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**Video Games as a Form of Stress Relief and Emotional Improvement**

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### **Abstract**

The potential risk factors and benefits of video games have been a topic of interest in psychology for quite some time (Anderson & Carnegey, 2009; Bushman & Gibson, 2011; Granic et al., 2014). This research study addressed the question as to whether video games can be emotionally beneficial to the ones playing them. It was hypothesized that relaxing games, when played over time for healthy periods of time, would help to significantly improve moods and lower stress levels. To test this hypothesis, participants completed measures of their positive affect, negative affect, and stress levels prior to and after one week of daily sessions of gaming. The game used for this study is known as “Stardew Valley” (Barone, 2016). As hypothesized, the results indicated a significant increase in positive affect, as well as significant decreases in negative affect and stress after the gameplay period. However, further research is required to observe whether there is a causal relationship between gaming and significant emotional benefit.

## **Video Games as a Form of Stress Relief and Emotional Improvement**

Video games differ from other forms of media (e.g., movies and books) because they are interactive: they are designed to engage players and garner reactions from them. The gaming industry is constantly making new innovations in the way people play, seeking to enrich players' experiences with new technologies that allow for higher resolutions and increased immersion (Kowert et al., 2017). Games themselves are more intricate and diverse than ever before, with any sort of combination of genres one could imagine. It may be beneficial to consider how games can affect emotional wellbeing. The main objective of this study was to observe whether video games can be an effective means of improving mood and reducing stress, when played consistently over a longer period.

It can be somewhat difficult to define what video games are, given that there are so many different genres and formats they can follow. It may be helpful to consider a general definition for video games, while also applying distinct defining features of each genre available. Video games as an entertainment medium can be defined as electronically interactive games that require and encourage input from the players (Granic et al., 2014). Genres themselves can be individually defined by the features of the games within them. Examples may include role-play games, in which players assume the role of characters within a (usually fictional) world, or puzzle games that require players to solve problems and encourage critical thinking skills. Despite the vast diversity that the gaming industry offers, video games seem to have garnered a poor reputation in popular media. There is quite a bit of speculation surrounding the violent nature of video games, and their negative effects on players (Anderson & Carnegey, 2009; Bushman & Gibson, 2011). However, there are many potential benefits that games can offer,

which will be discussed later. This research study aimed to observe the possible effects gaming can have regarding improved emotional wellbeing. The goal was to examine whether regular intervals of relaxing gameplay can improve mood and decrease stress among players.

### **History and Development of Video Games**

Video games have been a relevant aspect of mediated entertainment since the popularity of some of the first video games (Clement, 2021). The success of games like SpaceWar at the Massachusetts Institute of Technology (Russell, 1962) and Pong (Alcorn, 1972), established video games as a viable source of entertainment (Wulf et al., 2020). According to the National Purchase Diary Panel (or the NPD Group) in 2019, 73% of Americans aged two and older play video games, an increase of 6% since the previous year. Nearly 18% of adult gamers and over 50% of teenage males in the United States reported that video games were their main source of entertainment (Mintel, 2012). Financially, the gaming industry earned over double the amount of money than was made by Hollywood's North American box office sales (Motion Picture Association of America, 2011). While the popularity of this pastime continues to rise (Clement, 2021), most of the psychological research on video games has focused on the negative outcomes of gaming, with particular focus around violent video games and aggression (Anderson et al., 2010; Ferguson, 2013). In contrast to these studies, Entertainment Software Association (2019) provided statistics that indicate a different perspective. This perspective relates to beliefs fostered by mainstream media. For example, these statistics indicate that approximately 79% of gamers believe that games provide mental stimulation, and about 78% of gamers report relaxation and stress relief from playing video games. Correlational studies suggest that individuals consciously turn to these games to regulate their emotions: to relax, unwind, or temporarily escape the

hassles of daily life (Olson, 2010). According to Olson, this form of electronic entertainment has become particularly prevalent among children, adolescents, and young adults. Considering the large amount of young people that partake in gaming, it is important that parents as well as researchers better understand both the risks and benefits that gaming provides (Mikuška & Vazsonyi, 2018).

### **Video Games and the COVID-19 Pandemic**

For the past two or so years, the world has been plagued by the COVID-19 pandemic. The pandemic has affected the video game industry in a variety of ways. An online survey conducted by Barr and Copeland-Stewart in 2021 found that time spent playing games had increased for 71% of respondents. Additionally, about 58% of respondents reported that playing games had impacted their well-being in significant ways. Most of those responses indicated positive impacts. It also seems that, according to an article written by Kelly (2021), that video games acted as a coping mechanism for social isolation during the pandemic. Since spending time with one's friends in-person was not possible, many turned to virtual and online mediums to maintain their relationships. Video games, Kelly wrote, had become an important “tether” for people to their friends that they could not interact with in person (2021). This form of coping extended to families as well. When public schools were shut down and children needed to switch to virtual learning from home, parents were required to step up and ensure that their children were getting the educational support they needed. Doing so while also balancing their work, health, and social aspects of life demanded extra strain of parents across the globe. According to Pearce et al. (2021), many parents had used video games to relieve themselves from pandemic-related stressors. They considered psychological detachment, relaxation, mastery experiences, and

control within gameplay as parts of the stress coping process. Psychological detachment was defined in this study as a disengagement from the pandemic and pandemic-related stress. Mastery experience included challenges and growth opportunities within the game. Many participants from this study claimed that playing the game allowed them to have a sense of control, despite a great deal of uncertainty in their lives due to the pandemic (Pearce et al., 2021).

### **Features of Video Games**

Across the globe, people spend over three billion hours per week playing video games (Knewton Inc., 2014), with the average gamer playing about eight hours each week (Entertainment Software Association, 2019). When it comes to accessing these games, there are plenty of options such as computers, home consoles, handheld consoles, or even smartphones (Oswald et al., 2014). Access to gaming content has become easier than ever before, and so it reasonably follows that such a hobby would continue to rise in popularity. The increasing number of gamers can be attributed to the fact that video games are personally meaningful, experiential, and social (Shaffer et al., 2005). According to Beck and Wade (2004), many games tend to have high engagement levels, with players concentrating on the task they are presented with, and finding it difficult to quit that task even when mentally fatigued. While this could, of course, lead to problematic use, Folkins and colleagues (2016) suggest that these aspects of gaming have the potential to aid in a clinical setting, making possible links to client engagement and motivation in various forms of therapy. According to these authors, the built-in reward systems in video games have similarities to speech-language therapy, which often incorporates both extrinsic and intrinsic motivations. The intrinsic motivation that video games supply makes them a potentially valuable tool for providing a sense of accomplishment for those who play

them. With further research, video games may be considered an effective tool in clinical psychology.

Segev and colleagues (2017) highlighted the fact that interaction within games used to be limited and the industry focused on arcade-style gaming. However, enriching storylines and immersive world building have become increasingly common in big titles like Grand Theft Auto V and Skyrim (Rockstar, 2013; Bethesda, 2011). As technologies have advanced, developers have been able to create increasingly beautiful backdrops and believable, realistic characters. According to Segev and colleagues (2017), the concept of interactive media in recent years has been expanded across many genres of games, such as open-world and Massive Multiplayer Online Role-Playing Games like Minecraft and World of Warcraft. These games have multiple pathways that change and adapt to the chosen actions of each player, which means that it is possible that different players in the same game can each have a completely different experience from one another (Segev et al., 2017). These statements suggest that there is a difference between the game itself and the experience one has from playing it. Games are tangible activities that use hardware, characters, and stories to invoke several kinds of thoughts and emotions in the players (Schell, 2008). Stories in all types of mediums have allowed people to see different perspectives and, at times, immerse themselves in completely different worlds. Based on what various artists have shown, video games seem to delve deeper in allowing players to make decisions they would not make in reality. They can assume the role of different characters to fit the intended narrative of the developer, or to create an entirely new one (Gee, 2007). It could be argued that the true purpose in video games is not completion or competition, but rather the provision of the opportunity to go on a journey as they play (Schell, 2008).



An excellent example of this journey, and how it can differ for each individual, lies in the widely successful game known as Minecraft (Mojang, 2011). Minecraft is a sandbox game, which means that it does not provide players with specific goals to achieve, nor is there an overarching storyline to be experienced (Folkins et al., 2016). Minecraft could also be defined as a casual game, in that it is easy to learn, quick to access, and requires no previous video game experience to play (Russoniello et al., 2009). There are two main focal points of the game: crafting, and building. Players can choose to play in survival mode, where they craft tools and build homes using materials they collect from the world around them. Creative mode, aptly named, gives players access to unlimited materials and allows them to build any structures they could possibly imagine with little to no limitations. In both modes, each block of each building is placed by the individual, allowing for intricate planning and the promotion of exploration and creativity (Mojang, 2011). Minecraft creates an essential experience that connects with a player's imagination and motivates deep engagement (Folkins et al., 2016). This kind of engagement can be seen in other games as well, both of this genre and within similar genres.

### **Defining Mood and Stress**

“Mood” refers to positive or negative emotions that last over a period of time. Experiencing the emotion of happiness in a moment differs from feeling happy throughout the day (Merriam-Webster Dictionary). According to a study done by Frederickson (2001), experiencing positive emotions on a daily basis is important in improving other aspects of life including motivation, building strong social bonds, inspiration, and general social connectivity. Furthermore, Frederickson found that positive emotions help in coping with failure and other negative emotions. Although positive emotions are not exclusive to video gaming, one cannot

deny the fundamental emotional benefits that games can bring (Granic et al., 2014). The benefits to recreation in general include a positive mental state coupled with feelings of relaxation (Russoniello et al., 2009). The increasing popularity of gaming is no doubt partly due to this relaxation.

Stress can be described as a feeling of strain and/or pressure (Merriam-Webster Dictionary). It can be felt physically and psychologically (Serafina et al., 2015). Physically or psychologically challenging circumstances are referred to by Serafina and colleagues as stressors. Under normal circumstances, a person can generally manage their stress levels. However, the demands of life can often overwhelm a person's normal coping abilities and additional help is needed. In these situations, many individuals utilize emotional coping mechanisms through external substances like food, alcohol, or drugs (Russoniello et al., 2009). It is imperative that people learn healthier methods to decrease stress and improve mood, because high levels of stress correlate with high levels of cortisol. Cortisol is a hormone linked to numerous processes such as metabolism, emotional/cognitive functioning, and immune system functioning (Thayer & Sternberg, 2006). Thus, when stress reaches unhealthy levels, various systems in the body function less efficiently. Stress is also related to various mood disorders, such as anxiety and depression (Russoniello et al., 2009). Anxiety and depression are common among adolescents and tend to persist into adulthood (Scholten et al., 2016). It is, therefore, important to seek out ways to reduce stress in these populations, so that they may be better equipped to cope with these disorders.

## Potential Risk Factors of Gaming

A large portion of psychological research on gaming revolves around the negative results that video games potentially bring (Anderson & Carnegey, 2009; Bushman & Gibson, 2011). Popular media and a number of researchers have contributed to a rather negative stigma surrounding video games. Most technological advances are usually initially met with hesitation and wariness from the public, media, and even some scholars (Mikuška & Vazsonyi, 2018). There is an ongoing debate in psychological research in this area, with some studies suggesting a causal link between playing violent video games and subsequent aggression and violence (Anderson & Carnegey, 2009; Bushman & Gibson, 2011), while other studies find no causal link or indicate that the relationship is insignificant or unpredictable (Bushman & Gibson, 2011; Gunter & Daly, 2012). Some studies find both positive and negative effects on prosocial behavior, with prosocial effects being more likely when children play video games with parents (Coyne et al., 2011). It is entirely possible that video games receive such criticisms from the public due to the tendency to focus on the games themselves rather than the mental states of the people playing them. Future studies should seek to understand the situation of these individuals who seek refuge within such games, rather than attributing violent outbursts purely to exposure to violent games (Oswald et al., 2014). Altintas, and colleagues (2019), as well as Ferguson (2007), argue that because gaming in general is such a popular hobby, it does not necessarily follow that such a universal behavior can accurately explain a rare behavior such as a school shooting. Results from Ferguson's (2007) meta-analysis indicated only a 2% overlap in variance between violent video game playing and aggressive behavior. Their analyses did, however, support the conclusion that violent video game exposure is associated with increased visuospatial

cognition. Ferguson defines visuospatial cognition as a combination of several measures, such as visual rotation, visual memory, and visual attention. Further research is necessary before true causations can be declared.

The negative effects that video games can have on people will now be addressed. In 2020, Tian et al. conducted a study that measured shyness, negative affect, and aggressive behavior in relation to violent video games. Their results showed that playing a violent video game increased aggressive behaviors, negative affect, and hostile attributions among shy participants. Sometimes, an increase in aggression is only seen for certain types of games. In a study done by Hawk and Ridge (2021), participants saw an increase in aggression after competitive gaming. The same was not true for non-competitive gaming. In this study, participants all played a first-person shooter. Some participants were told that they would receive a chance for a reward, if they were able to score higher than another player. Other participants were not given this incentive. No significant differences were observed whether participants won or lost, or played on easy or hard level of difficulty. However, participants who competed with each other exhibited higher levels of behavioral aggression than those who did not compete. Many longitudinal studies have also found links between exposure to violent video games and subsequent aggression (Verheijen et al., 2018; Teng et al., 2019; Greitemeyer 2019). Several studies have also found that males have higher aggression levels in violent video games than females do (Bartholow & Anderson, 2002; Teng et al., 2019; Hawk & Ridge 2021).

Various studies have also observed negative impacts on mental health from video games as well (Mikuška & Vazsonyi, 2018; Yousafzai et al., 2014; Brunborg et al., 2014). Perhaps the most important thing to consider in this debate is the nature of video game usage; that is, whether

the individual is engaging in healthy or unhealthy gaming. It is important to differentiate between casual gaming and excessive gaming. With this distinction, video game play can be understood as both harmless or even beneficial, when played in moderation, and quite harmful, when used excessively (Mikuška & Vazsonyi, 2018). Excessive gaming can be described as problematic and/or addictive when it pervades and disrupts other aspects of life (Yousafzai et al., 2014). For example, a study conducted by Brunborg and colleagues (2014) found that longitudinal changes in game play intensity were not associated with changes in depression for casual gamers. However, depression was predicted by gaming addiction, which differs greatly from normal gaming sessions as described above. Another study, by Mikuška and Vazsonyi (2018), indicated similar results. They found that gaming in young adulthood, particularly around age 21, predicted depressive symptoms six years later. Depressive symptoms saw more developmental increases as reported gaming increased beyond casual gaming. Gaming becomes problematic when it starts to disrupt other aspects of life, and in some cases leads to symptoms commonly experienced by substance addicts, including salience (preference and motivation), mood modification, craving, and tolerance (Chiu et al., 2004; Hussain & Griffiths, 2008, as cited by Yousafzai, 2014). In related studies, gaming late into the night was found to have potential links with depression, while gaming during regular daylight hours was not (Lemola et al., 2011). Furthermore, Desai and colleagues (2010) found no association between casual video gaming and negative mental health indicators, while excessive gaming or gaming addiction was related to both depression and delinquency. Based on the outcomes of these studies, it appears that excessive gaming is more at fault for the perceived negative outcomes, rather than moderate gaming levels.

## The Potential Benefits of Gaming

Although there is evidence for a connection between violent video games and aggressive behavior, it can be argued that in order to truly understand the impact gaming has on development, a more balanced perspective is needed. It would be ideal to consider both the possible negative effects as well as the benefits related to playing these games. The nature of gaming has grown more complex, diverse, realistic, and social in nature (Ferguson & Olson, 2013), and the psychological research surrounding this topic should reflect that.

Granic et al. (2014) outline the various benefits to gaming, including cognitive, motivational, emotional, and social benefits. For example, studies suggest that playing games with simplistic user interfaces, short-term commitments, and a high degree of accessibility can improve players' moods, promote relaxation, and ward off anxiety (Russoniello et al., 2009). It has further been suggested by McGonical (2011) that some of the most intense positive emotional experiences are experienced in the context of playing video games.

Nostalgia, commonly identified as an emotion featuring a combination of positive and negative affect when longing for the past (Hepper, et al., 2012), has been shown to play a significant role in gaming. Some series of games have become their own franchises within the gaming industry, with multiple games releasing under the same brand. An example of this is the Pokémon series of games (Nintendo & The Pokémon Company, 1998-2022).. The first two Pokémon games, Pokémon Red and Blue, were released in 1998 by Nintendo for the Game Boy system. Since then, new Pokémon games have been released every year, with the most recent installment being *Pokémon Legends: Arceus* for the Nintendo Switch (Nintendo & The Pokémon Company, 2022). Other companies have created brands and franchises as well. Activision (2003-

2021) has published several titles, including the *Call of Duty* franchise, the first of which was released in 2003. Like the Pokémon franchise, Call of Duty games have been released every year, with the exception of *Call of Duty 2*. This was released two years after the first game. The most recent title of this series, *Call of Duty: Vanguard*, was released on November 5, 2021, by Activision. These games, whose series span over decades, tend to sit at the top of sales charts (Kain, 2018). Nostalgia may play a part in these series' continued success. Today's adults have played the early installments as children and teenagers, and so the current releases satisfy the desire to relive those childhood memories (Everett-Haynes, 2016). Experiencing nostalgia has been linked to social connectedness (Sedikides et al., 2015), and so it is not irrational to consider video games as having a social benefit related to reconnecting with the past (Wulf et al., 2020). However, it is important to study the extent to which turning to video games to feel better is adaptive and at what point using games becomes an avoidant strategy that leads to more negative outcomes (Granic et al., 2014).

Adaptive emotional regulation strategies such as acceptance, problem solving, and reappraisal have repeatedly been linked to less negative affect, more social support, and lower levels of depressive symptoms (Aldao et al., 2010). These same adaptive regulation strategies seem to be rewarded in gaming contexts because their use is clearly linked to goal achievement (Granic et al., 2014). Games continuously provide novel challenges, demanding players to shift already established appraisals to new ones in order to most efficiently reach goals. *Portal 2* is an excellent example: In this first-person puzzle game, players utilize portals to solve intricate puzzles and progress through the game's story (Granic et al., 2014). The problems become more complex as the game progresses, which further challenges players' critical thinking abilities and

encourages them to think more abstractly. As soon as they master one strategy, like carrying cubes through portals to hold down buttons, the main focus shifts and cognitive reappraisal is required to move forward (Gross & John, 2003). Nearing the end of the game, players must combine their previously learned strategies to solve each level, motivated by a desire to overcome the challenge and experience the ending of the story. Role-playing games also make use of this concept. Games like World of Warcraft and Final Fantasy contain different class systems, in which characters can be equipped with certain abilities, strengths, and weaknesses. For example, a team of warriors would deal high amounts of damage, but during a longer boss fight (a longer, more difficult fight than average) in which the party takes a lot of damage, having a healer present becomes crucial. Granic et al. (2014) proposed that this type of system teaches players to deal with frustration and anxiety in adaptive ways. Furthermore, less adaptive strategies, such as rumination (Aldao et al., 2010), are less likely to be rewarded in video games, because such tactics impede players from quickly reacting to new challenges. Thus, game playing may promote the ability to reappraise emotional experiences with flexibility and efficiency.

Although it is clear that games can elicit positive emotions, there remain unanswered questions regarding the emotional experiences during video game play. For instance, puzzle games have been empirically shown to trigger positive emotions (Russoniello et al., 2009), but these games are designed for brief, intermittent play. It is unclear whether games designed for long-term engagement also promote positive emotional wellbeing. This is the gap I intended to fill with my own research. More specifically, I intended to assess whether short sessions over a longer period of time could invoke a positive mood and lower stress levels in university aged



individuals. The purpose of this study was to determine whether relaxing video games could improve mood and/or decrease stress in players using valid and reliable psychological measures. To determine this, the focus of the study was to investigate whether playing an open-ended country-life role-playing game (RPG), *Stardew Valley*, could help students relax, reduce poor moods, and increase positive moods. The hypothesis was as follows: Daily sessions of *Stardew Valley* would positively correlate with mood and negatively correlate with stress over the course of several days.

## **Method**

### **Participants**

Sixty-two individuals completed consent forms online, and indicated their interest in participating in the study. Twenty-eight of these individuals completed the pre-test survey that measured stress levels and moods prior to the week of gaming. Twenty-four participants appeared to have completed the study; however, entries for three of those 24 participants could not be linked to their pre-test scores. It is possible that these individuals had not fully completed the surveys. Thus, the completed number of participants whose data was usable was 21. Of these 21, there were 16 (80%) females and four (20%) males. One participant chose to not disclose their demographic information. Most participants were students at Tyndale University, a privately run Christian University with a population of approximately 1300 students. Some participants were not students at Tyndale. They were recruited online in order to increase participant numbers. Most participants were undergraduates within the age range of 18-24 years (~65%), coming from various ethnicities. Most participants were Caucasian (~65%). Participants were given the opportunity to receive 2% extra credit in select psychology courses. Those who

were not eligible for extra credit could enter a draw for a chance to win a \$25 Amazon gift card. Participants were also able to opt out of both options if they wished.

## **Apparatus**

### ***Consent Form***

Informed consent forms provided information about the purpose of the study, procedures, potential benefits and risks of participating, and instructions for accessing the required materials and results of the research. Students were also informed about the availability of counselling services, voluntary participation and withdrawal, and the implications of confidentiality. Contact information of the researchers was provided on this form. See Appendix A for a draft of the informed consent forms.

### ***Positive and Negative Affect Schedule - Short Form Scale***

The Positive and Negative Affect Schedule - Short Form (PANAS-SF) Scale (Watson et al., 1988) was used to assess the positive and negative emotion associations in the moments surrounding participants' gaming. This measurement tool can be used in different time scales, such as how one has felt "in the past week," "in the past few days," or "in the past few hours." This study made use of a 20-item scale that measured moods within the past week before gameplay, and the current mood after gameplay. Participants were asked to indicate how often they felt certain emotions throughout the week. For example, one item asked how much they felt "proud," on a likert scale of 1 to 5. A one on the scale would have indicated that the participant felt proud "very slightly or not at all" that week. A two on the scale would have indicated that the participant felt "a little" proud that week. A three on the scale would have indicated that the participant felt "moderately" proud that week. A four on the scale would have indicated that the

participant felt “quite a bit” proud that week. A five on the scale would have indicated that the participant felt “extremely” proud that week.

The PANAS scale intercorrelations and internal consistency reliabilities (Cronbach's alpha) have been found to be acceptably high, ranging from 0.86 to 0.90 for Positive Affect and from 0.84 to 0.87 for Negative Affect (Watson et al., 1988). Watson et al. (1988) also found that test-retest reliability of the PANAS Positive Affect and Negative Affect scales were 0.86 and 0.87, respectively. This indicates a good level of internal consistency and test-retest reliability. See Appendix B for the version of the PANAS-SF scale that was used in this study.

### *Perceived Stress Scale*

The Perceived Stress Scale (PSS) (Cohen et al., 1983) was utilized to measure stress levels among participants. An example question includes asking how much participants felt nervous and “stressed” the past week. In this case, a zero on the scale would have indicated that the participant “never” experienced feeling nervous and stressed that week. A one on the scale would have indicated that the participant “almost never” experienced feeling nervous and stressed that week. A two on the scale would have indicated that the participant “sometimes” experienced feeling nervous and stressed that week. A three on the scale would have indicated that the participant experienced feeling nervous and stressed “fairly often” that week. A four on the scale would have indicated that the participant experienced feeling nervous and stressed “very often” that week. Coefficient alpha reliability for the PSS was 0.84, 0.85, and 0.86 in three samples of Cohen and colleagues’ study in which they develop and use this measurement scale. According to Cohen et al. (1983), test-retest reliability was 0.85 when the PSS was administered on two occasions separated by two days. However, when the scale was administered six weeks

apart, reliability dropped to 0.55. For this study, the test was utilized at the beginning and end of a one-week period. Test-retest correlations are expected to be much higher for short retest intervals than for longer ones (Cohen et al., 1983). See Appendix C for the version of the Perceived Stress Scale that was used in this study.

### ***Video Game: Stardew Valley***

The game that participants were to play is called *Stardew Valley*: a simulation role-playing video game developed by Eric Barone, under the alias of ConcernedApe. In the game, players assume the role of an office worker who, dejected by their busy city life, moves to the countryside to become a farmer (Barone, 2016). The game is open-ended, allowing players to take on several activities such as growing crops, raising livestock, fishing, mining for ores, selling produce, and socializing with the townsfolk. See Appendix D for more information regarding this game. *Stardew Valley* was chosen for this study for several reasons. First of all, the game has been commended for its relaxing nature by critics and players alike (Sanchez, 2018; Cochran, 2021; Wiseman, 2022; Yen, 2022). In 2018, popular video game and entertainment media website IGN released a review for *Stardew Valley*, praising it as a comforting and satisfying experience (Sanchez, 2018). The task-based nature of *Stardew Valley*, alongside its flexibility in terms of when to complete those tasks, makes it an excellent source of comfort and satisfaction. The game's soundtrack in particular has garnered a reputation for being soothing to listen to; Scarlet Moon Records collaborated with Eric Barone to make a *Stardew Valley* album in their *Prescription for Sleep* series (Salbato, 2021).

Another reason *Stardew Valley* was chosen was its accessibility. Most participants used the computer version of the game via Steam, which is an online platform for buying,

downloading, and playing video games (Valve, 2022). The technical requirements for the computer version of Stardew Valley are non-demanding, making the game accessible from most computers (Valve, 2016). According to its described system requirements on Steam, Stardew Valley is playable on Windows, Mac, and Linux operating systems. Since this study was conducted using participants' own computer systems, it was important that the game chosen would be one that most people would be able to play on their devices. It was required that participants had access to their own computers.

### ***Demographic Questions***

At the end of the study, participants were given the option to disclose some basic demographic information. They were asked about their age, ethnicity, and gender. This information was not used for any comparisons regarding stress and mood changes. See Appendix E for examples of the questions participants were asked.

### **Procedures**

Due to the global COVID-19 pandemic at the time of the study, all aspects of this study were conducted remotely. Participants were mostly recruited from presentations given in select online Psychology classrooms, through which they were supplied links to SurveyMonkey. Some were likely recruited through advertisements on campus television screens. Others may have joined due to word-of-mouth through their peers. They were prompted to sign an informed consent form if they wished to partake in the study after learning of the details of it. Participants then received an email with a code which they could use to access Stardew Valley free of cost. These codes were supplied by Eric Barone, the developer of *Stardew Valley*, and were mostly for the PC version of the game. A couple of participants received codes for the Nintendo Switch

version of the game. Through this email, participants were also given links to two more surveys. Each survey consisted of the PANAS-SF and PSS scales used to measure their mood and stress levels. These questionnaires were to be completed before and after a play period of seven consecutive days. The online medium remained active for a period of approximately five months; from October 2021 to February 2022. During this timeframe, participants could select any seven days to consecutively conduct the experiment. The online format was convenient in that it facilitated participants completing the study from the comfort of their own homes, and during times that would work best with their own individual schedules.

Participants completed questionnaires to assess their emotional status using the PANAS Scale and stress levels using the Perceived Stress Scale. They did this before and after seven days of playing *Stardew Valley* for 15-30 minutes per day. This process occurred at the participant's leisure; they were able to start at any time of the day and were able to start their week at any point within a certain time interval, as long as they consistently completed their tasks each consecutive day.

## **Results**

### **Descriptive Statistics of Key Variables**

The key variables of this study included participants' stress levels, positive emotions, and negative emotions prior to and after one week of gameplay. Additional variables measured were whether participants played more than was expected of them, as well as their overall enjoyment of *Stardew Valley*. This was done in order to observe if time spent playing and enjoyment had any significant influence on participants' results regarding stress and mood.

### *PANAS Positive Emotions Prior to Gaming*

The PANAS items are split evenly between positive and negative emotions. There were 10 items for each. Please see Table 1 for descriptive statistics of the Positive Affect PANAS scores prior to the week of gameplay sessions. Prior to the gaming period, the mean scores for all positive emotions listed were slightly below the “moderate” range. Overall, participants had felt Determined the most out of all the positive emotions, with a mean of 2.93. This was closely followed by feeling Interested, with a mean of 2.82. Proud was the least common feeling, with a mean score of 2.14. The Positive Affect scores had a good level of internal consistency and test-retest reliability, with Cronbach’s alpha ranging from 0.86 to 0.90.

Table 1

#### *Descriptive Statistics of Positive PANAS Scores (Pre-Gaming)*

Emotion	Mean	SD	N
Interested	2.82	0.94	28
Excited	2.32	0.72	28
Strong	2.43	0.96	28
Enthusiastic	2.36	0.91	28
Proud	2.14	0.97	28
Alert	2.64	1.03	28
Inspired	2.39	1.03	28
Determined	2.93	1.15	28
Attentive	2.50	0.96	28
Active	2.21	0.88	28

*Note.* Participants could select a score between 1 and 5, with 1 indicating that the participant felt a certain emotion “little or none of the time,” whereas a 5 on the scale indicated an “extreme” amount. A 3 would be considered a “moderate” amount.

### ***PANAS Negative Emotions Prior to Gaming***

Negative Affect was also considered in the PANAS scale. Please see Table 2 for descriptive statistics of the Negative Affect PANAS scores prior to the week of gameplay sessions. The mean scores for all negative emotions listed were below the “moderate” range, with one exception being slightly less than 2. Participants mostly felt Distressed and Irritable, with mean scores of 2.96 and 2.82 respectively. The lowest negative emotion score was Hostile, with a mean score of 1.93. The Negative Affect scores had a good level of internal consistency and test-retest reliability, with Cronbach’s alpha ranging from 0.84 to 0.87.

Table 2

### *Descriptive Statistics of Negative PANAS Scores (Pre-Gaming)*

Emotion	Mean	SD	N
Distressed	2.96	1.40	28
Upset	2.75	1.38	28
Guilty	2.32	1.31	28
Scared	2.36	1.13	28
Hostile	1.93	0.90	28
Irritable	2.82	1.19	28
Ashamed	2.14	1.30	28
Nervous	2.64	1.10	28
Jittery	2.57	1.29	28
Afraid	2.25	1.04	28



*Note.* Participants could select a score between 1 and 5, with 1 indicating that the participant felt a certain emotion “little or none of the time,” whereas a 5 on the scale indicated an “extreme” amount. A 3 would be considered a “moderate” amount.

### ***PANAS Positive and Negative Affect Means Prior to Gaming***

Overall, participants had equal amounts of Positive Affect as Negative Affect prior to the study period. Please see Table 3 for the means of the total PANAS scores. Total Positive Affect scores ranged from 14 to 39, while Total Negative Affect scores ranged from 10 to 40. Both scales had means of 24.75.

Table 3

#### *Descriptive Statistics of Total PANAS Scores (Pre-Gaming)*

	Mean	SD	N
PANAS Positive Emotions Total	24.75	6.47	28
PANAS Negative Emotions Total	24.75	8.91	28

*Note.* Maximum score for both Positive and Negative Affect scales would have been 50, should a participant indicate “Extreme” for every positive or negative emotion. The lowest possible score would have been 10, should a participant indicate “Little or Not at All” for every positive or negative emotion.

### ***PSS Prior to Gaming***

Stress levels were measured alongside positive and negative moods, via the Perceived Stress Scale (PSS). Stress scores ranged from 17 to 33, with an overall mean of 22.57 and a standard deviation of 7.26. For each item, participants could select a score between 0 and 4. A score of 0 indicated that the participant “never” felt a certain way that week. A score of 4

indicated that the participant “always” felt a certain way that week. In the middle, a score of 2 indicated that a participant “sometimes” felt a certain way.

### *PANAS Positive Emotions After Gaming*

After completing seven consecutive days of 15 to 30-minute sessions of gameplay, participants filled out the PANAS and PSS surveys once more. Please see Table 4 for descriptive statistics of the Positive Affect PANAS scores after the week of gameplay sessions. After the gaming period, the mean scores for six of the positive emotions listed were slightly above the “moderate” range of 3. The rest remained slightly below. Overall, participants had felt Interested the most out of all the positive emotions, with a mean of 3.49. This was closely followed by feeling Enthusiastic, with a mean of 3.42. “Proud” was still the least common feeling, with a mean score of 2.71. The means for all positive emotions are higher than they were in the pre-test.

Table 4

#### *Descriptive Statistics of Positive PANAS Scores (Post-Gaming)*

Emotion	Mean	SD	N
Interested	3.49	1.06	24
Excited	3.04	1.08	24
Strong	2.58	1.06	24
Enthusiastic	3.42	1.02	24
Proud	2.71	1.04	24
Alert	2.79	1.06	24
Inspired	3.21	1.28	24
Determined	3.29	1.00	24
Attentive	3.12	1.09	24
Active	2.96	1.27	24

### *PANAS Negative Emotions After Gaming*

Please see Table 5 for descriptive statistics of the Negative Affect PANAS scores after the week of gameplay sessions. After the gaming period, the mean score for one of the negative emotions listed was slightly below the “moderate” range of 3. The other nine were below the “A Little” level of 2. Participants still mostly felt Distressed and Irritable, with mean scores of 2.08 and 1.96 respectively. “Scared” and “Afraid” were the emotions that received the lowest scores, both with a mean of 1.38. The means for all negative emotions were lower than they were in the pre-test.

Table 5

#### *Descriptive Statistics of Negative PANAS Scores (Post-Gaming)*

Emotion	Mean	SD	N
Distressed	2.08	0.93	24
Upset	1.79	0.93	24
Guilty	1.46	0.88	24
Scared	1.38	0.58	24
Hostile	1.42	0.83	24
Irritable	1.96	0.86	24
Ashamed	1.58	1.02	24
Nervous	1.54	0.59	24
Jittery	1.63	0.77	24
Afraid	1.38	0.58	24

### ***PANAS Positive and Negative Affect Means After Gaming***

After the study, Total Positive Affect had a higher mean score than Total Negative Affect. Please see Table 6 for the means of the total PANAS scores post-test. Total Positive Affect had a mean of 30.63, with scores ranging from 10 to 45. Total Negative Affect had a mean of 16.21, with scores ranging from 10 to 29.

Table 6

#### *Descriptive Statistics of Total PANAS Scores (Post-Gaming)*

	Mean	SD	N
PANAS Positive Emotions Total	30.63	7.91	24
PANAS Negative Emotions Total	16.21	5.00	24

### ***PSS After Gaming***

After the gaming period, stress levels were measured again, via the Perceived Stress Scale (PSS). Stress scores ranged from 10 to 22, with an overall mean of 14.74 and a standard deviation of 3.03.

### ***Changes Between Pre and Post-Gaming PANAS and PSS Totals***

The differences between the three key variables were calculated. Please see Table 7 for the changes between the pre- and post-gaming PANAS and PSS totals. One participant completed the post-test PANAS scale but did not complete the PSS survey. Therefore, the N value is one less for the PSS. The mean positive emotions increased by 7.77 points (resulting in a negative difference when post test scores were subtracted from pre test scores). The mean

negative emotions decreased by 9.59 points. Stress levels saw the largest improvement, with a mean reduction of 11.91.

Table 7

*Descriptive Statistics of the Changes between pre and post-gaming PANAS and PSS Totals*

	Mean	SD	N
PANAS Positive Emotions Difference	-7.77	9.33	22
PANAS Negative Emotions Difference	9.59	7.55	22
Perceived Stress Scale Difference	11.91	6.33	21

***Participant Enjoyment of Stardew Valley***

Though not a key variable on its own, it may still be important to consider whether participants actually enjoyed playing *Stardew Valley* during the week. To measure this, one of the post-test questions asked participants to rate their experience with the game. Scores were chosen from a 1 to 7, in which a 1 indicated that the participant “Very much disliked playing the game,” and a 7 indicated that the participant “Very much liked playing the game.” Approximately 61% of participants liked or very much liked the game. The mean enjoyment was 5.74, in between somewhat liking and liking the game.

***Participant Gameplay Time***

It would also be useful to consider how much time participants spent playing the game. As stated above, it was recommended that participants spend around 15-30 minutes per day each

of the seven days playing *Stardew Valley*. In the post-gameplay survey, participants were asked to indicate whether they spent more, less or as much time playing the game as was expected of them. Please see Table 8 for the frequencies of participants' gameplay times. Five participants (20.80%) spent less time playing than expected. Six participants (25%) spent as much time playing than expected. Twelve participants (50%) spent more time playing than expected.

Table 8

*Frequency Table for How Much Participants Played "Stardew Valley"*

	Frequency	Percent	Valid Percent
Spent Less Time Playing <i>Stardew Valley</i> than was expected based on instructions.	5	20.80	21.70
Spent As Much Time Playing <i>Stardew Valley</i> than was expected based on instructions.	6	25.0	26.1
Spent More Time Playing <i>Stardew Valley</i> than was expected based on instructions.	12	50.0	52.2

## Hypothesis Testing

### *Correlations Between PANAS and PSS Scales Prior to Gaming*

The relationships between positive affect, negative affect, and stress were considered. Please see Table 9 for the correlation statistics of PANAS Scales and PSS totals prior to the

testing period. Stress scores were negatively related to positive emotions ( $r = -.47$ ), and positively related to negative emotions ( $r = .83$ ). This means that as participants experienced higher levels of stress, their positive emotions decreased and negative emotions increased. Stated differently, if positive emotions were higher, stress tended to be lower, and if positive emotions were lower, stress tended to be higher. If negative emotions were higher, stress tended to be higher, and if negative emotions were lower, stress tended to be lower. Please see Figure 1 for a scatterplot of the correlation between stress scores and positive affect, and Figure 2 for a scatterplot of the correlation between stress scores and negative affect. Additionally, positive and negative emotions had a negative correlation with each other ( $r = -.49$ ). Someone experiencing more positive emotions would tend to have fewer negative emotions, and vice versa. Please see Figure 3 for a scatterplot of the correlation between positive affect and negative affect prior to the gameplay period. All correlations were significant.

Table 9

*Correlation Statistics of PANAS Scales and Perceived Stress Scale Totals (Pre-Gaming)*

	PANAS Positive Emotions Total		PANAS Negative Emotions Total		Perceived Stress Scale Total	
	r	n	r	n	r	n
PANAS Positive Emotions Total	1	28	-0.49**	28	-0.47*	28
PANAS Negative Emotions Total	-0.49**	28	1	28	0.83**	28
Perceived Stress Scale Total	-0.47*	28	0.83**	28	1	28

*Note.*

\*\* is significant at the 0.01 level (2-tailed)

\* is significant at the 0.05 level (2-tailed)

Figure 1

*Scatterplot of the Correlation Between Stress Scores and Positive Affect (Pre-Gaming)*

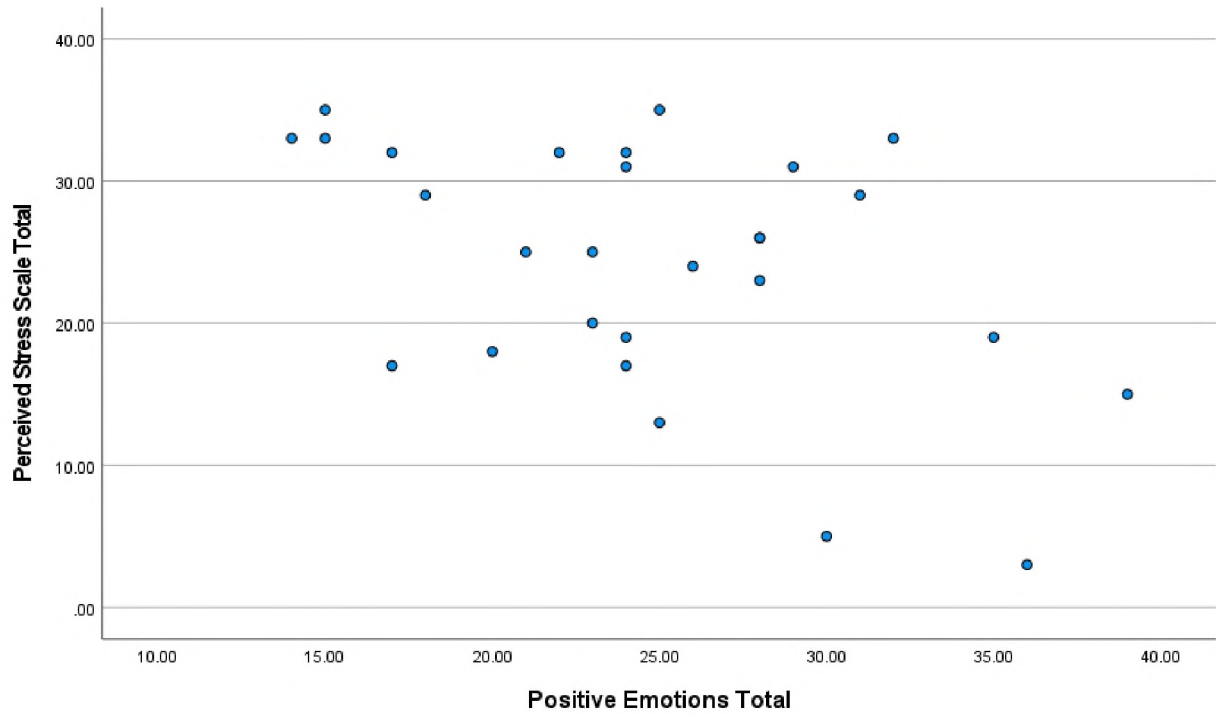


Figure 2

*Scatterplot of the Correlation Between Stress Scores and Negative Affect (Pre-Gaming)*



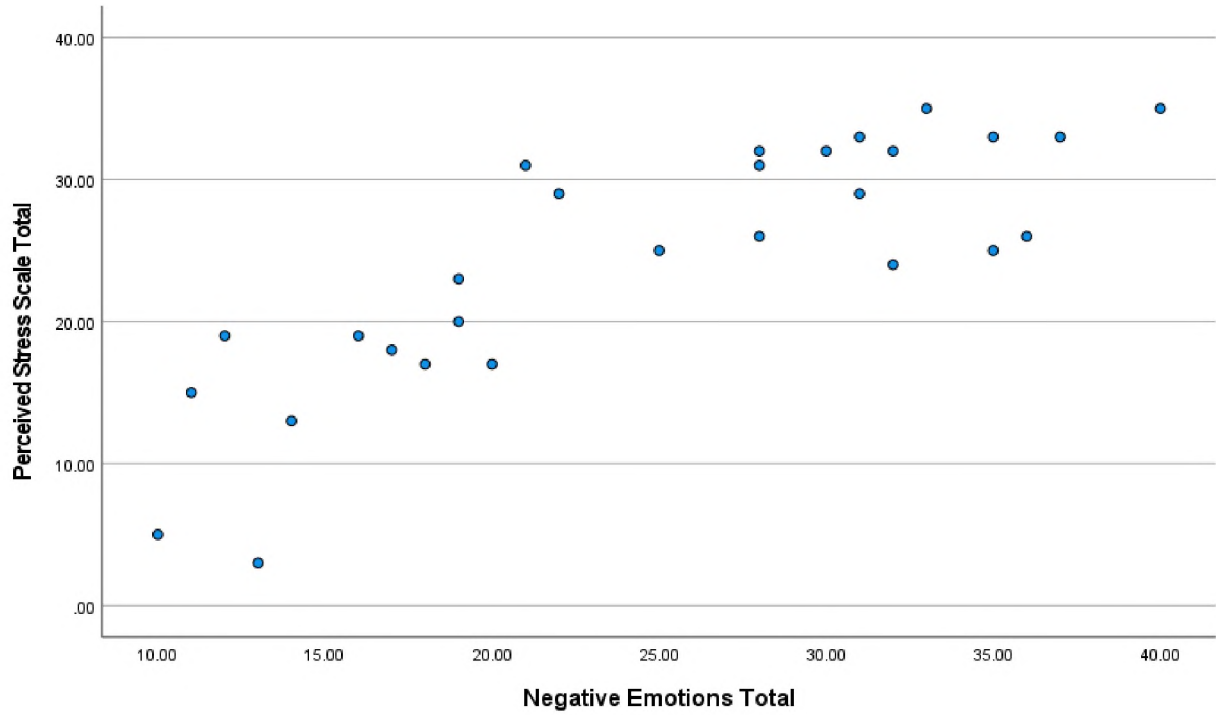
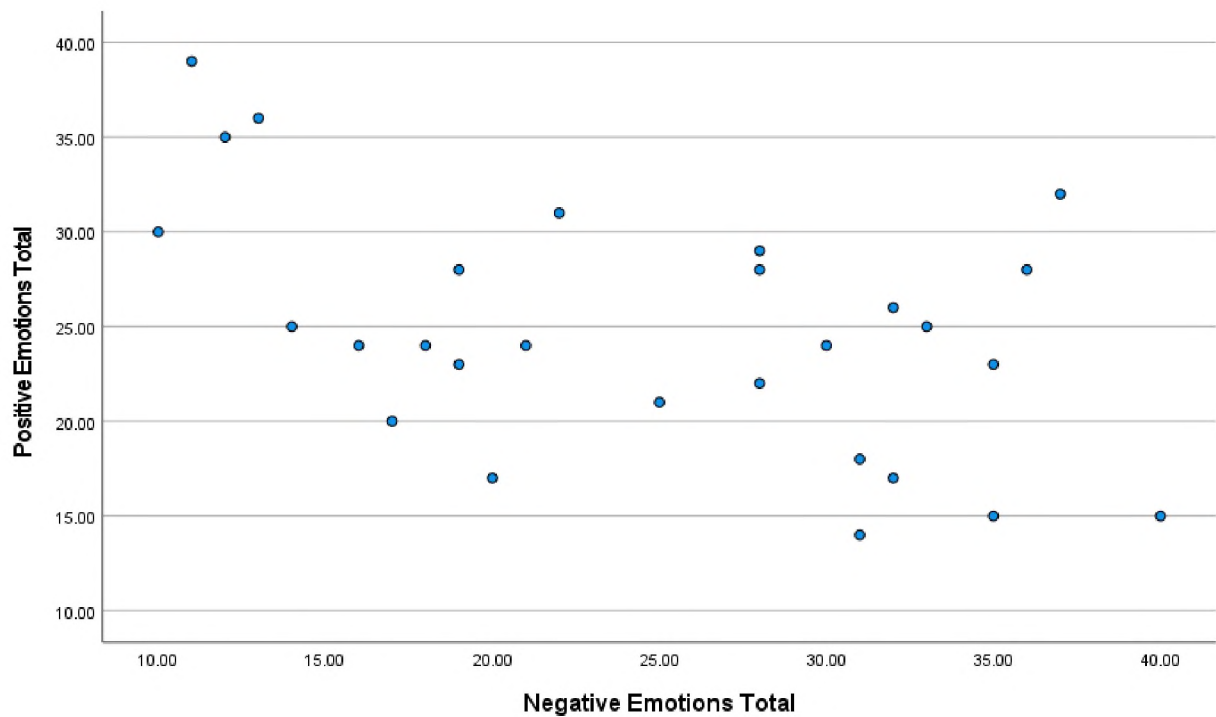


Figure 3

*Scatterplot of the Correlation Between Positive and Negative Affect (Pre-Gaming)*



### *Correlations Between PANAS and PSS Scales After Gaming*

Although the overall pattern remained similar, the correlations from the post-gaming surveys differed from the pre-gaming results. Please see Table 10 for the correlation statistics of PANAS Scales and PSS Totals after the testing period. Stress scores were negatively related to positive emotions, slightly more than seen in the pre-test ( $r = -0.50$ ). Please see Figure 4 for a scatterplot of the correlation between stress scores and positive affect after gameplay. Stress scores were also positively related to negative emotions, though less significantly than before ( $r = 0.44$ ). Please see Figure 5 for a scatterplot of the correlation between stress scores and negative affect after gameplay. This correlation was significant at only the 0.05 level, rather than at the 0.01 level seen in the pre-test. It is interesting to note that Positive and Negative Affect had a positive correlation ( $r = 0.32$ ). Please see Figure 6 for a scatterplot of the correlation between positive affect and negative affect after gameplay. It seems that the more strongly people felt positive emotions, they also strongly felt negative ones. However, this correlation was not significant. It is possible that these results could differ had there been more participants overall. After gaming, there was very little sign of negative emotions (i.e. a low mean), and very little variability in them (a low standard deviation). This lack of variability may be why we do not see correlations involving negative emotions after gaming. However, the same is true of the PSS post scores.

Table 10

#### *Correlation Statistics of PANAS Scales and Perceived Stress Scale Totals (Post-Gaming)*

PANAS Positive Emotions Total		PANAS Negative Emotions Total		Perceived Stress Scale Total	
r	n	r	n	r	n

PANAS Positive Emotions Total	1	22	0.32	22	-0.50*	21
PANAS Negative Emotions Total	0.32	22	1	22	0.44*	21
Perceived Stress Scale Total	-0.50*	22	0.44*	22	1	21

Note.

\* is significant at the 0.05 level (2-tailed)

Figure 4

*Scatterplot of the Correlation Between Stress Scores and Positive Affect (Post-Gaming)*

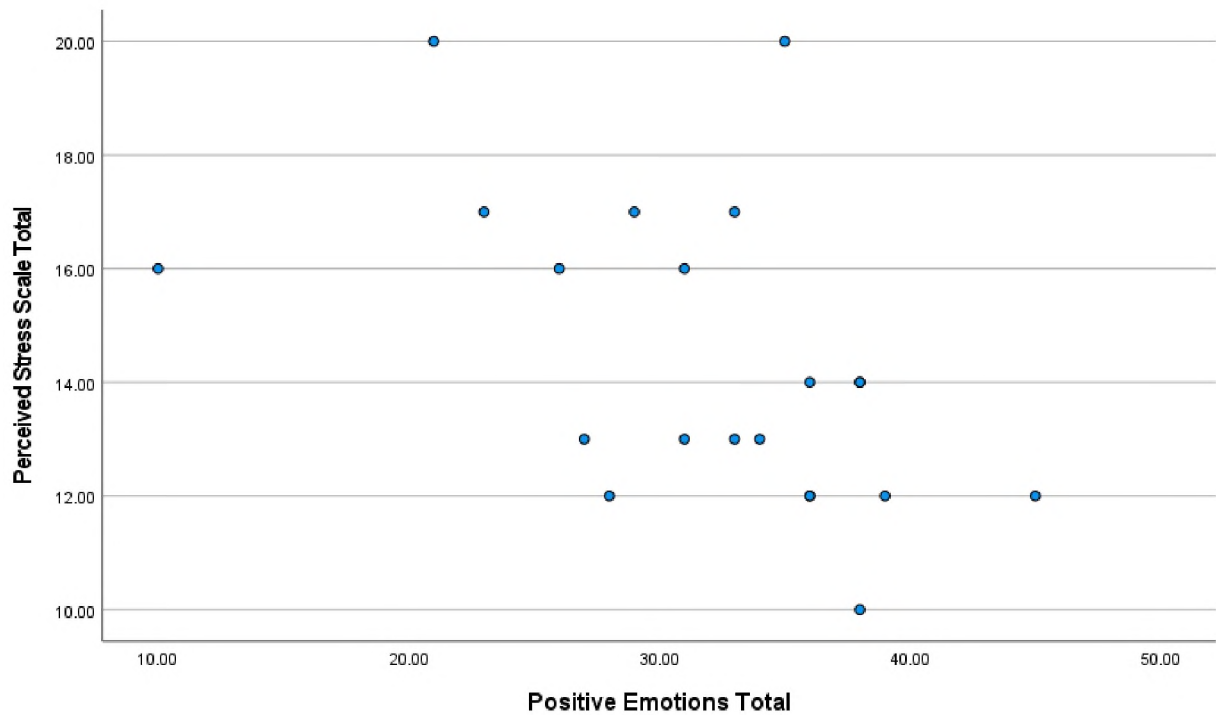


Figure 5

*Scatterplot of the Correlation Between Stress Scores and Negative Affect (Post-Gaming)*

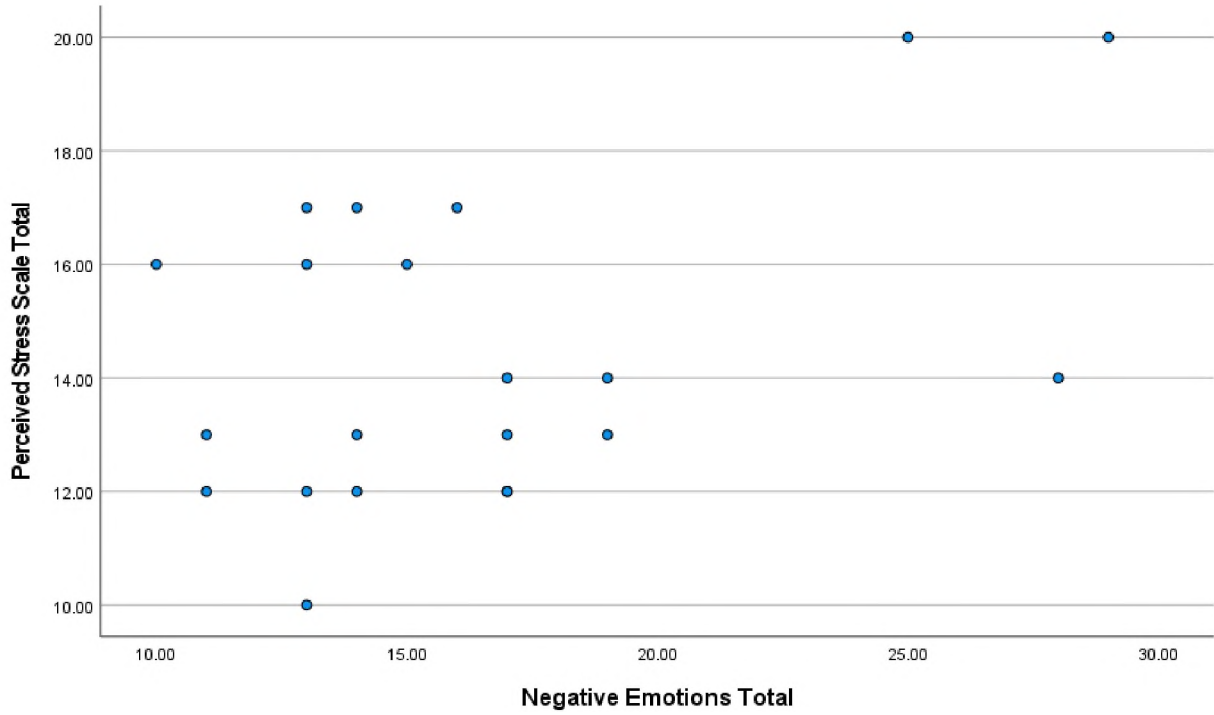
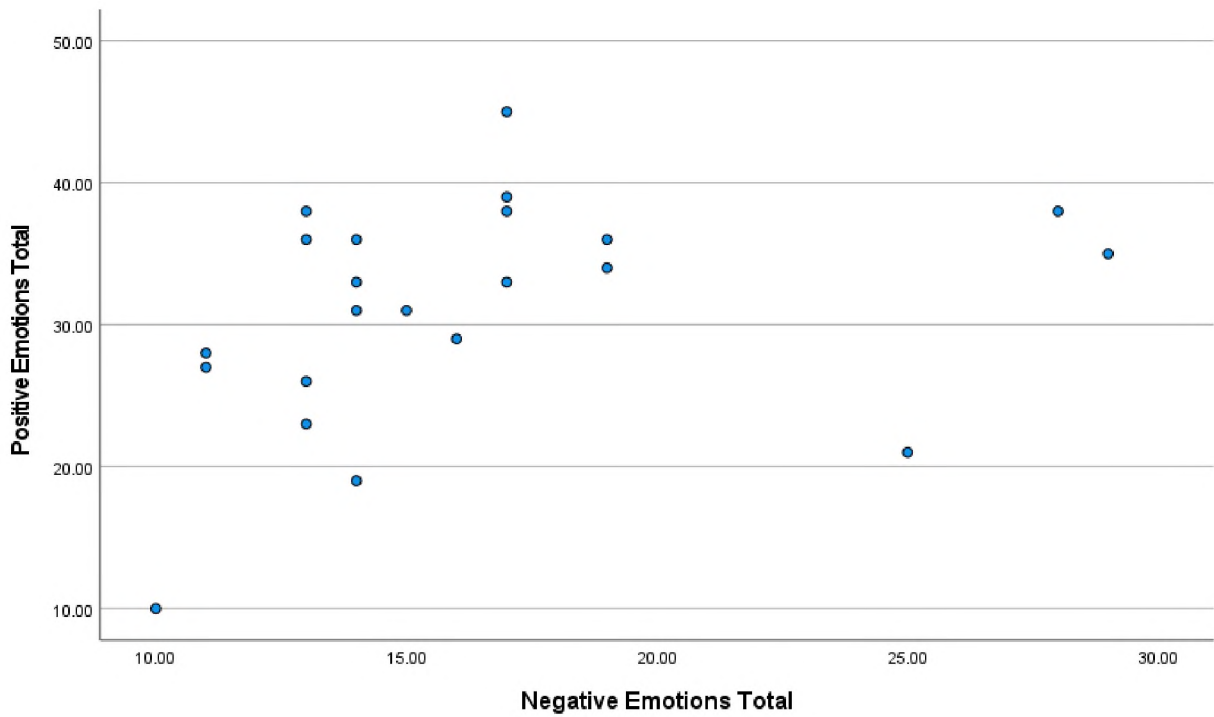


Figure 6

*Scatterplot of the Correlation Between Positive and Negative Affect (Post-Gaming)*



### *Changes Between PANAS Emotions and Stress Levels Before and After Gaming*

Perhaps most central to the hypotheses being tested here were the differences between PANAS and PSS scores before and after the gameplay period. Please see Table 11 for the means and standard deviations of the PANAS Emotions and Stress Levels before and after the study. Before the seven days of gameplay, Positive Affect mean scores were 23.41. Afterwards, this increased to 31.18. Paired samples changes for Positive Affect means ( $t(21) = -3.91$ ) were significant ( $p < 0.001$ ). Negative Affect scores decreased from 25.91 to 16.32. Paired samples changes for Negative Affect means ( $t(21) = 5.96$ ) were significant ( $p < 0.001$ ). The mean for Stress scores decreased from 26.33 to 14.43. Paired samples changes for Perceived Stress means ( $t(20) = 8.62$ ) were significant ( $p < 0.001$ ). It seems that, based on these means, positive emotions were higher, negative emotions were lower, and stress levels were lower after a week of gameplay.

Table 11

*Mean and Standard Deviation Scores of the PANAS Emotions and Stress Levels Before and After the Study*

	Before Gaming			After Gaming		
	Mean	SD	N	Mean	SD	N
PANAS Positive Emotions	23.41	6.40	22	31.18	7.92	22
PANAS Negative Emotions	25.91	8.42	22	16.32	5.13	22
Perceived Stress Scale Scores	26.33	6.99	21	14.43	2.71	21

***Participants' Enjoyment of Stardew Valley and Changes in PANAS Emotions, and PSS***

Comparisons were made to see whether participants' enjoyment of *Stardew Valley* had any significant correlation with the changes in PANAS and PSS scores. In order to explore how changes in emotions and stress levels related to enjoyment of *Stardew Valley*, post-test scores for each measure were subtracted from pre-test scores, creating a measure of difference for each variable, which could then be correlated with enjoyment. Since positive emotions increased for most participants, the average difference was negative for positive emotions. Since negative emotions and stress levels decreased for most participants, the average difference was positive for these variables. Please see Table 12 for the correlation data of participants' game enjoyment, changes in PANAS totals, and changes in PSS totals. Participants' enjoyment of the game was negatively correlated with the change in Positive Affect, significant at the 0.01 level. Please see Figure 7 for a scatterplot of the correlation between positive affect and participants' enjoyment of *Stardew Valley*. This indicates that the more that participants enjoyed playing, the greater the increase in their positive emotions. Enjoyment was also positively correlated with the changes in Negative Affect and Perceived Stress, though not at significant levels. Please see Figure 8 for a scatterplot of the correlation between negative affect and participants' enjoyment of *Stardew Valley*. Please see Figure 9 for a scatterplot of the correlation between perceived stress and participants' enjoyment of *Stardew Valley*.

Table 12

*Correlation Statistics of Participant Game Enjoyment, PANAS, and Perceived Stress Scale Totals*

	How much Participants Liked Playing <i>Stardew Valley</i>		PANAS Positive Emotions Total		PANAS Negative Emotions Total		Perceived Stress Scale Total	
	r	n	r	n	r	n	r	n
How much Participants Liked Playing <i>Stardew Valley</i>	1	21	-0.75**	21	0.01	21	0.69	21
PANAS Positive Emotions Difference	-0.75**	21	1	22	-0.25	22	-0.39	21
PANAS Negative Emotions Difference	0.01	21	-0.25	22	1	22	0.63**	21
Perceived Stress Scale Difference	0.69	21	-0.39	21	0.63**	21	1	21

*Note.*

\*\* is significant at the 0.01 level (2-tailed)

Figure 7

*Scatterplot of the Correlation Between Positive Affect and Participant Game Enjoyment*

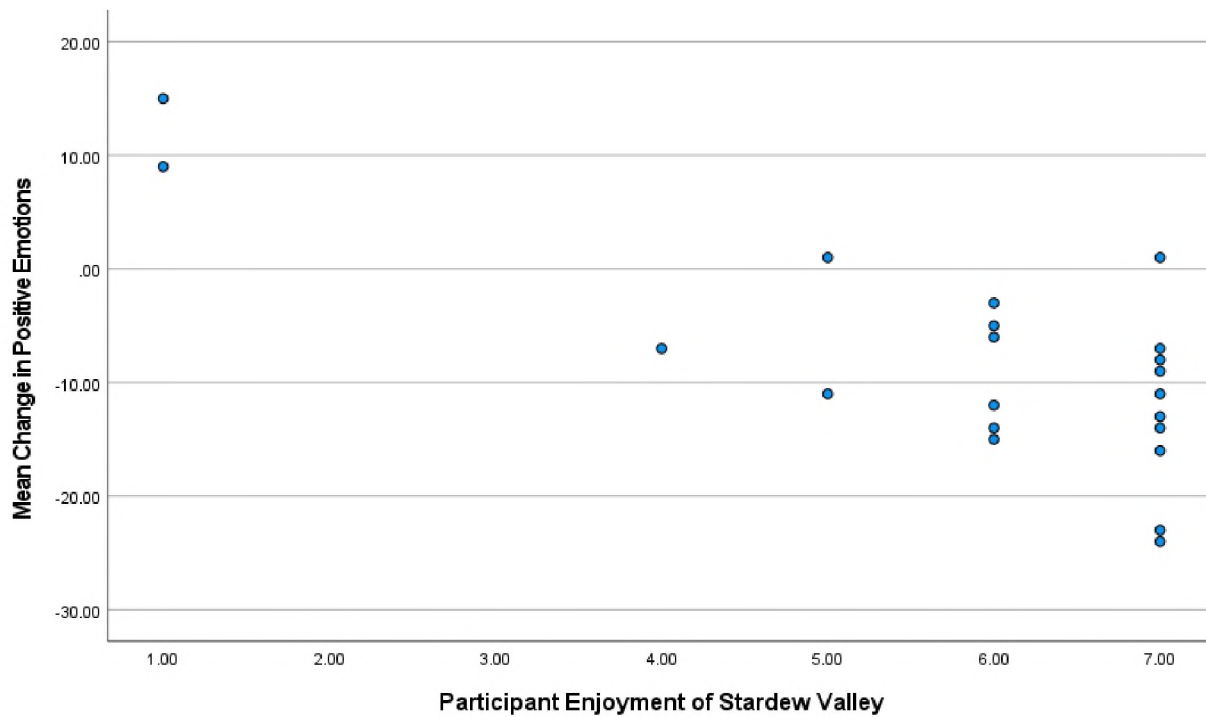


Figure 8

*Scatterplot of the Correlation Between Negative Affect and Participant Game Enjoyment*

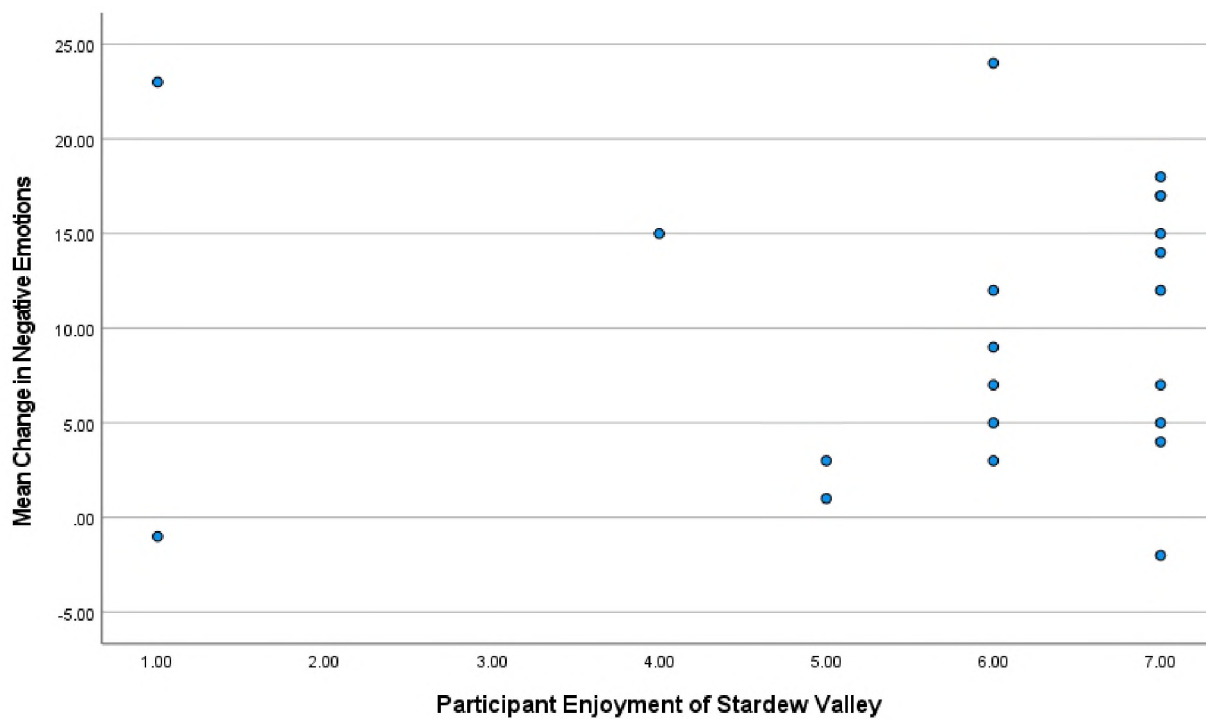
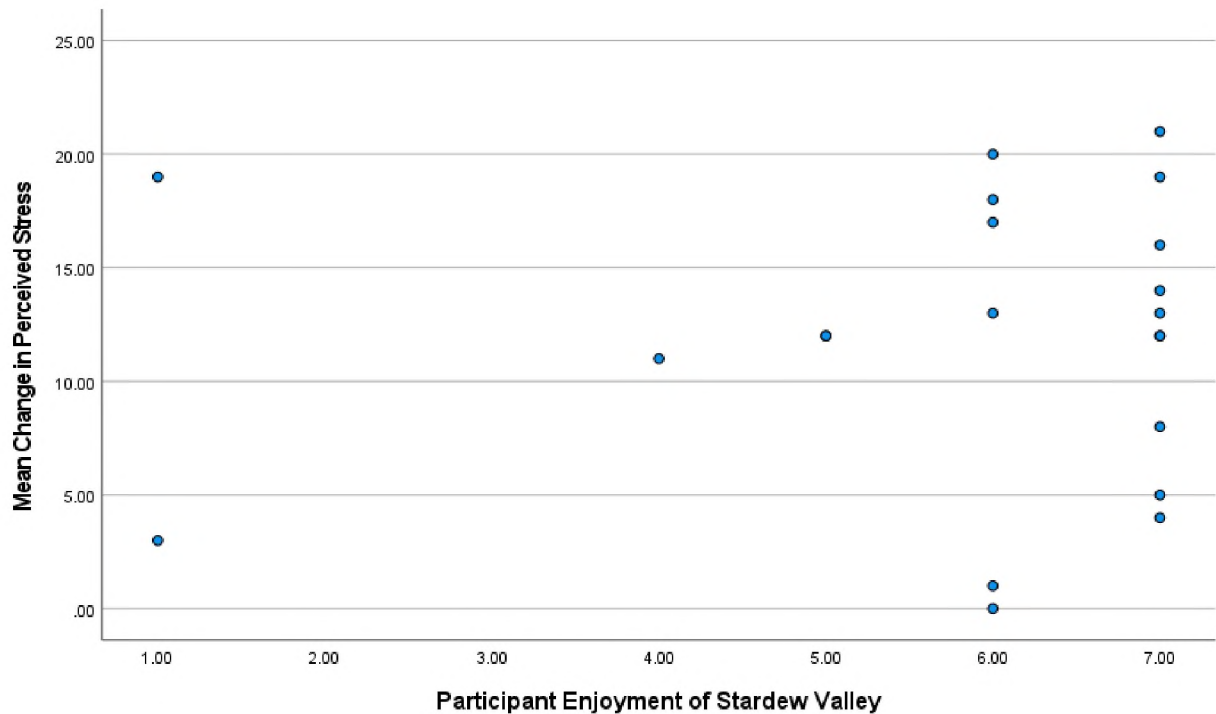




Figure 9

*Scatterplot of the Correlation Between Perceived Stress and Participant Game Enjoyment**Participants' Gameplay Time and Changes in PANAS Emotions and PSS*

Additional comparisons were made to see whether participants' time spent playing *Stardew Valley* had any significant relationship to the PANAS and PSS scores. Please see Table 13 for the changes in PANAS scores and PSS scores based on time spent playing *Stardew Valley*. Expected gameplay time was approximately 15-30 minutes per day, for seven days. Participants who spent less than or equal to the amount of expected gameplay time had lower levels of change in Positive Affect and Stress means ( $M=-3.70$ ,  $M=10.30$ ), and a slightly higher change in Negative Affect mean ( $M=10.10$ ). Those who spent more time playing than expected saw greater change in Positive Affect and Stress means ( $M=-12.27$ ,  $M=13.36$ ), and lower change in Negative Affect mean ( $M=9.73$ ). Please see Figure 10 for a graph of means between positive

affect and participants' gameplay time, and Figure 11 for a graph of means between negative affect and participants' gameplay time. Figure 12 is a graph of means between perceived stress and participants' gameplay time. These numbers indicate that participants who spent less or just enough time playing *Stardew Valley* saw less of an increase in positive emotions than those who played more. These participants also saw less of a decrease in stress afterwards, yet more of a decrease in negative emotions.

Table 13

*Changes in PANAS Scores and PSS Scores Based on Time Spent Playing "Stardew Valley"*

	Participant Gameplay Time	Mean	SD	N
PANAS Positive Emotions Difference	Less Than or Equal to What was Expected	-3.70	9.44	10
	More than What was Expected	-12.27	7.47	11
PANAS Negative Emotions Difference	Less Than or Equal to What was Expected	10.10	10.10	10
	More than What was Expected	9.73	4.80	11
Perceived Stress Scale Difference	Less Than or Equal to What was Expected	10.30	6.80	10
	More than What was Expected	13.36	5.80	11

Figure 10

*Mean Positive Affect Changes and Participant Gameplay Time*

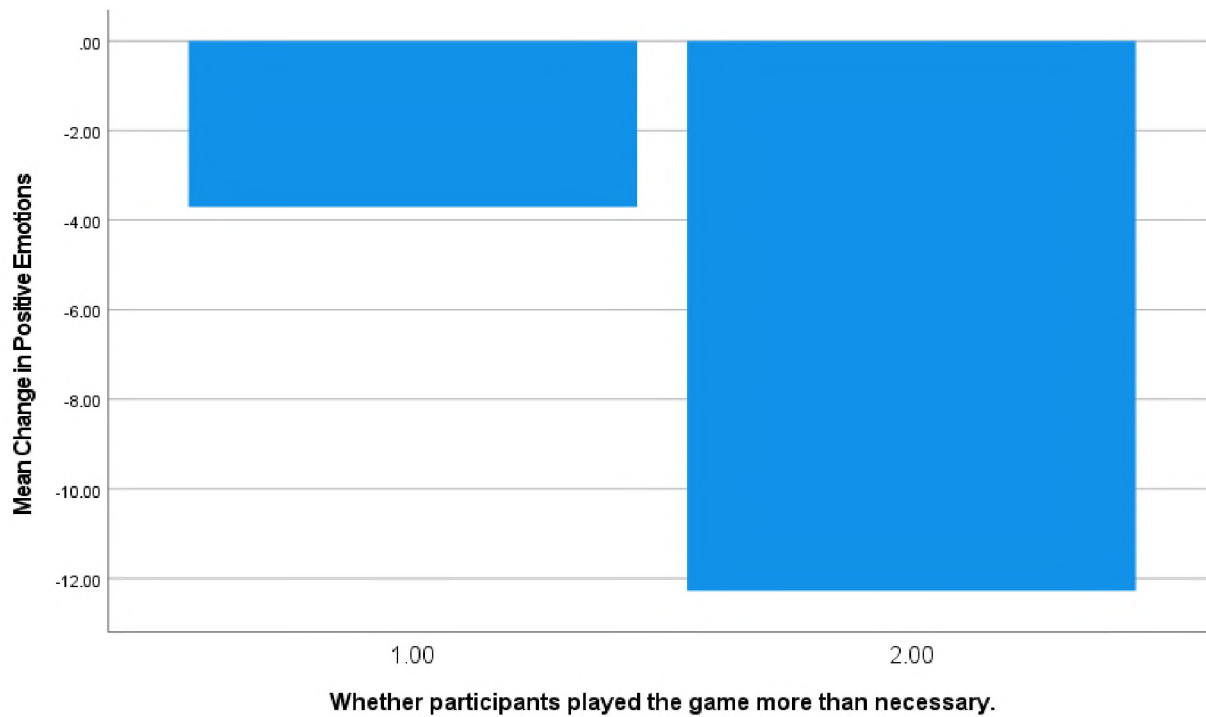


Figure 11

*Mean Negative Affect Changes and Participant Gameplay Time*

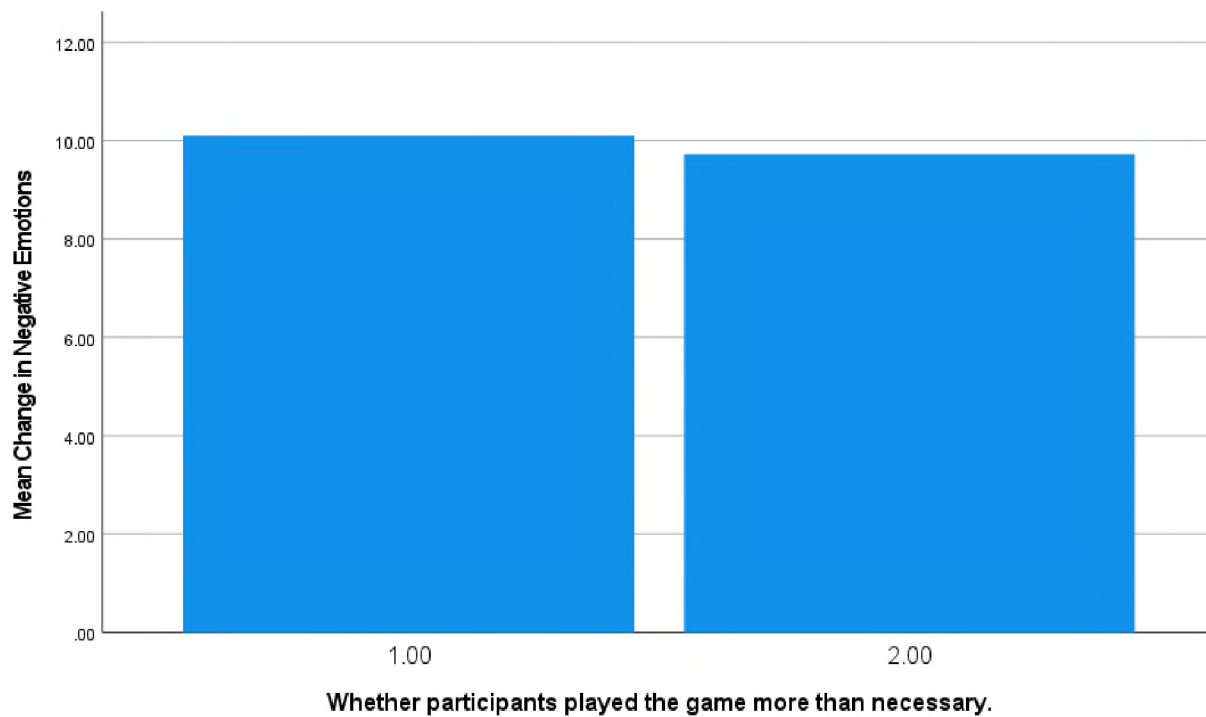
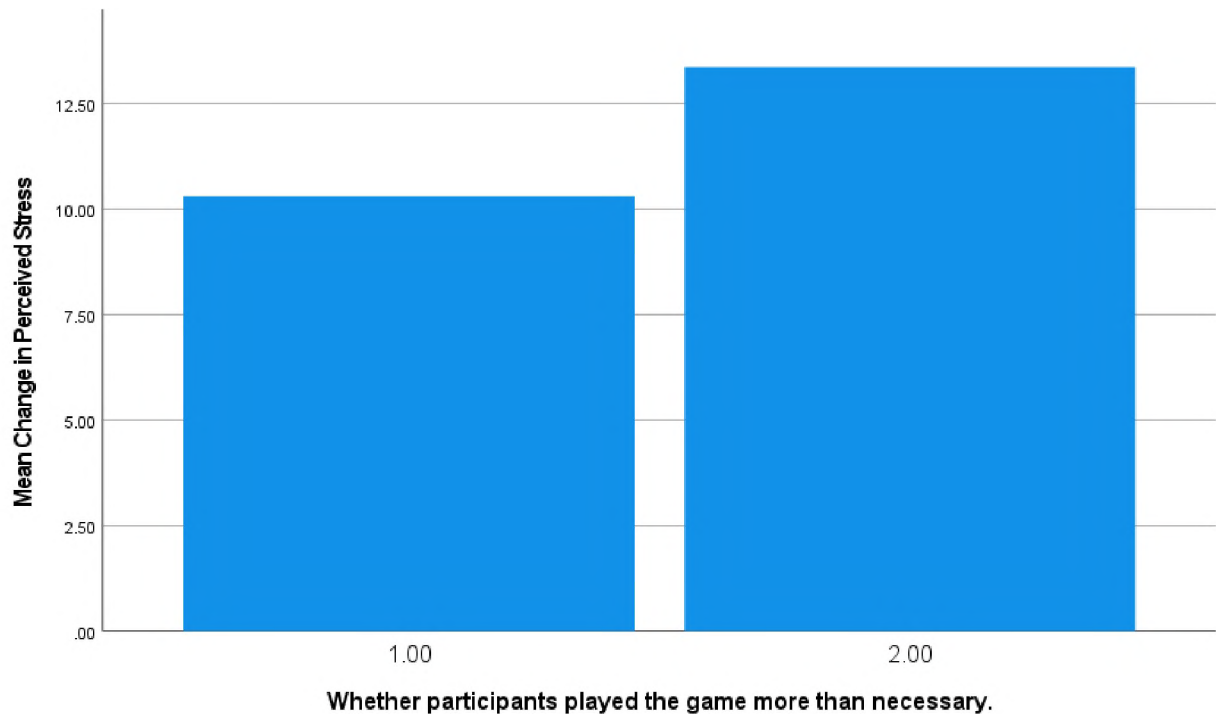


Figure 12

*Mean Negative Affect Changes and Participant Gameplay Time***Discussion**

The main hypothesis tested in this study was that participants could lower stress levels and improve their moods through playing *Stardew Valley*. This hypothesis was supported by the findings seen in the study outcomes. On average, positive emotions were higher, negative emotions were lower, and stress levels were lower after the gaming period. When given the opportunity to add comments, several participants expressed improvement in their moods as the week progressed. One participant stated that being able to accomplish tasks in the game made them feel better about themselves, and that they felt better equipped to assert themselves or accomplish other small tasks that would normally cause them anxiety. Future studies could conduct further research into the effects that gaming can have on task motivation or

self-confidence. There is perhaps a potential for task-based games like *Stardew Valley* to be used as mediums for inspiring accomplishment in real life pursuits. Feedback from participants who provided extra information regarding their experiences with *Stardew Valley* indicated that this game was successful overall in lowering stress and improving moods. Individuals reported feeling less stressed, less anxious, and more relaxed after their week-long period of gameplay. Some even expressed interest in continuing to play after the study ended. Games like *Stardew Valley* may have potential as tools for therapy treatment in the future. If therapy patients are feeling particularly stressed or emotionally drained, and previous methods have not helped them, gaming could be a suitable leisure activity for them to pursue as a method of self-care. The current research shows that excessive gaming often has adverse effects (Lemola et al., 2011; Brunborg et al., 2014; Mikuška & Vazsonyi, 2018), so moderation should always be considered. However, if players can keep their gaming to levels which would not impact other aspects of their lives, relaxing games could provide significant emotional benefits.

Although the findings of the study supported the primary hypothesis, it is important to keep in mind that correlations are not conclusive to the actual cause. There are several factors that may have affected the results. For example, some participants may have conducted the study shortly after completing assignment deadlines, which would have lowered stress considerably during the gameplay week. Alternatively, if a participant chose to conduct the study at the beginning of reading week, their stress levels may have been lower due to exam season ending. With emotions and mood, any number of factors could have significantly influenced those variables during this study.

The overall timing of the study may have had a significant impact on results. The COVID-19 pandemic has caused constant change in the overall state of the world. In Ontario, where most participants resided, lock-down restrictions and other guidelines changed quite often. Some participants may have done the study during particularly tense times in the pandemic, when lockdowns were more strict and general fear was higher. Higher levels of social isolation would have contributed to lower moods, which the game may have helped or hindered. *Stardew Valley* has a distinctly social aspect to it, related to getting to know and befriending the virtual townsfolk. If one was feeling particularly lonely while playing, this part of the game may have helped them feel less alone. Being a part of a small virtual town may have fostered a sense of community, which was missing due to the lockdowns. Alternatively, this could also have caused an individual to miss their friends and real-life communities even more. Whether or not the social parts of *Stardew Valley* filled the social voids is wholly dependent upon what is taking place within the individual. Other participants may have done the study when cases were in decline and restrictions were being lifted. They may have spent more time with friends or family during the study period. Perhaps some had other special events in their lives that would have improved their moods outside of the game. In these cases, it may not have been only the game that caused their improved mood and stress scores. Alternatively, one's stress or enjoyment could have influenced how much one played. Perhaps those who were less stressed played more. Perhaps those who were in more positive moods were inclined to play more. It is possible the game had nothing to do with the changes at all. Playing *Stardew Valley* may have been the main influencer on the changes seen, but there is no way to be certain. However, it is still interesting to

see these results. Further research on this subject could address whether the gaming had significant impacts on stress or mood, or if the data is purely correlational.

Secondary hypotheses tested whether game enjoyment and gameplay time had any relationship with stress levels and mood. The findings indicated a stronger increase in positive emotions with greater enjoyment of the game. Additionally, participants who spent more time playing *Stardew Valley* than expected saw higher changes in Positive Affect and Stress means. These participants had smaller changes in Negative Affect. These results mostly align with what was expected. Since stress and negative emotions had strong connections to each other, it is surprising that those who played more had more decrease in stress but less decrease in negative emotions. Even though stress and negative emotions had a strong relationship with one another, they may not always increase or decrease together. There were 10 different negative emotions measured. It is possible that some had such low levels of negative emotions at the outset that they could not decrease.

### **Limitations of the Study**

#### ***Time Constraints***

Since this study was conducted as part of a university thesis, there were several restricting factors. First, there was a limited amount of time in which the study could be completed by participants, data collated, and research documented and presented. Research on the potential benefits of gaming would be more suited to observation over a longer period of time. However, since participation in this study was done remotely, with university students who have busy schedules, it was not feasible to collect results over a longer interval. The study was originally scheduled to be completed in December 2021. This was extended in order to recruit

more participants. When gathering data over a one week-long period, participant numbers dropped from 68 interested, to 28 who began the study, to 24 who completed it. Although reminder emails were sent out to interested participants, it is possible that many simply forgot to follow through with the study. Alternatively, some participants may have simply gotten too busy with their own responsibilities to fully complete the study. Should there have been more participants overall, and more time to conduct the study, the results may have been different.

### ***Sample Characteristics***

The greatest limitation for this study was the completed sample size. With only 21 complete data sets available for analysis, these findings, at best, direct our attention for additional studies with adequate sample size. Although the repeated measures nature of the design did make full use of those 21 participants, the strength of the research outcomes would have been enhanced with more participants who complete all aspects of the study. It would have also been beneficial to have a more diverse population. The participants of this study were mostly female (80%), mostly caucasian (~65%), and mostly between the ages of 18-24 (~65%). Though demographics were not expected to interact with any of the key variables, there is a possibility that such factors could have some sort of impact on one's experience.

### ***Data Collection***

Since this study was conducted remotely, there was unfortunately no effective way to guarantee that participants who completed the surveys truly played *Stardew Valley* consecutively. If they wanted to, participants could have easily answered the surveys without actually performing the tasks expected of them. Although it would have required extra effort from participants, a potential solution to this issue would have been to require a daily log of specific



play-times. For each of the seven days, participants could write the exact times they played, as well as for how long. This information could also potentially be falsified, but these daily logging activities might have proven helpful. The most effective way to fully ensure this study was conducted as intended would be to implement it out in person, with participants coming in each day and being observed. However, given the prevailing circumstances of the pandemic, this option was not viable.

### *External Factors*

Since the study was conducted with an open-ended timeframe of five months, the timing in which students participated fluctuated greatly. Some did the study during midterms, while others did so during reading week or holiday breaks. Participants had different levels of stress and experienced different emotions based on their current situations. In the post-test survey, participants were given an option to disclose any external factors that they thought could have possibly affected their responses. Some of the listed items were financial stress, family stress, exams, assignments, neurodivergence, isolation due to the pandemic, and changes in residence. Such external factors could influence data either way. For example, financial issues would produce more stress than usual, which either could have made the positive impact bigger than it normally would be for others, or the extra stress could have inhibited positive impact than normal.

Each individual reacts to, and copes with stress in unique ways. Furthermore, video games are not suitable for everyone. Setting aside their potential risks or benefits, some people find enjoyment or entertainment in video games whereas others simply do not. Thus, the outcomes of this study will not be universally applicable to everyone. Someone who previously

hated video games may have benefited from this particular experience, whereas someone else who also previously hated video games may not have. Similarly, someone who regularly plays video games could have either benefitted or not from this experience, based on their own preferences. Everyone is different regarding what relaxes them. Some people may find first-person shooters relaxing and can de-stress with that form. However, other people may find first-person shooters incredibly stressful and not enjoyable. The same is true for *Stardew Valley*. Although this game was designed to be a rather stress-free experience, anything can be stressful if you do not enjoy doing it.

### **Further Research Directions**

Due to the various limitations of this study, it would be beneficial for further research to be conducted on this subject before conclusions about the benefits of the game are made. Should this study be replicated, a larger sample size would be ideal. More participants with greater demographic diversity would be useful for producing more reliable results. Specifically, it would be valuable to have greater diversity in gender, ethnicity, and age. It would also be good to measure participants' previous experience with video games. It would be interesting to see if previous gaming experience would have any significant impacts on results. If someone had extensive experience with video games beforehand, they may see greater results due to being familiar with the concept. Experiencing something new can be a stressful or satisfying endeavor, depending upon the individual. In any case, more participants would provide more data to analyze, which would strengthen any potential conclusions.

This research study could be replicated with any number of games. Many games are designed to be stress-free that would be suitable for measuring the same variables. One example

would be *Animal Crossing: New Horizons*, a game released by Nintendo for the Switch in 2020. *New Horizons* is a life simulation game played in real time. The game follows a villager customized by the player, who moves to a deserted island. The game proceeds in a non-linear fashion, allowing for the player to play the game at their own pace. They can catch bugs and fish, plant and grow trees, crops, and flowers, and craft a number of items with the natural resources they gather. The island allows players to place items and decorate as they please (Nintendo, 2020). This game remains quite popular, and many have praised it for being a relaxing experience overall (Scheurle, 2020; Craddock, 2020; Collins, 2020). This game shares some traits with *Stardew Valley*, such as the open-ended nature and player-chosen pace, which makes it an excellent option for future studies in this format.

If participants of a future study had a bit more free time, it would be beneficial to have them complete the surveys each day of gameplay. This way, one could observe the results from daily changes as well as changes over time to stress and mood. The research would also be strengthened by extending the timeframe, which would allow for a clearer analysis of changes in relevant variables like stress and emotions. It is possible that results could change when data is collected over a period of one month versus one week. More in-depth research in this topic would be advantageous for analyses on gaming as a means to reduce stress and improve mood.

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## Appendix A

### Informed Consent

#### Informed Consent Form

**Study name:** Benefits of Gaming on Mood and Stress Levels

**Researchers:** Shaylee Scott, advised by Dr. Vivette Henry.

Email: |

**Purpose of the research:** To assess the benefits people, particularly students, could have from engaging in low intensity gaming at consistent intervals. This study aims to explore the relationship between gaming, mood, and stress levels. The desired result is to shed more light on the good that video games can bring, rather than focus on the negative generalization that gaming tends to solicit.

**What you will be asked to do in the research:** Participants will be asked to engage in 15-30 minutes of playing *Stardew Valley*: a relaxing, low-difficulty game, easily accessible from most computers. These sessions are to happen daily for five consecutive days. You will be expected to fill out questionnaires to assess your emotional status and stress levels both before and after each play session (using The PANAS Mood Scale and the Perceived Stress Scale).

To make this process as convenient as possible for you, after agreeing to participate you will be given a randomized number that you will use to gain access to the required materials through an online portal. The purpose in doing this is so that you will be able to do the entirety of this experiment from the comfort of your own home. The portal will be accessible for a two month period, so that you can choose to begin the five consecutive days at any point within those two months. Each day should take around 30-45 minutes to complete the necessary play-time (at least 15 minutes) and assessment forms. Thus, total time to complete this study, across the five day period, is approximately two to three hours.

**Risks and discomforts:** Though the video game used in this study is designed to be relaxing, it is possible that participants could still experience stress or frustration. If this happens for any reason, and you find yourself not enjoying the game, it is advised that you stop playing and complete the questionnaires. Aside from this possibility, no harm or discomfort should be experienced during this study.

**Benefits of the research and benefits to you:** This research will help to provide a greater scope of the positive effects that gaming can bring. Psychological benefits expected in this study include an improvement in mood and a decrease in perceived stress. Furthermore, participants will receive 1% extra credit per hour spent in the study, for a maximum of up to 4% per course according to Tyndale University's guidelines. This extra credit can be allocated to any PSYC course of your choosing. Those who are not eligible for extra credit but wish to participate will be entered into a draw for a gift card to the Tyndale University bookstore.

**Voluntary participation:** Your participation in the research is completely voluntary and participants may

*This study has been reviewed and has received ethics approval through the REB.*

choose to stop participating at any time. A participant's decision not to continue participating will not influence their relationship or the nature of their relationship with researchers or with staff of Tyndale University, either now or in the future.

**Withdrawal from the study:** You may stop participating in the study at any time, for any reason, if you so decide. Your decision to stop participating, or to refuse to answer particular questions, will not affect your relationship with the researchers, Tyndale University, or any other group associated with this project. In the event that you withdraw from the study, all associated data collected will be immediately destroyed wherever possible. If you decide to stop participating, you will still be eligible to receive the promised extra credit for agreeing to be in the project.

**Confidentiality:** Data collected through the questionnaires will not be associated with any identifying information. Participants will be given random numbers that will represent their data in the analysis. The only people who will have access to the information are the principal investigator (Shaylee Scott), their academic advisor (Dr. Vivette Henry), and Tyndale's Research Ethics Board (REB). The data will be securely stored for one year after the conclusion of the study, after which it will be destroyed. Confidentiality will be provided to the fullest extent possible by law. It is possible that an opportunity will arise at some point for the data to be reanalyzed by colleagues or other professionals.

**Questions about the research?** If a research participant has questions about the research in general or their role in the study, they should contact the researcher or their supervisor.

**Researcher email:**

**Supervisor email**

**Research Ethics Board email:**

**Legal Rights and Signatures:** I consent to participate in the following study conducted by Shaylee Scott. I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by signing this form. My signature below indicates my consent.

**Signature:**

Participant name

**Date:**

**Signature:**

Principal Investigator name

**Date:**

*This study has been reviewed and has received ethics approval through the REB.*

## Appendix B

### Positive and Negative Affect Schedule (PANAS-SF) Scale



1. This series of questions is intended to get a sense of how you are feeling before you begin the study. Please indicate the extent you have felt each of these emotions over the past week on the scale provided.

	Very slightly or not at all	A little	Moderately	Quite a bit	Extremely
Interested	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Distressed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Excited	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Upset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strong	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Guilty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Scared	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hostile	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Enthusiastic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Proud	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Irritable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Alert	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ashamed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Inspired	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nervous	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Determined	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Attentive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jittery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Active	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Afraid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Appendix C

### Perceived Stress Scale

2. This series of questions is intended to get a sense of your stress level before you begin the study. Please indicate the extent you have experienced each of these things over the past week on the scale provided.

	Never	Almost never	Sometimes	Fairly often	Very often
In the past week, how often have you been upset because of something that happened unexpectedly?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the past week, how often have you felt that you were unable to control the important things in your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the past week, how often have you felt nervous and “stressed”?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the past week, how often have you felt confident about your ability to handle your personal problems?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the past week, how often have you felt that things were going your way?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the past week, how often have you found that you could not cope with all the things that you had to do?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the past week, how often have you been able to control irritations in your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the past week, how often have you felt that you were on top of things?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In the past week, how often have you been angered because of things that were outside of your control?

In the past week, how often have you felt difficulties were piling up so high, that you could not overcome them?

## Appendix D

### Stardew Valley

*Stardew Valley* is an open-ended country-life role-playing game. Players inherit an old farm plot from their late grandfather, and they jump at the opportunity to escape the city in favour of the quiet countryside (Barone, 2016). They are tasked with turning the overgrown fields and dilapidated house into a thriving home. This can be accomplished in a multitude of ways. If players wish to earn all of their income through farming, fishing, or mining, they have the freedom to do so. If they want to combine different activities and expand their horizons, they are able to.

As players get acquainted with the local townsfolk, they will uncover the rich history of Pelican Town; including an abandoned community centre that was once the town's most vibrant hub of activity. Will players fight back against corporate control and restore the centre with nature's bounty, or will their wallets do the work? The choice is up to the player, and they can accomplish their goals at a leisurely pace. The valley is full of opportunity, and with some time and dedication, players can own the farm of their dreams.

## Appendix E

### Demographic Questions

What is your age?

- 18-24
- 25-39
- 40-59
- 60+

What is your ethnicity?

- Aboriginal (Inuit, Métis, North American Indian)
- Arab/West Asian (e.g., Armenian, Egyptian, Iranian, Lebanese, Moroccan)
- Black (e.g., African, Haitian, Jamaican, Somali)
- Caucasian
- Chinese
- Filipino
- Japanese
- Korean
- Latin American
- South Asian
- South East Asian
- Other

What is your gender?

- Male
- Female
- Non-binary
- Other
- Prefer not to say