

**Measuring the Enjoyment Younger Players Feel for
Aesthetically Older Video Games**

By

Justin Malone

In

Computer Information Science

A Thesis

Presented to the

Honors Program of

Missouri Southern State University

Mr. Dennis Herr

Associate Professor of Computer Information Science

Fall 2015

Abstract

Measuring the Enjoyment Younger Players Feel for Aesthetically Older Video Games

Justin Malone, B.S. Info Technology

Missouri Southern State University, 2015

Faculty Mentor: Dennis Herr

There exists a trend in the video game development community to create modern games that contain aesthetics seen in much older generations of video games. Younger players today never got to experience this older generation of video games. How is the overall enjoyment a player feels about these games affected by his or her lack of connection to this older generation? In this project, I developed a video game with retro and modern aesthetics and let two sets of age groups, around 12 and 21 years of age, play through the game and fill out a survey. While there were differences in opinions between the two age groups, certain factors were shown to be more important in video game enjoyment, such as the number of other game players in the household and the number of devices owned to play games.

Measuring the Enjoyment Younger Players Feel for Aesthetically Older Video Games

Research & Terminology

The experiment deals heavily in certain aspects of the video game market that need to be explained before the experiment's value can be understood. To begin, the term "indie" (as in, independently developed video games) must be defined. An article entitled "Examining Indie's Independence" gives a rather simple definition of the term, claiming any game that does not fall in to the "mainstream" of the modern video game culture to be considered "indie" (Lipkin).

While indie games typically carry with them an expectation among players to offer quite different experiences than other video games, a more concrete definition of the term "indie" would be: a video game developed by individuals without video game publisher financial support. It is comparable to the mental image of an "indie" band with musicians all meeting in a garage once a week in their spare weekends to work on their concept album. These "indie" developers are individuals who typically hold another position outside game development as their main source of income, and are working on their game as a passion project with funding provided by either themselves or their own alternate efforts in obtaining financial support (such as Kickstarter, a website in which an idea in need of funding allows "backers" to pledge money in different amounts, usually for different levels of rewards provided in the future).

These indie games bring with them a certain expectation from players. Edmund McMillan, developer of several popular indie titles, said that when he was creating Super Meat Boy (a game reminiscent of early 1990's platforming games in graphics, sound, and game play), his goal was to capture the frustration he felt playing the difficult games of his childhood while adding improvements to the platforming genre to make the consequences of failure in his game

less permanent. His goal is a similar theme shared among many indie games. Most take an aesthetic of that similar to the games that indie developers played as a child. These games are, in many ways, a way of reminiscing about these childhood memories, while also attempting to add their own critique and improvements. They are developing the kinds of games they wanted to play as children but never got the chance to.

These recent indie games have risen to popularity rather quickly over the last five years, but why the sudden jolt in popularity? In addition to the fact that the children who were influenced by these older video games now being old enough to make their own, Lipkin's article states that there is a "dissatisfaction with the present." Not only are these developers making the games they did not experience as a child, they are making the games that no one else is making right now. Over time in the video game industry, certain trends in game design rise and fall, just like in any other culture. In the 1990s, platforming games were popular. These were games in which the goal was for the player to control a character, moving from the beginning to the end of the level. The player would need to jump over obstacles, across gaps, and on top of various platforms along the way. In the recent decade, first person shooters have risen to become the dominant method for developers to make money. Platformers, however, have been largely ignored by large video game developing studios, due to their lack of selling power on the market. As a result, the individuals who grew to love video games largely due to the platformers they grew up playing and now reviving platforming games. As they do this, they bring with them in these revivals the art and sound styles of these older generations as well.

Recent increase in the technological capabilities of both computers and video game consoles has also helped to harbor an indie-friendly environment recently. "Retro Evolved," a presentation at the 2011 conference for the Digital Games Research Association, covers in detail

these trends (Kayali). One factor is the ability for indie developers to distribute their games to their consumers directly over the internet. Internet connectivity has become increasingly available to more and more individuals with greater and greater speeds. There is no longer a need to get a game produced on a disc and on store shelves to get it in to the hands of players, cutting costs tremendously. Game development tools have also become cheaper and more widely available. Many tools focus on making game creation a less complicated skill to learn. Some even cut out entirely the need to learning a programming language. These tools are helping to bring full development power to any individual with an idea and no prior experience in the technical aspects of game development, or at least help individuals make an interesting enough prototype to get the attention of those willing to help.

Kayali's article coins the term "contemporary retro games" to describe modern indie games that borrow the aesthetics of the older video games they were influenced by. These indie games may appear on the outside as simply games that should have been made twenty years ago, but there is much more going on in these games from a design stand point! The article states that these contemporary retro games consist of a single or few core mechanics and will base the game play solely around exploring them fully. For game design, a "mechanic" can be thought of as an action that player takes to try to complete a goal. For example, in the video game Super Mario Bros., the main mechanics include the player making Mario run and jump. The player uses these actions to complete the tasks given to the player in the game, such as killing enemies, collecting coins, and getting to the end of the level. A game's mechanic is what determines what kind of puzzles the game designer will make for the player to complete. These contemporary retro games are taking these classic mechanics and bringing in modern day influence to them. The modern indie game Bit Trip Beat takes a mechanic called object-oriented level design (level are made out

of objects which will reoccur with variations later on to test what the player has learned) and then syncs the whole game to a musical soundtrack, much like Rock Band or Guitar Hero. Bit Trip Beat may look and sound like an older game, but it feels like nothing that was available during those times.

These indie games may seem like a small niche in the video game industry, one without much clout, but even as early as the beginnings of the video game industry, these indie games have been instrumental in keeping video games as an entertainment industry relevant and thriving to both consumers and artists. The article "Paradigm Shifts in the Video Game Industry" tells the tale of third-party video game developer Activision to demonstrate this fact. Throughout the late 70's and early 80's the company produced independently developed video games for the Atari consoles available at the time, without permission from Atari. Atari wanted total control of their whole video game ecosystem, from the hardware you bought to the software you played on their consoles. Their lawsuits against Activision were brought to an end when Atari realized that the increase in available software for their console made it more appealing on the market for consumers. Atari and Activision competed directly in the software market, but allowing this to happen lead to more sales and a larger consumer-base, which benefited both companies in the end.

The presence of indie games can boost a console's position in the marketplace, but in addition they bring with them more experimental, artsy games due to the independent nature of the developers of these games. Typically a single person or group of persons have control over the entire project from start to finish. They have no bosses or share owners to answer to. In many cases, the money made from a project is secondary to the message the developer is wanting to express. "An Art World for Artgames" looks at this art game subgenre through the case of an

indie game called "Passage," a very short game packed with retro aesthetics (seen in figure 1). In fact, the game limits itself technically speaking even more so than is typical for indie games. The

game takes place in a resolution of

100x16 pixels. For comparison,

Nintendo's very first console, the

NES, had a screen resolution of

256x240 pixels (seen in figure 2).

Passage has two percent the space

to display graphics than the NES

used. Even with such limiting

factors, it is considered the first

modern art game and caused quite

a stir of emotions in critics with its

commentary on the journey

through life. The article mentions a

critic who felt the death of the

companion character in "Passage"

affected him emotionally greater than the death of a companion character in the game "Final

Fantasy VII". The Final Fantasy game in question contains 3D rendered cutscenes, voice acting,

and hours of gameplay leading up to the death scene. "Passage" lasts a total of five minutes from

beginning to end. Such critical responses are important in elevating the video game industry,

showing it can produce more than entertainment. These short, sometimes strange, art games



Figure 1 – screenshot from Passage

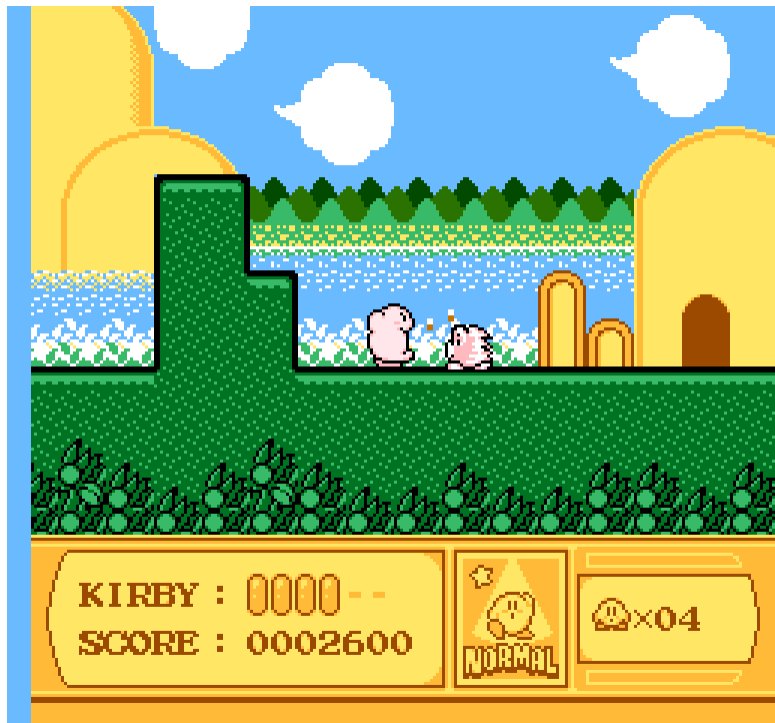


Figure 2 – screenshot from Kirby's Adventure, an NES title

gives critics a physical point of evidence to refer to when attempting to critique more mainstream, bigger budget video games.

Significance

Many examples in literature cover definitions for the term "indie game" and its importance to the video game industry as a whole. There are not studies looking at how these games are perceived by consumers who did not experience first-hand the aesthetic styles these games are attempting to emulate. These indie games are easier to produce than ever before, and with them capturing a bigger and bigger portion of the public eye, it is important to understand how these games are perceived by a portion of the player base that is growing equally, if not more. As time passes, the average players will no longer remember when games used to look and sound like they do in these contemporary retro games. Without the hook of nostalgia, how will these games be perceived by the upcoming rush of new players? Will these games simply cease to be in the public eye over time? Will children appreciate these games in a different way than older players will?

These contemporary retro games are already written off by some to be merely a marketing ploy to cash in on an older generation on its way out of the main consumer base. It has been noted that the group of people born between 1980 and 1995, or "Generation Y" as they are referred to (Bawany), are much more nostalgic than previous generations before them. Shannon McCain believes that the advent of the internet is responsible, at least partially (McCain). With it, Generation Y has access to all their childhood content at all times. There was never a putting away of childish things for Generation Y. Older generations saw their childhood media broadcasts end and their favorite toy lines cease production as they grew older. In a way, they were forced to put away their childish things because they were gone. As a whole, their culture

grew up with them. With the internet acting as an archive of these childhood memories for Generation Y, as well as giving them a community in which to share and reminisce about them, they uploaded their childhood rather than letting it slip away. There is no indication of the internet going away any time soon, and it can be easily assumed this affect will not only apply to Generation Y. Nostalgia might be a powerful marketing tool far in to the future, apply to all new generations going forward. Understanding its effects on the entire market, and not just the intended audience, will be important as well.

Video games are in a unique position when it comes to the nostalgic marketing movement. For example, a movie attempting to cash in on nostalgia can typically be enjoyed outside of the targeted audience as simply another movie. With Michael Bay's Transformers movies, viewing the cartoon in the 80's was not essential in any way to understand the new movies, yet there is certainly a nostalgic connection there. However, when a video game attempts this technique, the result is something noticeably different than other video games available on the market. It will contain strange visual and audio aesthetics not seen in other games. The interactive nature of video games also forces its participants to take a more active part in these strange phenomena. The disconnect between these young players and this older setting is easier to capture in such a medium, making this a valuable study for marketing.

Game developers themselves will benefit from the knowledge as well. Indie developers typically do not have many financial resources, and doubtfully many are able to give any to market research, relying on the publicized works of others to learn important data for what projects will sell and what will not. Decisions on what art style to use can be checked against who they want to target with their game. This in turn will affect game artists and what kinds of art they will spend their time creating. This information also can affect what skills are relevant

when hiring artists for projects. Pixel art and 3D modelling are two different skills, and completely different individuals might need to be hired to fill one or the other. Decisions about who and where to market a finished game also benefit from this study.

Procedure

The first step was to create a video game that could be considered contemporary retro in aesthetics and design. The game was designed with two different modes: one modern (figure 4)



Figure 4 - screenshot of retro aesthetic mode

and one retro (figure 3).

The game play is exactly the same between the two modes. The modern mode uses 3D models, realistic textures, high-quality realistic sound effects, and orchestrated music. All of

these are common elements in modern games that choose a realistic aesthetic. The 3D models and accompanying textures, as well as the musical track, were collected from several late 2000's Nintendo games to ensure they would be of high quality. The sound effects and the remaining textures were gathered from online Creative Commons sources or were created by me. The retro mode was crafted after the modern mode to better connect the



Figure 3 - screenshot of modern aesthetic mode

two modes. I created 2D blocky versions of the 3D models using NES restrictions (limiting myself to three colors per graphic, using colors only available on the NES, and keeping their resolution low enough to match up with an original NES's screen resolution). Sound effects were created using an online tool that generated 8-bit tones. A retro-sounding remix of the orchestrated Nintendo track was chosen for the music. All modern media has an equivalent retro counterpart.

The game is very similar in design to games like “Space Invaders” or “Galaga.” Before the game starts, the player is presented with a black screen explaining the controls and allowing them as much time as they want to explore the simple controls and become comfortable with them. The player controls a space ship and is able to move in all directions on a 2D plane. The player can also press a button to shoot directly in front of them. Once the player is ready, he or she will press 'Start' on the controller to begin. Different enemy types fly out in front of them from the screen edges. The player shoots at and destroys these targets that spawn gold coins to collect. A player is allowed to collide with an enemy ship or be hit by an enemy ship's bullet three times before dying. Upon death, several gold coins are subtracted from the score. All enemies on screen are also destroyed to help give the player a safe place to begin again from. The player has a total of four minutes to play the game. At the beginning of the game, one of the two aesthetic modes, modern or retro, is chosen at random and presented to the player. At the two minute mark, the game pauses temporarily and swaps over to the other aesthetic mode for the rest of the game. When the game was finished, a screen was displayed thanking the player for playing, showing the final gold tally, and instructing the player the survey section would now follow. It was created using an engine called GameMaker Studio, runs on Windows 10, and uses an Xbox 360 controller to be played. The game ran at fullscreen as to help with immersion.

Specific care was given to enemy design to have a challenge players would be engaged with for the entire duration of the four minutes of game play. Enemies could be split in to two categories: those focused on movement and those focused on shooting. Each category had three different enemies that represented increases in difficulty levels. The movement-based enemies began by initially only moving in a single direction across the screen. The next iteration gave them the ability to perform a circular flip, broadening their range and keeping them on screen longer. The final iteration gave them a flip and the ability to slowly turn themselves towards the player, making it near impossible for the player to not have to directly deal with them when they appeared. The shooting enemies employed a similar progression line. They began by simply shooting directly in front of them while flying in a straight line across the screen. In the next iteration they shot two lasers at once, slightly angling them out and away from themselves to broaden their attack range. The final iteration allowed a much quicker fire rate, double lasers, and the ability to perform circular flips, essentially letting the enemy shoot in all directions.

The player was also able to expect certain behaviors out of new enemies by their graphical representations as well. Enemies that specialized in movement typically had more box-like shapes that slimmed up slightly as their speed increased at different iterations. The shooting enemies had spires coming from them indicating where projectiles would fire from. Through this, the player was able to anticipate actions of enemies without having a tutorial explain the actions, which is essential in keeping play time short and simple.

A wave generator was also created that handled the creation of enemies. Over time, the frequency and difficulty of the enemy ships increased. Enemies began appearing slowly, and only in their lowest tier of difficulty in their category. This allowed the player to learn the basics

of an enemy category in a relatively easy way. Over time, as a player learned the basics of what to expect from enemies, enemies of a higher tier of difficulty were allowed to be created.

After completion of the game, testing could begin. Participants were lead in to a room in which the game was already running at the introduction screen. I would instruct the participant that the game would give instructions, I would be on the other side of the room's door, and to come get me when the game was finished. After indication the participant understood, I left and shut the door behind me. After the participant came and opened the door, I would hand them a survey to fill out. After completion of the survey, they were thanked and told they were finished. The survey captured their age demographic, their video gaming habits, and how they felt about several different aspects of the game in the first half and in the last half. A sample of the survey they filled out is included at the end of the document.

Participants were collected from several different sources. An email was sent out to all students in the Honors Program of Missouri Southern State University and three dates were setup on campus to allow these students the chance to participate. These students were also awarded an honors' point (a method of measuring on-campus participation for students in the program) for helping out. The study took place in a classroom during times when classes were not scheduled to take place, with a desk and chair setup in the front of the room for the participant to use. Participants were also collected from the Wednesday night youth program at New Life Church in Anderson, MO. This captured an age range from 7th grade to 12th grade. Participants were explained what the study was, its purpose, and were given forms to have their parents sign if they wanted to participate. Those that brought back forms the following week were allowed to participate. A similar setup was used for this experiment in which an empty room used for church study groups was used to setup the computer at a desk and chair. Participants were also

After setting up and allowing the participants to play the game and fill out the survey at the locations listed previously, 39 surveys were collected. The data was extracted from them by hand and placed in a Microsoft Excel spreadsheet (figure 5) for data analysis. This allowed for much easier sorting and a means to create graphical representations of the data for easier analysis. This also allowed the use of several formulas useful in statistical analysis, such as the correlation function. It should be noted that although the starting aesthetic, retro or modern, was determined by random at the start of each play session, the data was entered into the spreadsheet in a manner that identified which data came from the retro aesthetic and which from the modern aesthetic. An additional flag was also entered in to indicate which aesthetic the player experienced first.

Initially, it was intended to collect data from all age ranges. However, due to availability and the fear that spreading the data too thin across a large range of ages would lessen the impact the data would have in finding correlations, two age ranges were selected to focus on for data collection: participants near the age of 12 and participants near the age of 21. These age ranges were selected for two reasons: the age groups were easy to find participants to fill, and the age groups satisfied the condition that one would find retro gaming nostalgic while the other would have no first-hand experience with it. In the 12 year old range, the highest age was 14. This would put their year of birth most likely in 2001. At this point in the video game industry, the sixth generation of consoles were being launched. Video game console developers typically release new consoles at the same time to compete with each other, thus the term "generation" being used to describe each wave of console releases. At this generation, 3D graphics had already been around a whole generation and were now maturing into the main aesthetic style for mainstream video games. A focus on realism was now possible at this point with the increase in

hardware power for home consoles. For contrast, taking out an outlier of 17, the lowest age in the 21 year old range is 18, placing their birth year likely in 1998. At this point, the fifth generation of gaming had just launched a year prior. The fifth generation was the generation in which home consoles first began offering 3D graphics titles. 2D pixelated titles that fit the retro aesthetic were still being developed and released for previous generations of consoles, meaning these participants would have had plenty of exposure to this aesthetic style.

In the 12 year old range (referred to as the "younger" range hence forth), 15 entries were collected. These ranged from ages 11 to 14. The average age for the category was 12.333, which stayed close to the target of 12 for the younger range. The 21 year old range (referred to as the "older" range hence forth) had 24 surveys collected. These ranged from ages 17 to 24 with an average around 20.417. This also kept close to the target for the range.

One question on the survey asked the participant to rank their frequency of video game playing. They did so by selecting a letter corresponding with one of the following choices: more than two hours every day, less than two hours, several days a week, once a week, once every few weeks, or hardly ever. To be able to assess these for correlation, they were converted over to a numeric scale indicating approximately how many two hour video game sessions the participant was having per day. A single 1 on the scale translated to a single two hour session in a day. Other less-frequent values were given fractions to represent them, such as 0.5 sessions per day when the participant marked he or she played several days a week, or 0.14 when answering he or she played once a week. These values were also computed in averages as well. The younger range held an average of 0.233 for their regularity and the older range had 0.678. The older range represented individuals who played video games quite more frequently than the younger range. This could be attributed to the fact that when gathering participants for this age group, those who

played video games were more likely to participate than those that did not. With the younger range, the individual's opinions on gaming may not have been as big a factor in whether they wanted to participate. They may have been more willing to act out on their curiosity and participate regardless of their habits due to their younger age.

Another question on the survey asked the participant how many other individuals in their home played video games, not including him or her. The younger range had an average of 2.533 other individuals playing video games at home. The older range had an average of exactly 1. This is easily explained through the fact participants in the older range are able to live independently from their families. These participants more than likely have moved out from their parents and live either alone, with roommates, or with a spouse. Since this age range is also more likely to have participants playing video games at a more regular rate, these older participants are also likely to seek out like-minded individuals as spouses and roommates, driving up the possibility that, if the participant does not live alone, he or she is living with someone who also plays video games. The younger range is more likely to live with parents or siblings that play video games, driving their average higher.

The survey also asked the participants to indicate what devices they used to play video games on. Rather than asking the participant for a number, asking them to leave a check mark next to devices both reminds participants of devices they may have forgotten they use and eliminates confusion on what does and does not count as a device. These check marks were tallied up for each participant. The younger range averaged 3.333 devices and the older range averaged 3.208 devices. Both ranges had averages that were fairly close together.

To capture how much each participant enjoyed the different aspects of the video game, a six-point likert scale was used. Three categories were measured for both the retro and modern

aesthetics: graphics, sound and music, and gameplay. Because the starting aesthetic was randomized, the survey asked how much the participant enjoyed each aesthetic at the start and at the end. The scale was converted to a number range with 1 being "Strongly Disagree" and 6 being "Strongly Agree." The higher the number on the scale, the more the participant enjoyed the category.

For the retro aesthetic graphics, the score averages were very close. The younger range rated the graphics at 4.467, and the older range rated them at 4.458. This is equivalent to half-way between the "Somewhat Agree" and "Agree" choices on the survey. This was an unexpected result. This suggests the retro graphics are enjoyed equally by both age ranges. While the older range can be explained with nostalgia, the younger range's enjoyment can be potentially explained by two factors. First, the individuals in the younger range all have the potential to be familiar with older gaming aesthetics to some degree, either potentially through their parents or older siblings. The larger household number for the younger range suggests there are many individuals providing opportunities for these younger participants to become familiar with this subject matter. There could also be other media influences causing a connection, such as the rise of the video game Minecraft, a game popular among younger children that contains blocky, pixelated graphics. The younger range could see this retro graphic style as its own art style in today's age. Further experimentation will be needed to confirm these claims.

For the retro sound and music, the score averages were again quite close. The younger range's average score was 4.733 and the older range's average score was 4.583. Much like with the graphics, this is baffling. The rise of synthesizers in modern music may have made children comfortable with the synthesized sounds and music in the video game. Prior experience with the retro aesthetic would also explain such a similar rating.

The modern aesthetic graphics show higher averages than the retro graphics. The younger range averaged at 4.8, while the older range averaged at 4.833. Comparing the younger range and the older range, the difference is negligible. However, comparing the averages to their retro counterpart is more interesting. Much like with the retro graphics, the modern graphics holding a higher average for both age ranges was surprising. There are certainly individual participants who favored the retro aesthetic over the modern aesthetic, as indicated by some of the red in the "Difference Graphics" column of the data sheet. However the majority tends to rate the newer graphics higher. Perhaps the idea that newer is better was prevalent enough to sway opinions. The video game industry as a whole has always tried to sell each new generation's consoles by demonstrating how much more powerful they are graphically than the previous generation. This marketing behavior may influence individuals to favor the newer look. The retro aesthetic could also suffer greatly from being in direct comparison with modern aesthetic counterparts. While individuals may nostalgically enjoy the retro graphics, given the opportunity to choose an exact equivalent in modern graphics may turn out to be more appealing to the consumer-base at large. Video games focusing on retro aesthetics may want to focus on them as an art style rather than a technical limit to constrain themselves to for the sake of nostalgia.

The modern aesthetic sound and music showed an interesting difference, however. The younger range rated the sound at 4.867, rising a bit from their rating of the retro sound. The older range rated it at 4.292, dropping slightly from their retro sound rating. The older range preferring the retro sound and the younger range preferring the modern sound aligns more with the idea of the nostalgic connection. The nostalgic connection for the older generation may not apply through the graphical aspect of the aesthetic, but seems to be intact for the sound and music aspects of the aesthetics.

For the gameplay, comparing retro and modern aesthetics would not make much sense. The gameplay starts off easier in the beginning and introduces new elements over time. Since the aesthetic was different at the beginning and end for different participants, this needs to be corrected in the data when looking at the gameplay. A "Gameplay Difference" column was added to the data sheet that looked at which aesthetic a player was presented with first. It then subtracts the ending aesthetic from the beginning aesthetic. This creates a difference column that measures how much a rating changed from the easier starting segment to the more difficult ending segment of gameplay. For the younger range, their average rating went up 0.533 points from the beginning to the end. For the older range, the average dropped 0.167 points. As the game grew in difficulty, this led to more deaths. In the game, deaths were punished by taking away 50 coins from the player. This punishment becoming more frequent can cause the player to become more frustrated, rating the ending gameplay lower, like what is seen with the older range. The younger range, however, has spent most of their life thus far developing the finer motor control and reflexes needed to complete more challenging video games. These individuals expect and are more accepting of a difficulty spike that brings the game outside of their skill level. They may even be more interested in getting to see the new enemy types introduced towards the end than in winning the game or getting a higher score. The never-ending supply of lives may have also been something they came to appreciate by the end of the game. All of these factors may have contributed to the younger range rating the end of the gameplay higher than the beginning.

In addition to averaging, certain pairs of data sets were also compared using correlation coefficients. Correlation coefficients are values used to describe how closely two data sets correlate, representing this using a value from -1 to 1. If the correlation coefficient for two sets is

equal to 1, that means the two sets have perfect positive correlation. As data in one set increases, so does the other. Likewise, if the correlation coefficient is -1, the two sets negatively correlate perfectly, with one decreasing as one increases. A correlation coefficient of 0 would indicate no correlation between the data set. This value can be used to indicate how much of an effect two data sets have on each other. The farther from 0, the more the two data sets influence each other.

First, the aesthetic ratings were compared to the entire age range to see if age had any correlation with the ratings. The retro graphics and sounds had coefficients of 0.026 and -0.072 respectively, indicating virtual no correlation at all. The modern aesthetics had a similar showing, with coefficients of -0.027 for the graphics and -0.149 for the sound. This shows that strictly age alone as a number was not a deciding factor of what score a participant would give a category. However, since the two categories were broken up in to two different ranges, this information has little weight. Categories need to be compared against the different categories broken up.

By breaking up the ages into the younger and older age ranges, more meaningful comparisons can be made against other factors. Starting with the retro aesthetics, regularity is checked for correlation against the different categories in the aesthetics. For the younger range, regularity gives a correlation coefficient of -0.226 for graphics and 0.15 for sound. The older range gives -0.234 for graphics and -0.243 for sound. These are fairly low values and do not indicate much of a connection. The frequency with which individuals play video games does not seem to affect how much either group enjoyed the aesthetics of the retro aesthetic. For the modern aesthetic, the younger range's regularity data gave correlation coefficients of 0.362 for graphics and 0.576 for sound. These are slightly higher, especially in the sound and music. With

almost 60% correlation, there is some credence to the hypothesis that an increase in regularly playing video game leads to higher ratings for the sound of the modern video game aesthetic.

The number of individuals playing video games in the household was compared next. For the retro aesthetic, in the younger range, the household category generated a correlation coefficient of 0.805 for the graphics and 0.723 for the sound. This is quite a strong correlation shown. The younger-aged participants growing up in houses where older individuals have been playing video games for a while tends to lead to a better appreciation for the retro aesthetic. This data tends to support that claim. For the older range, the household generated a coefficient of 0 for both the graphics and sound. Due to the low range of values in the older range's household responses (a minimum of 0, a maximum of 2, and an average of 1), this data is expected. These older participants are around less individuals in the home, and seem to not be taking influence from them. These coefficients support the idea that the older range participants are surrounding themselves with individuals that are like-minded and have moved away from other influential parental figures. The coefficients for the modern aesthetics show much less correlation. For the younger range, the graphics and sound have coefficients of -0.061 and -0.231 respectively. The older range shows values of -0.19 and -0.082 for modern graphics and sound.

Finally, the number of devices used to play video games by the participants was compared for correlation. For the retro aesthetic, the younger range had correlation coefficients of -0.39 for graphics and -0.129 for sound. This shows some correlation, but only very slight. For the older range, the graphics and sound produced coefficients of 0.276 and 0.107 respectively. It is interesting the correlations for the graphics were highest in this category, yet are flipped between ranges. It shows slight support for device exposure lowering the younger range's graphics score while raising the older range's graphic score. With the younger range, access to

more devices typically includes modern game consoles, many of which are capable of producing the modern aesthetic very well. This might aid in the retro aesthetic appearing more dated to this range. However, with the older range, higher device exposure might indicate an individual who has kept with gaming in to their adulthood. These are individuals who were more likely to have enjoyed gaming as a child and might appreciate the retro aesthetic in a nostalgic way.

Interestingly, the correlations increase and flip when brought over to the modern aesthetic. The younger range showed a device number correlation coefficient of 0.706 for the graphics and 0.398 for the sound. The graphics coefficient is quite high, and the sound coefficient is high enough to show some correlation at least. Not only does exposure to more devices lower the younger range's enjoyment of the retro graphics, but it sharply increases enjoyment of the modern graphics. This lends more credence to the idea of console exposure increasing a likeness and awareness for a realistic aesthetic in video games among the younger age range. The older range had coefficients of -0.302 for graphics and -0.264 for sound. The correlation is much less, yet still present enough to lend observation. The adults sharing this nostalgic connection with the retro aesthetic, when directly comparing the two aesthetics back-to-back, might tend to rate lower the modern aesthetic. This does not mean this participant does not enjoy modern aesthetic, but merely that the participant might feel like they need to make a choice to support one over the other, given the nature of the experiment and the survey the participant filled out, they therefore chose the nostalgic connection to the past and let the modern aesthetic suffer as a way of solidifying their choice.

Gameplay has been absent from the correlation comparisons due to the difficulty change over time being applied to different aesthetics. However, comparisons can be made when using the aforementioned "Gameplay Difference" column, meant to track the difference in rating from

beginning to end, rather than from the retro aesthetic to the modern aesthetic. For the younger range, the gameplay change compared with regularity produced 0.391 as a correlation coefficient. This means that the tendency for participants in the younger range to enjoy the end of the game more so than the beginning of the game, correlates positively with how regularly the participants played video games at about 40%. This reinforces the trend that experience tends to be more important with game satisfaction and enjoyment than does age for the younger range. The correlation with the number of other video-game-playing individuals living in the household was even higher, at -0.728. This indicates that as the household value increases, the enjoyment of the end of the game decreases. This could be attributed to larger households being more likely to containing siblings, where competitive video game play is more likely to take place. These competitive atmospheres might drive players to desire to reach win conditions more so than other players. As difficulty increases in the video game, the player might be even more susceptible to the frustration felt by the increase in deaths and the loss in score.

The number of devices a participant uses to play video games shared some correlation as well, producing a coefficient of 0.413 in the younger range. Much like the regularity, this shows a slight correlation where an increase in the number of devices used to play games results in higher scores for the end of the game.

For the older range, however, correlation was almost non-existent. For regularity, the coefficient was 0.072. The number of video-game-playing individuals in the household showed a coefficient of -0.094. The number of devices used to play had a coefficient of 0.016. None of these factors were responsible for much change between the beginning and end of the play session for participants in the older range.

The participants also indicated what genres of video games they typically played. The genres each came with a name and one or two example games to help the participant get an idea of what the genre represented. For a list of the genres and the example games included, refer to the included post-game survey. There were a great number of categories to choose from, therefore only the categories that had significant amounts of correlation will be mentioned and discussed.

First, the younger range's answers were calculated for correlation. Starting with the retro graphics, a significant negative correlation of -0.628 was found for the FPS, RPG, and strategy genres. This seems logical, as these are typically genres that favor a realism in graphic style over other graphic styles, thus these participants would be more likely to rate lower the retro graphic style. The racing genre also followed this trend to a lesser extent with a coefficient of -0.536. The puzzle and sandbox genres had coefficients of 0.336 and 0.31 respectively, indicating a slight positive correlation between retro graphics and these genres. This again is logical, as these are typically genres that favor more whimsical and non-real art styles. The indie hit Minecraft falls in to the sandbox genre, a game with very blocky and pixelated graphics, which might explain the slight positive correlation for that particular genre.

For the retro sound category, correlations were more mixed. The fighting genre and sandbox genre both had slight positive correlations, at 0.365 and 0.49 respectively. Fighting games tend to use sound cues effectively for giving important player feedback quickly. For example, in the game "Mortal Kombat 2," many attacks use sound cues to warn the player that they are still in effect, so the player can continue to stay away to avoid these attacks. This fact might make participants pay more attention to important sound cues and be thankful for them, such as the charging-laser sound cue that indicated an enemy was about to fire. The sandbox genre enjoyed the retro sounds even more, which is more difficult to explain. Perhaps this

increase in rating is residual from the Minecraft bump in the graphic category. The RPG genre had a negative correlation of -0.518 with the retro sound, which can again be explained by the favoritism of more realistic aesthetic styles for the genre.

Moving on to the modern graphics, the FPS and RPG genres from earlier had small positive correlations, at 0.362 and 0.491 respectively. This matches the negative correlations seen earlier for these two genres in the retro graphics category. The fighting, MMO, and sports genres also shared small positive correlations at around 0.23 for each. This genres also favor realism, explaining the small bump. However, the sandbox category had a large spike in correlation at 0.756. This is difficult to explain, but strong enough it cannot be ignored. Perhaps Minecraft as a video game acts as a solid introduction to gaming for many in the younger range, and those that play video games at all in this range are more likely to have played Minecraft. Therefore, those that play Minecraft are more likely to enjoy all aspects of the game. The party genre showed a negative correlation of -0.485. This makes sense as games in this genre are typically more light-hearted in tone and appearance, which is quite different from the aesthetics found in a 3D space shooter.

The modern sound category also had quite a few correlations worth mentioning. The party genre had a -0.792 correlation with the modern sound. This again fits with the mismatch in aesthetics in the party genre. The platforming genre had a -0.436 correlation with modern sound for similar reasons. Both FPS and strategy genres had a 0.407 correlations, both genres where modern sound aesthetic is appreciated in abundance. The sandbox genre, though, rose to 0.619 in correlation, which can only be explained with the same reasoning as the modern graphic correlation.

The older range had much less correlation overall than did the younger range. For the retro graphics, the highest correlation seen was -0.233 for the RPG genre, fitting with the realism theme from earlier. This trend carries over to the retro sound as well, with a correlation of -0.24. For the modern graphics and modern sound, the highest correlation was seen in the sports genre, with a -0.351 correlation to the graphics and -0.297 to the sound. The correlations are small, but puzzling still, considering sports is a genre where realistic aesthetics are preferred. The settings themselves are also realistic, though. Perhaps the space fantasy setting was off-putting to this group.

When comparing the genre data with the gameplay ratings data, more strong correlations begin to appear. For the younger range, the FPS, RPG, and strategy genres had coefficients of 0.636, 0.729, and 0.636 respectively. These genres all tend to contain gameplay segments favoring skill and proficiency to achieve victory, explaining why these participants may have enjoyed the difficult segment of the game more than the easier beginning segment. Likewise, both the puzzle and party genres had negative correlations at -0.383 and -0.405 respectively. These are genres in which the gameplay is either less skill-based, or less frantic in style. The game played by the participants required quick decision making and physical reflexes to stay alive in. Puzzle games typically take a slower approach to gameplay and require the player to think more about his or her movements, rather than react quickly. Once again, the older range failed in showing much correlation, with the highest being seen in the puzzle category with a correlation coefficient of -0.314.

When looking at the correlation between individual device usage and certain ratings, even more connections can be found. Again, due to the size of the list, only interesting correlations will be mentioned.

Beginning with the younger range, the retro graphics show a negative correlation when compared with many devices that typically have titles utilizing the realistic aesthetic. The Playstation and PSP users gave the retro graphics lower markings, having coefficients of -0.636 and -0.628 respectively. Computer users showed a coefficient of -0.449 as well. Likewise, the two Nintendo consoles, the Wii and DS, which are known for typically having non-realistic aesthetics in the games available for them, showed slight positive correlations, at 0.387 and 0.291 respectively. Participants who marked "Other" along with their devices had a positive correlation of 0.427. Interestingly, tablet users showed a negative correlation, with a coefficient of -0.405. Tablet games typically do not utilize realistic aesthetics in their games, but perhaps participants who owned a tablet were also more likely to own other game consoles.

The retro sound category shows similar results to the retro graphics. All previously mentioned devices continue their trends into this category with small variations on the coefficient amount. However, phone users had a coefficient of 0.341, a much higher amount than the -0.014 coefficient for graphics.

The modern graphics category falls in line with what is expected from the seeing the retro correlation data. The tablet, computer, Playstation, and PSP all have positive coefficients at 0.39, 0.527, 0.243, and 0.491 respectively. However, the DS and "Other" device categories keep their positive coefficient at 0.275 and 0.235 respectively. In addition, the phone participants have a 0.414 correlation with the modern graphics. Due to the fact that the majority of the participants mentioned playing games on a phone, the phone's correlation status may not carry much weight. Likewise, the modern sound category was nearly a negative flip of the retro sound category. Again, the phone device broke this trend with a positive correlation coefficient of 0.399. Wii users also showed a negative correlation of -0.395 with the sound. Participants who spend a lot

of time playing the Wii or WiiU devices are not being experienced to realistic aesthetics on these devices, leading to the lower correlation.

Much like with the video game genre categories, the older range showed much less correlation among all their device usage. In the retro graphics category, the only significant correlation is for the phone with a coefficient of 0.56. Again, the phone's popularity as a device might discount it from much discussion merit, but a 0.56 correlation could easily be explained through the use of retro aesthetics in mobile games, due to their low cost to produce and ease in creation. The retro sound category for the older range showed no significances anywhere.

For the modern aesthetic, the only significance shown for both the graphics and sound was the Wii category. It showed a negative correlation coefficient of -0.38 and -0.419 for the modern graphics and modern sound respectively. This is understandable, with the lack of realistic titles on the platform.

The device usage brings a few more correlations when compared with the differences in gameplay ratings. For the younger range, a very high correlation exists with the PSP at 0.729, indicating those that mentioned playing video games on a PSP regularly enjoyed the more difficult segment of the game. Playstation and tablet users also rated the more difficult segment higher as well, with coefficients of 0.55 and 0.432 respectively. Computer and phone users also showed smaller positive correlations with coefficients of 0.307 and 0.29 respectively. The Wii and DS participants tended to rate the easier segment higher, as seen with the correlation coefficients at of -0.485 and -0.252 respectively. For the older generation, the only significant correlation is for the Playstation users, having a 0.41 coefficient in favor of the more difficult gameplay.

Conclusion

Some correlations were discovered in some interesting locations. The number of video-game-playing individuals living with participants in the younger range tended to have a large influence on their appreciation for retro aesthetics. The number of devices those in the younger age range use to play video games on also had an effect on their appreciation of modern video game graphics. The average scores for the two aesthetics did not venture too far from each other, except in regards to the sound category, where the younger range appreciated both the retro and modern sound much more than the older age range. The genres showed additional correlation. In the younger range, participants favoring genres that consisting of more realistic aesthetics voted higher on the modern aesthetic and lower on the retro aesthetic. They also enjoyed the more difficult segment of gameplay, rather than the simpler and easier beginning. Likewise, those that played genres that favored more unrealistic aesthetics tended to vote lower on modern aesthetic. The sandbox genre, interestingly, tended to vote higher all categories, especially those in the modern aesthetic category.

I initially expected that participants in the study who were old enough to nostalgically connect with the past (the older range) would rate higher the older retro aesthetic, while the younger participants without the nostalgic connection (the younger range) would rate higher the newer modern aesthetic. While some of this thinking was supported by the data, more important identifying trends were found. The younger range did vote higher the modern aesthetic style, but they also voted the retro aesthetic higher than did the older range. The older range enjoyed the retro sound and music more than the modern, but the opposite was true with the graphics. Age alone only offers a small glimpse at the picture, as the household number, device number, and

various genre correlations show. Previous exposure to media seems to be more important than nostalgic connection.

Reflection

Throughout the course of the experiment, I had many experiences that shaped how I would approach this problem if asked to do so again. I am happy with the experiment as a whole, but there are several areas I would tweak to increase the effectiveness of the correlations found.

First, I would have more numeric data that was easier to compute. This is not possible with all information collected, such as with the genre data. The regularity, however, needed to be more numeric in nature. Rather than have the participant write in the number of hours per week spent playing video games, or some other numeric measurement of regularity, I opted to make the regularity a multiple choice question with choices that were worded in ways I felt that younger participants would find easier to pick. These participants might still have an abstract enough concept of time that asking them how many hours they play video games each week could prove worthless, as they do not understand how to estimate this information well enough. However, the method in which I worded the question left some difficulty in converting over the answers into numeric values that could be analyzed for correlation. While I feel the scale I applied does a fair enough job for getting general correlation, I feel there could have been better ways to word the choices so that the answers could have been more accurate.

More experimentation will be required to fully make use of the genre and device information. I feel for the sample pool I had, the options were too large. It did help that each of the questions allowed for multiple answers (as opposed to, for example, asking what a participant's single favorite genre would be). There would not have been enough data to draw conclusions about any of the categories if this were the case. Capturing this information proved

useful in that it showed a lot of interesting correlations that can be further examined with more narrow experimentation, such as the strange correlation with the sandbox genre in the younger range.

Also, having it made known that I developed the game myself beforehand may have affected the scores. When attempting to find participants, the pitch I gave to several of the groups of people included the fact that the game was one I made myself. Especially among the younger range, I believe that them knowing I made the game in advance and seeing questions on the survey regarding the quality of several aspects of the game may have led many to, in an attempt to be polite, keep their scores in the upper range rather than be honest about their opinions. Not mentioning at all where the game came from would be a better way to combat this, as would lying about the origins of the game if it were determined to be too detrimental to the scores. However, I do feel like this fact brought in a lot of participation for the game, so more work would need to be done in securing participants if this detail was omitted.

The idea to make an arcade-style shooter came from several factors. First, the game needed to be easy for anyone to pick up and play. Arcade shooters contain simplistic controls that can be explained easily with a simple introduction screen. Second, the arcade feel of the game might lend itself to establishing a nostalgic connection easier. It also fit in well with the theme many indie games follow of taking classic genres of video games that do not have much, if any, modern representation in commercial video game releases and adding new features to the genres to make them feel brand-new. However, I feel like the style of gameplay may have not been fun for many of the participants. Instead, I would develop some style of puzzle game in a repeat experiment. While I initially felt that a puzzle game would not be a good way to represent the modern aesthetics well due to how abstract puzzle games tend to be, I now feel like the

benefit to the participant's enjoyment may have been worth it to focus on developing a puzzle game that allowed for both aesthetics. Puzzle games also scale very well for difficulty and can be designed so that reflex and physical skill are not such a limiting factor in how well a player does. Having a game that was able to incorporate these two factors better might have let players better immerse themselves in the game and have stronger opinions about what they were playing.

On the subject of the game, I also would have made the starting aesthetic alternate instead of being random. When it comes to video game development, it's generally understood that having factors decided by true randomness is almost never what a programmer actually wants. I may say I want the intro aesthetic to be chosen at random, but I also want the distribution to be close to 50% for each aesthetic. In true randomness, you cannot guarantee this. Instead, having the aesthetic chosen at random for the first roll, and then have it alternate one after the other would have guaranteed better distribution. For the sake of this experiment, the data turned out fine in the end, but for the sake of providing a better, more scalable version of this experiment, this would need to be changed to ensure good distribution at all sample sizes.

Another addition I thought hard about was having a way to collect player data online. If the game was able to be downloaded online and played anywhere, this would greatly aid with several factors, such as being able to collect more data, being able to collect data from several different regions, and being able to collect data from individuals with varying demographics. However, the biggest problem comes from being able to verify whether the data given from the participant is correct. It would be extremely easy for any individual to lie about any given information. Of course, the same could be said of the people filling out the surveys in person, but these individuals would have a much harder time making radically false claims about their age. Collecting permission for these individuals to partake over the internet would be tricky as well.

There is no way to verify that a parental signature is correct. There are also laws regarding collecting information about minors over the internet that would need to be taken in to account when redesigning the experiment to be taken online. Verifying the machine the game is being played on is able to render the game correctly would also be difficult. Giving the experiment in person and on the same machine for all participants makes sure everyone has the same experience. If others are allowed to download over the internet, the game could be played on a machine with no sound or no game controller plugged in, or even a machine that isn't powerful enough to run the game at full speed. To overcome these factors, the game would have be designed around them from the start. Perhaps certain barriers could be put in place to ensure proper conditions are met. The game would only begin a play session and allow the participant to fill out a survey if the conditions are met. The game could run tests and time itself to ensure the game is not lagging behind. The player would have to enter information from an audio cue to ensure they are hearing the audio. As for a controller, the game could be limited to use only that device, however this might prove more limiting than desired. Designing for a mouse and keyboard might be the better option. If the data authentication problem could be fixed, I believe it would be possible to modify this experiment to be taken over the internet, which would bring in a huge amount of data to analyze.

The experiment in its current state was a great success. I learned a lot and am very glad to have had this opportunity. I would like to thank Dennis Herr, Dr. Michael Howarth, and Rachel Stanley for their continued support with this project and my college career. I would also like to thank Pastor Tom Ellis and the rest of the members of New Life Church for the use of their facility and for giving their support.

Works Cited

- Bawany, Adam. "Generation Y." *Leadership Excellence* 31.8 (2014): 6-7. ProQuest. Web.
- HAL Laboratory. NES Kirbys Adventure.png. Digital image. Wikipedia. N.p., 30 Aug. 2005. Web. 28 Oct. 2015.
- Kayali, Fares, and Josef Schuh. "Retro Evolved: Level Design Practice Exemplified by the Contemporary Retro Game." *DiGRA 2011 Conference: Think Design Play* (2011). Web.
- Lipkin, Nadav. "Examining Indie's Independence: The Meaning of "Indie" Games, the Politics of Production, and Mainstream Co-optation." *The Journal of the Canadian Game Studies Association* 7.11: 8-24. Web.
- McCain, Shannon. "Generation Y: "What's My Age, again?"". *University Wire* Nov 15 2013. ProQuest. Web.
- Parker, Felan. "An Art World for Artgames." *The Journal of the Canadian Game Studies Association* 7.11: 41-60. Web.
- Rohrer, Jason. Screenshot of Passage. Digital image. Passage. N.p., 13 Dec. 2007. Web. 28 Oct. 2015.
- Zackariasson, Peter, and Timothy L. Wilson. "Paradigm Shifts in the Video Game Industry." *Competitiveness Review: An International Business Journal* 20.2 (2010): 139-51. Web.

Post-Game Survey

Your responses to the following questions are treated confidentially.
Please do **not** include your name on the survey in any location.

_____ 1. How old are you?

_____ 2. How regularly do you play video games?

- a. More than 2 hours every day
- b. Less than 2 hours every day
- c. Several days per week
- d. Once a week
- e. Once every few weeks
- f. Hardly ever

3. What devices do you play video games on? (Check all that apply.)

- | | |
|----------------|-----------------------------------|
| _____ Phone | _____ Xbox 360/Xbox One |
| _____ Tablet | _____ PlayStation 3/PlayStation 4 |
| _____ Computer | _____ PSP/PSP Vita |
| _____ Other | _____ Wii/Wii U |
| | _____ DS/3DS |

4. What kinds of video games do you usually play? (Check all that apply.)

- _____ Platformer (*Super Mario Bros.*, *Rayman*, etc.)
- _____ Adventure (*The Legend of Zelda*, Telltale's *The Walking Dead*, etc.)
- _____ First-person shooter (*Call of Duty*, *Team Fortress 2*, etc.)
- _____ Fighting (*Mortal Kombat*, *Super Smash Bros.*, etc.)
- _____ MMO (*World of Warcraft*, *Club Penguin*, etc.)
- _____ RPGs (*Final Fantasy*, *Monster Hunter*, etc.)
- _____ Puzzle (*Tetris*, *Candy Crush Saga*, etc.)
- _____ Party/Board game (*WarioWare*, *Heads Up*, etc.)
- _____ Sports (*Madden*, *FIFA*, etc.)
- _____ Racing (*Forza Motorsport*, *Need for Speed*, etc.)
- _____ Sandbox (*Minecraft*, etc.)
- _____ Strategy (*Civilization*, *Fire Emblem*, etc.)

_____ 5. How many other people in your house play video games (not including yourself)?

6. For each row, check the box that is the column indicating how you agree with the statement.

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
I enjoyed the graphics at the <i>start</i> .						
I enjoyed the graphics at the <i>end</i> .						
I enjoyed the sound and music at the <i>start</i> .						
I enjoyed the sound and music at the <i>end</i> .						
I enjoyed the gameplay at the <i>start</i> .						
I enjoyed the gameplay at the <i>end</i> .						