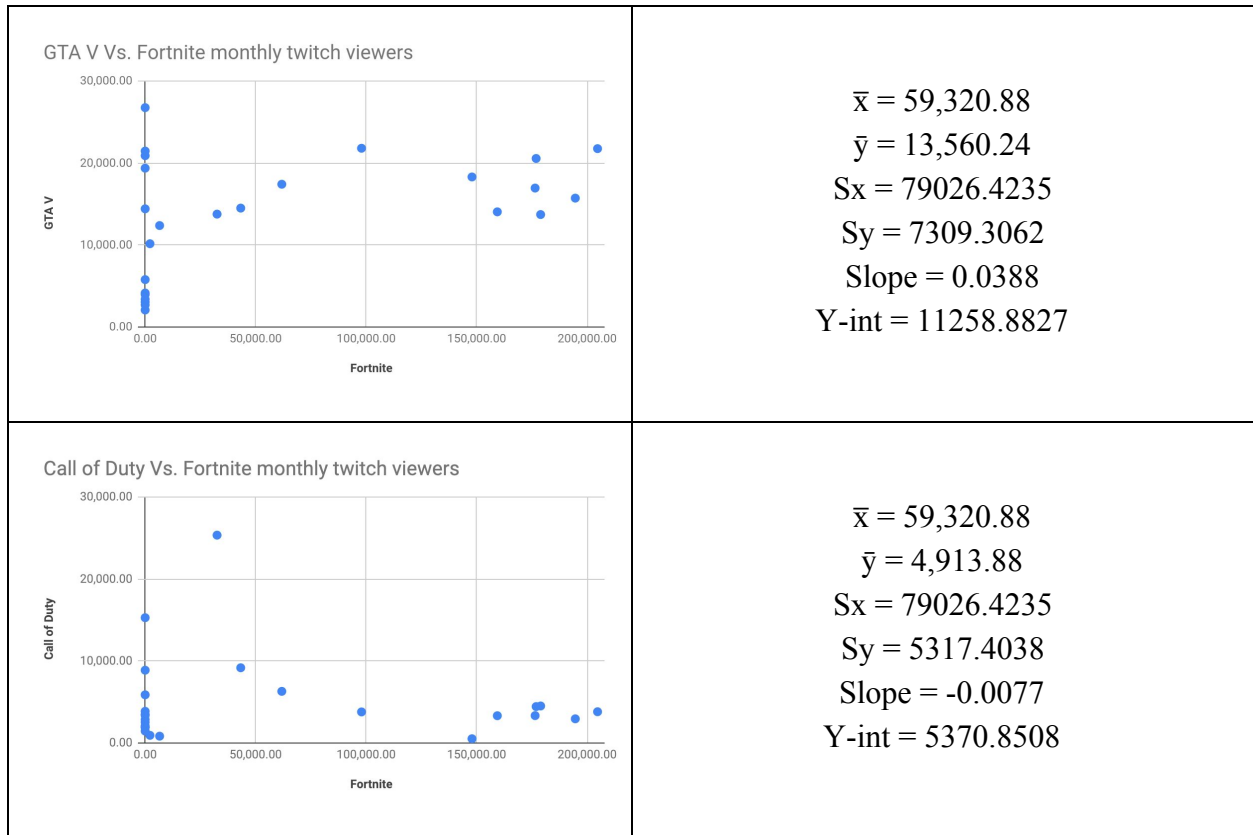
Correlation Tests for average monthly Twitch viewers

Changes Category	r and r^2 value	Conclusion
PUBG vs. Fortnite: Monthly Viewers	r = 0.2631 r^2 = 0.0692	With a r-value equal to 0.2631, the data does not provide sufficient evidence that a strong correlation exists between the average monthly viewers of Fortnite and PUBG. This means that there was a 6.92% change in the viewers of PUBG explained by a variation in the viewers of Fortnite. It also means that as the number of viewers of Fortnite increased, the number of PUBG viewers increased as well.
Tom Clancy's Rainbow Six Siege vs. Fortnite: Monthly Viewers	r = 0.8591 r^2 = 0.7380	With a r-value equal to 0.8591, the data does provide sufficient evidence that a strong correlation exists between the average monthly viewers of Fortnite and Tom Clancy's Rainbow Six Siege. This means that there was a 73.80% change in the viewers of Tom Clancy's Rainbow Six Siege explained by a variation in the viewers of Fortnite. It also means that as the number of viewers of Fortnite increased, the number of Tom Clancy's Rainbow Six Siege viewers increased as well.
Counter Strike: Global Offensive vs. Fortnite: Monthly Viewers	r = -0.1509 r^2 = 0.0228	With a r-value equal to -0.1509, the data does not provide sufficient evidence that a strong correlation exists between the average monthly viewers of Fortnite and Counter Strike: Global Offensive. This means that there was a 2.28% change in the viewers of Counter Strike: Global Offensive explained by a variation in the viewers of Fortnite. It also means that as the number of viewers of Fortnite increased, the number of Counter Strike: Global Offensive viewers decreased.
GTA V vs. Fortnite: Monthly Viewers	r = 0.4194 r^2 = 0.1759	With a r-value equal to 0.4194, the data does not provide sufficient evidence that a strong correlation exists between the average monthly viewers of Fortnite and GTA V.. This means that there was a 17.59% change in the viewers of GTA V explained by a variation in the viewers of Fortnite. It also means that as the number of viewers of Fortnite increased, the number of GTA V viewers increased as well.
Call of Duty vs. Fortnite: Monthly Viewers	r = -0.1145 r^2 = 0.0131	With a r-value equal to -0.1145, the data does not provide sufficient evidence that a strong correlation exists between the average monthly viewers of Fortnite and Call of Duty. This means that there was a 1.31% change in the viewers of Call of Duty explained by a variation in the viewers of Fortnite. It also means that as the number of viewers of Fortnite increased, the number of Call of Duty viewers decreased.

Graphical Representations

PUBG Vs. Fortnite monthly twitch viewers	
	$\bar{x}$ = 59,320.88 $\bar{y}$ = 48,168.52 Sx = 79026.4235 Sy = 30208.8602 Slope = 0.1006 Y-int = 42203.4090
Rainbow Six Siege Vs. Fortnite monthly twitch viewers	
	$\bar{x}$ = 59,320.88 $\bar{y}$ = 8,855.96 Sx = 79026.4235 Sy = 4591.0448 Slope = 0.0499 Y-int = 5895.3801
CS:GO Vs. Fortnite monthly twitch viewers	
	$\bar{x}$ = 59,320.88 $\bar{y}$ = 48,034.92 Sx = 79026.4235 Sy = 22820.3011 Slope = -0.0436 Y-int = 50620.3302

GTA V Vs. Fortnite monthly twitch viewers

$\bar{x}$ = 59,320.88
$\bar{y}$ = 13,560.24
Sx = 79026.4235
Sy = 7309.3062
Slope = 0.0388
Y-int = 11258.8827

Call of Duty Vs. Fortnite monthly twitch viewers

$\bar{x}$ = 59,320.88
$\bar{y}$ = 4,913.88
Sx = 79026.4235
Sy = 5317.4038
Slope = -0.0077
Y-int = 5370.8508

Correlation Tests for hours spent viewing a game

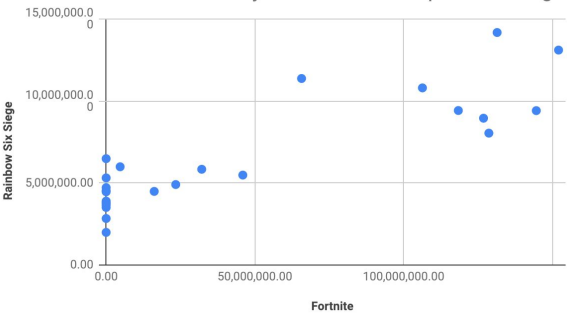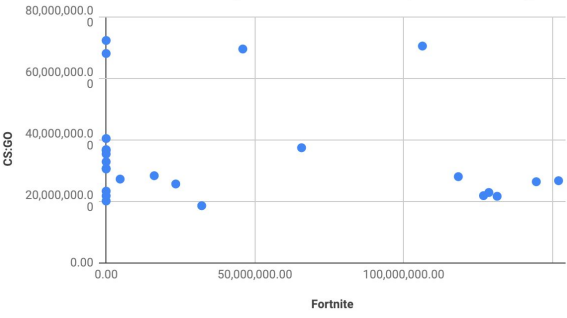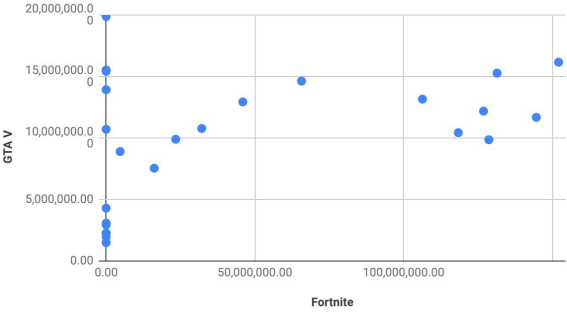| Changes Category	r and r^2 value	Conclusion
PUBG vs. Fortnite: Average number of hours	r = 0.1999 r^2 = 0.04	With a r-value equal to 0.1999, the data does not provide sufficient evidence that a strong correlation exists between the average number of hours people spent watching Fortnite and PUBG. This means that there was a 4.0% change in the viewers of PUBG explained by a variation in the viewers of Fortnite. It also means that as the number of hours people spent watching of Fortnite increased, the number of hours spent watching PUBG increased as well.
Tom Clancy's Rainbow Six Siege vs. Fortnite: Average number of	r = 0.8731 r^2 = 0.7623	With a r-value equal to 0.8731, the data does provide sufficient evidence that a strong correlation exists between the average number of hours people spent watching Fortnite and Tom Clancy's Rainbow Six Siege. This means that there was a 76.23% change in the viewers of Tom Clancy's Rainbow Six Siege explained by a variation in the viewers of Fortnite. It also means that as the

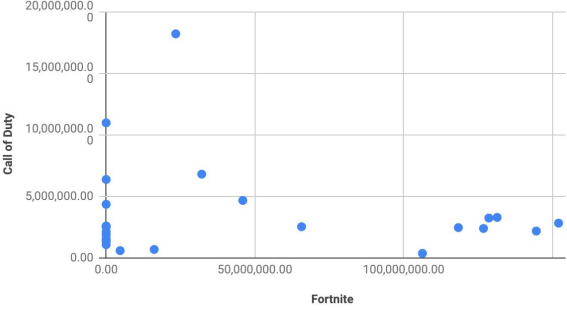| hours		number of hours people spent watching of Fortnite increased, the number of hours spent watching Tom Clancy's Rainbow Six Siege increased as well.
Counter Strike: Global Offensive vs. Fortnite: Average number of hours	r = -0.1570 r^2 = 0.0246	With a r-value equal to -0.1570, the data does not provide sufficient evidence that a strong correlation exists between the average number of hours people spent watching Fortnite and Counter Strike: Global Offensive. This means that there was a 2.46% change in the viewers of Counter Strike: Global Offensive explained by a variation in the viewers of Fortnite. It also means that as the number of hours people spent watching of Fortnite increased, the number of hours spent watching Counter Strike: Global Offensive decreased.
GTA V vs. Fortnite: Average number of hours	r = 0.4156 r^2 = 0.1727	With a r-value equal to 0.4156, the data does not provide sufficient evidence that a strong correlation exists between the average number of hours people spent watching Fortnite and GTA V.. This means that there was a 17.27% change in the viewers of GTA V explained by a variation in the viewers of Fortnite. It also means that as the number of hours people spent watching of Fortnite increased, the number of hours spent watching GTA V increased as well.
Call of Duty vs. Fortnite: Average number of hours	r = -0.1203 r^2 = 0.0145	With a r-value equal to -0.1203, the data does not provide sufficient evidence that a strong correlation exists between the average number of hours people spent watching Fortnite and Call of Duty. This means that there was a 1.45% change in the viewers of Call of Duty explained by a variation in the viewers of Fortnite. It also means that as the number of hours people spent watching of Fortnite increased, the number of hours spent watching Call of Duty decreased.

Graphical Representations

PUBG Vs. Fortnite monthly number of hours spent watching

$\bar{x}$ = 43,854,627.24
$\bar{y}$ = 36,798,332.32
Sx = 57550839.9353
Sy = 23905362.2244
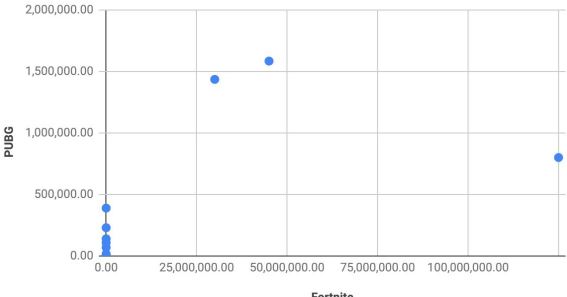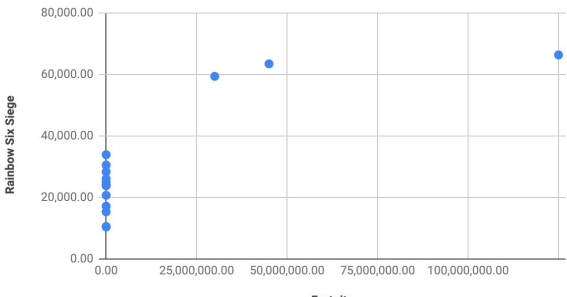Slope = 0.0830
Y-int = 33156480.0538
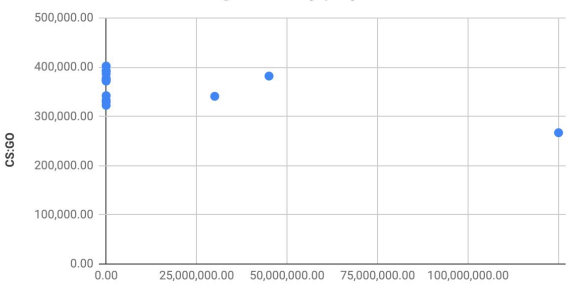
FORTNITE'S EFFECT ON THE VIDEO GAME INDUSTRY

Rainbow Vs. Fortnite monthly number of hours spent watching

$\bar{x}$ = 43,854,627.24
$\bar{y}$ = 6,436,779.04
Sx = 57550839.9353
Sy = 3314405.0341
Slope = 0.0503
Y-int = 4231711.5456

CS:GO Vs. Fortnite monthly number of hours spent watching

$\bar{x}$ = 43,854,627.24
$\bar{y}$ = 34,998,482.48
Sx = 57550839.9353
Sy = 16723173.0569
Slope = -0.0456
Y-int = 36999022.8195

GTA V Vs. Fortnite monthly number of hours spent watching

$\bar{x}$ = 43,854,627.24
$\bar{y}$ = 9,887,286.60
Sx = 57550839.9353
Sy = 5331255.2251
Slope = 0.0385
Y-int = 8199028.4366

COD Vs. Fortnite monthly number of hours spent watching

$\bar{x}$ = 43,854,627.24
$\bar{y}$ = 3,569,212.88
Sx = 57550839.9353
Sy = 3827211.9672
Slope = -0.0080
Y-int = 3919947.9001

Correlation Tests for average number of players

Changes Category	r and r^2 value	Conclusion
PUBG vs. Fortnite: Monthly players	r = 0.6032 r^2 = 0.3638	With a r-value equal to 0.6032, the data does provide sufficient evidence that a strong correlation exists between the average monthly players of Fortnite and PUBG. This means that there was a 36.38% change in the players of PUBG explained by a variation in the players of Fortnite. It also means that as the number of Fortnite players increased, the number of PUBG players increased as well.
Tom Clancy's Rainbow Six Siege vs. Fortnite: Monthly players	r = 0.7975 r^2 = 0.6360	With a r-value equal to 0.7975, the data does provide sufficient evidence that a strong correlation exists between the average monthly players of Fortnite and Tom Clancy's Rainbow Six Siege. This means that there was a 63.60% change in the players of Tom Clancy's Rainbow Six Siege explained by a variation in the viewers of Fortnite. It also means that as the number of Fortnite players increased, the number of Tom Clancy's Rainbow Six Siege players increased as well.
Counter Strike: Global Offensive vs. Fortnite: Monthly players	r = -0.6476 r^2 = 0.4194	With a r-value equal to -0.4675, the data does provide sufficient evidence that a strong correlation exists between the average monthly players of Fortnite and Counter Strike: Global Offensive. This means that there was a 21.86% change in the players of Counter Strike: Global Offensive explained by a variation in the players of Fortnite. It also means that as the number of Fortnite players increased, the number of Counter Strike: Global Offensive players decreased.
GTA V vs. Fortnite: Monthly players	r = 0.1771 r^2 = 0.0314	With a r-value equal to 0.1771, the data does not provide sufficient evidence that a strong correlation exists between the average monthly players of Fortnite and GTA V. This means that there was a 3.14% change in the players of GTA V explained by a variation in the players of Fortnite. It also means that as the number of Fortnite players increased, the number of GTA V players increased as well.
Call of Duty vs. Fortnite: Monthly players	r = 0.0745 r^2 = 0.0056	With a r-value equal to 0.0745, the data does not provide sufficient evidence that a strong correlation exists between the average monthly players of Fortnite and Call of Duty. This means that there was a .56% change in the players of Call of Duty explained by a variation in the players of Fortnite. It also means that as the number of Fortnite players increased, the number of Call of Duty players increased as well.

Graphical Representations

PUBG Vs. Fortnite average monthly players	$\bar{x} = 13,333,333.33$ $\bar{y} = 318,375.50$ $Sx = 33682693.0266$ $Sy = 530217.7962$ Slope = 0.0095 Y-int = 191774.7982
Rainbow Six Siege Vs. Fortnite average monthly players	$\bar{x} = 13,333,333.33$ $\bar{y} = 30,354.63$ $Sx = 33682693.0266$ $Sy = 18254.1097$ Slope = 0.0004 Y-int = 24591.8712
CS:GO Vs. Fortnite average monthly players	$\bar{x} = 13,333,333.33$ $\bar{y} = 359,296.54$ $Sx = 33682693.0266$ $Sy = 36293.1578$ Slope = -0.0007 Y-int = 368600.9291

FORTNITE'S EFFECT ON THE VIDEO GAME INDUSTRY

GTA V Vs. Fortnite average monthly players	$\bar{x}$ = 13,333,333.33 $\bar{y}$ = 54,355.55 Sx = 33682693.0266 Sy = 12902.3170 Slope = 0.0001 Y-int = 53451.1757
Call of Duty V Vs. Fortnite average monthly players	$\bar{x}$ = 13,333,333.33 $\bar{y}$ = 5,028.23 Sx = 33682693.0266 Sy = 2050.9112 Slope = 0.0000 Y-int = 4967.7187

Statistics key

$\bar{x}$ → x-bar = the mean value (of Fortnite)	Sy = standard deviation (of other game's distribution)
$\bar{Y}$ → y-bar = the mean value (of other game)	Sx = standard deviation (of Fortnite distribution)
ɑ → alpha = significance level (100% minus the 95% confidence level)	n = the sample size (the number of participants in each grouping)

VI. Discussion

Experimental Results and Hypothesis

The initial hypothesis posed in this paper was based off of the perceived correlation

between the increasing number of Fortnite players and viewers and the decrease in popularity of

other video games. However, after looking at the collected data and the statistical analysis, the

results of this study did not support the hypothesis that Fortnite caused other games' popularity

to decrease in the form of players and viewers. The statistical test for student surveys revealed

that students had an increase in the total hours played of all games and an increase in the total

hours played of their favorite video game had no change in the amount of time they spent

watching streamers. In addition, the student survey revealed that many students felt that they had

no change in the game they play or view most; however, Fortnite was the game that was most

played and watched by the students. Furthermore, the parent surveys generally supported the

hypothesis. The fact that almost all of the parents were most comfortable with their children

playing Fortnite over other first and third person shooter video games leads to the expectation

that they would let their children play and watch Fortnite more than other video games, but the

chi squared test proved that there was no change in the number of hours they felt their children

played video games.

In general the results of the survey supported the hypothesis that Fortnite has caused the

decrease in the number of players and viewers of other popular video games; however, the meta

analysis mostly went against the hypothesis. For each of the three categories for PUBG vs.

Fortnite, the correlation test resulted in a weak positive correlation which means Fortnite had

little effect on PUBG. For each of the three categories for Rainbow vs. Fortnite, the correlation

test resulted in a strong positive correlation which means Fortnite had actually increased the

number of players and viewers of Rainbow. For each of the three categories for CS:GO vs.

Fortnite, the correlation test resulted in a moderate negative correlation, which means Fortnite

increased as CS:GO players and viewers decreased, supporting the hypothesis. For each of the

three categories for GTA V vs. Fortnite, the correlation test resulted in a weak positive

correlation which means Fortnite had little effect on it. For the three categories for COD vs.

Fortnite, the correlation tests resulted in weak positive and negative correlations which means

Fortnite had some effect on it. Though CS:GO and COD resulted in r-squared values that

supported the hypothesis, the rest of the games did not.

Explanations

A possible explanation for the difference between the meta analysis and the survey was

that the survey only represents a small population while the data used in the meta analysis was

representative of the entire population. This may have lead to some disconnect between the

results of the meta analysis and survey.

Limitations

Lack of Data

A possible issue that has arised for the meta analysis was with the average monthly

player category. Because Fortnite has its own PC platform, its data was not available on

STEAMCHARTS which meant it was unavailable for only PC. As a result, only few data points

were able to be collected and those data points were for all platforms rather than for PC. Because

of this, the points that could not be collected after the release of Fortnite had to be cut out of the

data altogether meaning that those months for Fortnite and the other games could not be used in

the calculation of the correlation. This may have lead to inaccurate correlation results for this

category.

Time Constraint

Another limitation that occurred was that there was not sufficient time to collect enough parent surveys which caused only 16 to be collected. . This may also lead to inaccurate data because if more parents were to take the survey, they may have different opinions than the rest which could change the outcome of the statistical analysis.

Sampling

The survey was conducted using convenience sampling with a participant base consisting solely of students at Morris Hills High School, participants were chosen from a variety of academic classes across all four academic years. Additionally, 14 to 18 year-olds were chosen because they were the most consistent, available age bracket that participants could be randomly selected from.

Implications and further research

Ultimately, this study's use of website's API's to gather and organize data offered a promising method for studying changes in video game habits. However, this research suggests that the use of this type of quantitative analysis can provide useful insights into the markets of video games if enough time and data is able to be collected. The specific findings offered in this paper may hold solutions for failing games in the form of how certain games become or stay popular, but additional analysis is still needed to further understand the market.

<div align="center">

VII. Acknowledgements

</div>

I would like to thank XXXXXX for her instruction and guidance. I would also like to thank XXXXXX for helping me plan my meta analysis, survey, and statistical tests

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IX. Appendix

Student and Parental Consent Form

TITLE OF STUDY

Video game habits of students in ██████████████████

PRINCIPAL INVESTIGATOR

████████

Magnet Program for Math and Science at ██████████████
████████████

PURPOSE OF STUDY

Examine the video game habits of adolescent students

STUDY PROCEDURES

Subjects of the study will fill out a survey about their video game habits. Questions in the survey ask about what games the subjects play, how many hours they play, their opinion of certain video games.

After the survey is completed, the subject has completed his/her part in the study.

RISKS

There are no foreseeable risks that should occur prior, during, or following the survey

BENEFITS

There will be no direct benefit to the participant for their participation in the study. However, I hope that the information obtained from this study may help elevate the understanding of teen video game habits

CONFIDENTIALITY

All responses will be anonymous. No personal information will be recorded from the survey. To provide further anonymity, there will be numbers assigned to the participants that will be used on all research notes and documents.

CONTACT INFORMATION

If you have questions at any time about this study, you may contact the researcher.

Email: ███████████████

VOLUNTARY PARTICIPATION

Your participation in this study is voluntary. It is up to you to decide whether or not to take part in this study. If you decide to take part in this study, you will be asked to sign a consent form. After you sign the consent form, you are still free to withdraw at any time and without giving a reason. If you withdraw from the study before data collection is completed, your data will be returned to you or destroyed.

—

CONSENT

I have read and I understand the provided information and have had the opportunity to ask questions. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason and without cost. I understand that I will be given a copy of this consent form. I voluntarily agree to take part in this study.

| **Location** | ███████████████████ |

Title of the Study	Video game habits of students in ███████ ██████████████
Researcher	████████████
Mentor	XXXXXX (AP XXXXXX teacher)
AP Research Teacher	XXXXXX

Participant's Printed Name: _____

Participant's Signature: _____

Participant's email address:_____

Printed Parent name:_____

Parent Signature: _____

Parent email address:_____

AP® RESEARCH
2019 SCORING COMMENTARY

Academic Paper

Note: Student samples are quoted verbatim and may contain spelling and grammatical errors.

Sample: E
Score: 3

This paper scored a 3 because the paper narrows its focus, does reasonably replicable research, comes to a new understanding, and offers evidence. The method is slightly misaligned, and the conclusion is not fully justified by the data. The focus narrows through the use of date parameters and specific subjects on page 5: "How has Fortnite's growth from its release in September 2017 to September 2018 affected the number of players and viewers of other games?" The paper then discusses various perspectives about Fortnite on pages 5–8 and describes a replicable method on pages 9–16 (although the paper isn't actually doing a meta-analysis or an experiment as stated on page 9). Results are presented in both tables and figures on pages 17–28, and the new understanding appears on page 42: "the results of this study did not support the hypothesis that Fortnite caused other games' popularity to decrease in the form of players and viewers." Later on, the next page, the paper offers a slightly different new understanding: "For the three categories for COD vs. Fortnite, the correlation tests resulted in weak positive and negative correlations." The paper's communication is adequate, though not ideal.

This paper did not score a 2 because the method is reasonably replicable (see photographs of survey questions on pages 10–16), and there is a new understanding partially based on student-generated evidence on page 42 even though it is not well justified. The writing is competent, and citations are present.

This paper did not score a 4 because the topic of inquiry is not well-situated in the literature on video games. While there may not be research on Fortnite, there is plenty of scholarly research on video games that the paper could have linked to in their literature review. In addition, the conclusions are not sufficiently supported by the evidence. The method's alignment is also not well enough justified with its purpose. Finally, the paper's use of many tables and figures to show the method and results, as opposed to summarizing them more succinctly, detracts from the readability of the paper.