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A desire fulfillment theory of digital game enjoyment

Owen M. Schaffer
DePaul University, OSCHAFFE@depaul.edu

A DESIRE FULFILLMENT THEORY OF DIGITAL GAME ENJOYMENT

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OWEN MICHAEL SCHAFFER

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Name: OWEN MICHAEL SCHAFFER

Title of dissertation:

A DESIRE FULFILLMENT THEORY OF DIGITAL GAME ENJOYMENT

Date of Dissertation Defense:

12/6/2019

Xiaowen Fang
Dissertation Advisor*

Rosalee Wolfe
1st Reader

Adam Steele
2nd Reader

Fan Zhao
3rd Reader

** A copy of this form has been signed, but may only be viewed after submission and approval of FERPA request letter.*

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ABSTRACT

Empirical research on what makes digital games enjoyable is critical for practitioners who want to design for enjoyment, including for Game Design, Gamification, and Serious Games. But existing theories of what leads to digital game enjoyment have been incomplete or lacking in empirical support showing their impact on enjoyment.

Desire Fulfillment Theory is proposed as a new theory of what leads to digital game enjoyment and tested through research with people who have recently played a digital game. This theory builds on three established theories: Oliver's (1977) Expectancy Disconfirmation Theory, Reiss's (2004) Theory of Basic Human Desires, and Csikszentmihalyi's (2008) Flow Theory. These three theories are integrated into Desire Fulfillment Theory to create a new Desire Fulfillment Model of Digital Game Enjoyment. This model was presented and hypotheses based on the model were proposed and tested.

An online survey study was conducted to test this model and these hypotheses using multiple linear regression and Structural Equation Modeling (SEM). Data was collected from 315 participants who had played a digital game

for at least 30 minutes within the last 6 months. Participants who had played a game in the last 6 months for at least 30 minutes were chosen to be sure they had enough recent experience playing a digital game to draw on to answer the questionnaire questions about their experience playing that game.

When the impacts of Desire and Desire Fulfillment on Task Engagement and Enjoyment are examined by analyzing each desire separately (see Table 12), Desire Fulfillment: Curiosity has the greatest direct impact on Enjoyment, while Desire Fulfillment: Idealism has the greatest impact on the Task Engagement factors, Concentration and Sense of Control.

Additional analysis was conducted to investigate how the three most frequently fulfilled desires, Curiosity, Independence, and Tranquility, work together to impact Task Engagement and Enjoyment (see Table 16). Experiencing more fulfillment of a desire for Curiosity had a direct impact on Enjoyment. Usability of Controls, players' individual level of desire for Curiosity, and fulfilling a desire for Independence predicted Sense of Control. Players' individual level of desire for Tranquility predicted Concentration. So, all three of these desires played some role in game enjoyment when they were relevant to the gameplay experience. Because the overall R^2 of the model tended to increase as the three desires were combined, Curiosity, Independence, and

Tranquility appeared to be relatively independent and their effects appeared to add up and work together to increase player Task Engagement and Enjoyment.

The present research also advances our understanding of how Task Engagement impacts Enjoyment, and the System Design factors that lead to Task Engagement. The results of this study showed that Clear Proximal Goals and Immediate Progress Feedback are the System Design factors that lead to the experience of Concentration and Sense of Control, which are the key Task Engagement factors that lead to Enjoyment (see Figure 34). Designing interactive systems that give users clear proximal goals, immediate progress feedback and desire fulfillment will be more likely to lead to enjoyment. That means ensuring users know what to do next and how well they are doing at each step throughout the activity.

This study advances our knowledge of what leads to digital game enjoyment, and how practitioners can design for enjoyment. Guidelines based on Desire Fulfillment Theory and the findings of this study are presented (see Figure 35).

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CHAPTER 1. INTRODUCTION

The US video game industry reached record revenues of $36 billion in 2017, up 18% from the year before (Entertainment Software Association & The NPD Group, 2018). Digital games are defined here by the author as interactive, computer-based systems that present users with a series of goal-directed, challenging tasks to complete for the enjoyment the tasks provide. Digital games are computer-based systems, defined here by the author to mean they are games played on a computerized device, such as a video game console, Personal Computer (PC), smartphone, or on the Internet. Enjoyment is defined here by the author as the extent to which people positively evaluate their experience. But there has been little to no scientific consensus about what leads to that positive experience of enjoyment when people play digital games. The science of digital game enjoyment is still in its infancy, with scattered and incomplete theories that are either not supported by empirical research showing they lead to enjoyment such as Caillois's (1961) categories of games, Bartle's (1996) four player types, and Lazarro's (2004, 2009) Four Keys to Fun, or do not provide a comprehensive model of what leads to enjoyment such as Self-Determination Theory (Ryan and Deci 2000), Player Experience of Needs Satisfaction (PENS; Ryan, Rigby, & Przybylski, 2006), Flow Theory (Nakamura & Csikszentmihalyi, 2014), the Game

Engagement Questionnaire (Brockmyer et al., 2009), Yee's model of motivations to play online games (Yee, 2006; Yee, Ducheneaut, & Nelson, 2012), Malone's (1980, 1981) model of intrinsically motivating educational games, the Player Experience (PLEX) Framework (Korhonen, Montola, & Arrasvuori, 2009), and the taxonomy of gameplay enjoyment from Quick et al. (2012). The proposed research aims to fill that gap in the literature.

Understanding what makes digital games enjoyable is important not only for video and computer game designers, but for practitioners of Gamification and designers of Serious Games as well. Gamification is "the use of game design elements in non-game contexts" (Deterding, Dixon, Khaled, & Nacke, 2011, p. 10), such as to make non-game systems more game-like and enjoyable. Serious games are "full-fledged games for non-entertainment purposes" (Deterding et al., 2011, p. 11), such as education, exercise, or persuasion.

When users experience more enjoyment, which is by definition a more positive experience, it follows logically that they will be more likely to come back for more of that positive experience. This user behavior of coming back for more could translate into more sales, repeat sales, expanded market share, employee retention for a gamified business system, successful behavior change for a

persuasive game, or better learning outcomes for an educational game. This is why design for enjoyment is so important.

Design for enjoyment is the common thread across Game Design, Gamification, and Serious Games. To engineer enjoyable systems, practitioners need empirical research on what makes digital games enjoyable. The present study advances our knowledge of how to design for enjoyment, which is important to practitioners in the fields of Game Design, Human-Computer Interaction, and Information Systems.

The central research question guiding this research was: what leads to digital game enjoyment? A theory of desire fulfillment was proposed, hypothesizing that digital game enjoyment is a function of individual differences in desire to fulfill 16 basic human desires and how well the experience of playing the game fulfills (or over-fulfills) each of those basic human desires. Desire Fulfillment Theory suggests that the more a game fulfills the basic human desires of players, the more that players will experience enjoyment. This Desire Fulfillment Theory was based on three established theories, Oliver's (1977) Expectancy Disconfirmation Theory, Reiss's (2004) Basic Human Desires Theory (also known as Sensitivity Theory), and Csikszentmihalyi's (2008) Flow Theory. A Desire Fulfillment

Model of Digital Game Enjoyment is presented based on the proposed Desire Fulfillment Theory (see Figure 2 below).

More specifically, the research question for this study was: how well does the proposed Desire Fulfillment Model explain and predict digital game enjoyment? Based on this model, a series of hypotheses were presented. An online survey study was conducted using stepwise multiple linear regression and Structural Equation Modeling (SEM) to test the proposed model and hypotheses.

Existing theories of digital game enjoyment the author reviewed did not take into account individual differences in how much players are motivated by each basic human desire. The results of the present research advances our knowledge of how individual differences among users impact digital game enjoyment. This could be used by practitioners to personalize systems designed for enjoyment to the desires of different target user groups or even to the desires of individual users to maximize desire fulfillment and enjoyment. The present research also aims to investigate the relative impact of fulfilling each of Reiss's (2004) 16 basic human desires on enjoyment. The aim was to provide evidence for which desires tend to have the largest impact on enjoyment when they are fulfilled. The potential contribution of the present research is significant for both the theory and practice of designing interactive systems for enjoyment.

CHAPTER 2. LITERATURE REVIEW

A wide range of literature was reviewed including Psychology, Game Design, Anthropology studies of play and games, Information Systems, and Human-Computer Interaction looking for sources of digital game enjoyment. Each of these fields was chosen for their relevant contributions to the study of games, play, intrinsic motivation, and enjoyment. The aim of this literature review was to create a more comprehensive model of digital game enjoyment. This literature review is organized into the following sections, each with their own subsections: 1) Games, 2) Psychology, and 3) Two Main Theories that Inspired Desire Fulfillment Theory.

2. 1. Games

The theories and research reviewed in this section focus specifically on games, play, and digital game enjoyment. It begins with general theories games and play and ends with more specific taxonomies of digital game enjoyment. This section consists of the following subsections: 1) Theories of Games and Play, 2) Player Types and Motivations to Play Games, and 3) Taxonomies and Models of Digital Game Enjoyment.

2. 1. 1. Theories of Games and Play

Caillois (1961) classified games into competition, simulation, chance, and vertigo, or a combination of these elements. Sutton-Smith (2009, p. 215, p. 219-220) conducted a rhetorical analysis of play focused on: progress, fate, power over others, identity, imagination, peak experiences, and frivolity. These theories of games and play were based on philosophical contemplation and rhetorical analysis respectively. So, they were not generated or supported by empirical research with people who play games.

2. 1. 2. Player Types and Motivations to Play Games

Bartle (1996) proposed four player types as a model of what motivates people to play online games based on a theory that players can act or interact with the world and other players: Achiever, Socializer, Killer, and Explorer. Bartle's model was theoretical and not based on empirical evidence. Yee (2006) and Yee et al. (2012) created a model of motivations to play online games that had three components: achievement, social, and immersion. The construct validity of this model was assessed with factor analysis on data from a large-sample survey. Yee's survey items were mainly based on Bartle's model, which was not based on empirical research, so Yee's model may not be comprehensive or content valid.

Also, Yee did not separate player desires from how well the game fulfilled those desires. In their survey measure, Yee et al. asked "how important are these gameplay elements when you play online games?" This focuses only on player motivation, and ignores the player's experience of fulfilling that motivation. Also, Yee et al. did not test how much these motivations were related to enjoyment, choosing to test how well they predicted specific in-game behaviors instead.

Brown and Vaughan (2010) presented eight play personalities: The Joker, The Kinesthete, The Explorer, The Competitor, The Director, The Collector, The Artist/Creator, and The Storyteller. Fullerton (2014) expanded on the play personalities, calling them player types and adding The Achiever and The Performer. Brown and Vaughan noted there was no scientific basis for these play personalities. Because these theoretical play personalities and player types were not based on research with real people who play digital games, they may be incomplete, inaccurate, or lacking in content validity.

2. 1. 3. Taxonomies and Models of Digital Game Enjoyment

Malone (1980) investigated what made two games enjoyable using within-subjects experiments by creating multiple different versions of each game. Malone constructed six versions of the popular game *Breakout* and eight versions

of an educational game called *Darts*, varying whether or not certain features were included in the game. Based on this research, Malone developed a theoretical framework around three themes: challenge, fantasy, and curiosity. Malone (1981, 1982) proposed heuristics to design educational games based on this theory.

Because Malone's framework was derived from narrow controlled experiments, it may not be a comprehensive model of what leads to enjoyment. Malone did not conduct qualitative research with open-ended questions to give game players a chance to express what in their experience leads to digital game enjoyment. Also, Malone did not take into account individual differences in desire or motivation to have these experiences. Even curiosity was defined in terms of how the game aroused sensory curiosity through audio and visual effects and cognitive curiosity through optimal information complexity. The amount of curiosity the player had was not taken into account.

Quick et al. (2012) created a six-factor taxonomy of game enjoyment validated with factor analysis of survey data: Fantasy, Challenge, Exploration, Companionship, Fidelity, and Competition. To validate this taxonomy, participants rated how important 18 game design features were to their enjoyment of video games. However, Quick et al. did not discuss how they came up with those 18 game design features. It appears they did not generate their items

through research with people who play games. If that is the case, their taxonomy may incomplete or lacking in content validity. Also, Quick et al. did not separate player desires from how well the game fulfilled those desires.

Lazzaro (2004, 2009) proposed four pathways to emotion in games called the Four Keys to Fun: Easy Fun (Novelty & Curiosity), Hard Fun (Challenge & Fiero), People Fun (Friendship & Amusement), and Serious Fun (Altered States & Relaxation). Lazzaro (2004) claimed to have created twelve models of what facilitated enjoyment with affinity diagraming based on interviews and observations with 60 game players, but Lazzaro only presented these four keys. This suggests these four keys may be only part of the bigger picture of what makes games enjoyable.

Lazzaro (2004) also identified and defined several positive emotions people experience while playing their favorite games, such as Fear, Surprise, *Naches* (Yiddish for enjoying the accomplishments of mentees), *Fiero* (Italian for triumph and pride), and *Schadenfreude* (German for enjoying the pain of others).

Game designers have proposed some ideas of their own about what makes games enjoyable. Garneu (2001) listed 14 forms of fun, including Beauty, Problem Solving, Thrill of Danger, Physical Activity, and Creation. Koster (2013) proposed that learning is what makes games fun. Garneu's list and

Koster's theory were not generated or supported by empirical research, but they suggest some possible sources of enjoyment.

Korhonen et al. (2009) drew on previous models, especially Costello and Edmonds's (2007, 2009) pleasure framework, to create the playful experiences or PLEX framework. PLEX is made up of 20 categories of playful experiences, such as Completion, Discovery, Relaxation, Sensation, Expression, and Fellowship. Lucero and Arrasvuori (2010) developed a set of PLEX cards with one playful experience on each card, and used these cards to create playful experiences in three design projects. Korhonen et al. (2009) only assessed the PLEX framework by interviewing thirteen game players, finding that at least one player mentioned each of the PLEX categories during the interviews. The PLEX framework was based on previous theories rather than generated through research with game players, so it may not be sufficiently comprehensive or content valid. The PLEX framework lacks an overall theory that explains how the categories of playful experiences fit together. The PLEX framework also does not take into account individual differences in motivation or desire for each playful experience.

A questionnaire was created based on the PLEX framework, the PLEXQ, and factor analysis with it revealed four underlying factors: stimulation, pragmatic, momentary, and negative (Boberg, Karapanos, Holopainen, & Lucero, 2015).

However, empirical research has not yet tested the impact of the PLEX framework categories or PLEXQ factors on enjoyment in the reviewed literature.

2. 2. Psychology

This literature review section focuses on theories and research from Psychology that may help answer the question of what makes digital games enjoyable. It begins with two specific psychological theories often cited to explain game enjoyment and ends with the emerging field of Positive Psychology. The present research is the first attempt the author is aware of to incorporate Positive Psychology theories and research other than Flow Theory in the study of game enjoyment. This section consists of the following subsections: 1) Self-Determination Theory (SDT) and the Player Experience of Need Satisfaction (PENS) Model, 2) Flow Theory and Task Engagement, and 3) Positive Psychology.

2. 2. 1. Self-Determination Theory (SDT) and the Player Experience of Need Satisfaction (PENS) Model

Self-Determination Theory (SDT) proposed that fulfilling psychological needs for autonomy, competence, and relatedness facilitates intrinsic motivation, which leads to enjoyment (Ryan & Deci, 2000; Deci & Ryan, 1985). Autonomy

is about feeling in control, about feeling that you have voluntarily chosen to do what you are doing. Competence is about feeling skilled, feeling good at what you are doing. Relatedness is a sense of social belonging and social connectedness. Within SDT, basic psychological need theory says that the more an activity satisfies a person's psychological needs, the more that activity will positively impact that person's well-being (Ryan, et al., 2006, p. 350). But SDT only focuses on those three psychological needs rather than looking more broadly at the many basic human desires that drive human behavior.

Ryan et al. (2006) extended SDT to the study of computer game enjoyment by introducing the Player Experience of Need Satisfaction, which builds on and includes the three basic psychological needs of SDT but also adds Intuitive Controls and Presence. Intuitive Controls are how user-friendly the controls of the game are, or how easy the controls the player uses to interact with the game are to learn, make sense of, and master. Presence is about feeling like you are actually there in the game, physically, emotionally, and within the narrative of the game. They also measured Subjective Vitality and Self-Esteem as dependent variables. Vitality is the experience of feeling energetic and alive. Self-esteem is a sense of self-worth and having a positive self-evaluation.

SDT and PENS focus on only a few specific factors, so they do not provide a comprehensive model of what leads to digital game enjoyment. SDT is premised on the idea of satisfying human psychological needs, but SDT reduces that concept of human needs down to only autonomy, competence, and relatedness. The basic human needs and desires that motivate human behavior are more multi-dimensional than the three SDT proposed.

2. 2. 2. Flow Theory and Task Engagement

Flow is the experience of overcoming optimal challenges for the enjoyment they provide while continuously adjusting performance based on feedback. Flow is the psychological state of "getting in the zone", or of time flying when you are having fun. Flow is the experience of total absorption in an intrinsically motivating task such that there is no attention left over to think about anything outside of the task. Flow is the phenomenology of intrinsic motivation, meaning the study of the experience of activities done for the sake of the enjoyment they provide. Flow theory is premised on the idea that enjoyment is a desirable end result rather than a means to any other end, even if flow may have other benefits.

Nakamura and Csikszentmihalyi (2014) conceptually separated the factors that lead to flow, or the flow conditions, from the factors that indicate how much a person is in flow, or the flow indicators. In the author's study of flow in games

(Schaffer & Fang, 2016), the flow conditions and indicators were measured separately by adapting previously validated measures of flow (Fang, Zhang, & Chan, 2013; Jackson & Eklund, 2004; Jackson & Marsh, 1996). The factors that measured the flow conditions identified by Nakamura and Csikszentmihalyi – clear proximal goals, immediate progress feedback, and optimal challenge – were separated from the factors that measured flow indicators: effortless concentration, sense of control, merging of action and awareness, loss of reflective self-consciousness, altered perception of time, and autotelic experience.

Three flow conditions lead to flow, which in turn leads to enjoyment: optimal challenge, clear proximal goals, and immediate progress feedback (Nakamura & Csikszentmihalyi, 2014). Optimal challenge is extent to which a person perceives the task they are doing has a level of task difficulty that is high enough to stretch their perceived skills without overwhelming them. Clear proximal goals is how much the person feels they know what to do next throughout an activity. The word “proximal” emphasizes continuously receiving information about the goal of the next step rather than simply the overall goal, facilitating task engagement by providing step-by-step information about how to complete each task. As Csikszentmihalyi and Nakamura (2010) explained, "What counts is not that the overall goal of the activity be clear but rather that the activity present a clear goal

for the next step in the action sequence, and then the next, on and on, until the final goal is reached" (p. 187). Immediate progress feedback is how much the person feels they know how well they are performing the activity or how well they are making progress through the activity. When the flow conditions are high, people experience flow, and enjoyment is a part of the flow experience.

Brockmyer et al. (2009) used Rasch analysis to create the Game Engagement Questionnaire (GEQ), a measure of how likely people are to become engaged or get into flow when they play digital games. In their second study, they found a correlation between participants' GEQ scores for their typical experience playing video games and their GEQ scores for their experience playing one specific game after playing it for 30 minutes, showing that individual differences in tendency to get into flow has an impact on players' flow experience. However, Brockmyer, et al. did not present any research showing the impact of typical GEQ scores on enjoyment. They did not even measure enjoyment, instead focusing on trait aggression and trait tendency to disassociate.

A previous study by the author focused on flow in games (Schaffer & Fang, 2016, 2015). A controlled experiment was conducted on the impact of feedback on flow. Different versions of a simple timing game were created, manipulating the design of the feedback provided across the different game designs. With these

different versions of the game, a between-subjects experiment was conducted with 57 participants (14-15 in each of four experimental conditions). ANOVA results showed that feedback did have a statistically significant impact on flow. The kind of feedback that leads to flow was also investigated. Post-Hoc Tukey Honestly Significant Difference (HSD) tests showed that participants in the two treatment groups experienced significantly more flow than those in the two control groups. This showed that feedback needs to be relevant to the goal of the task to lead to flow, not task-irrelevant (randomized) feedback or missing feedback.

Flow or Task Engagement is an important source of enjoyment, but it is only one part of what makes digital games enjoyable. Each flow condition may be a source of enjoyment, and the experience of flow itself may be a source of enjoyment. One problem with calling flow a source of enjoyment is that enjoyment (or autotelic experience, a term derived from Greek for intrinsic motivation) is a flow indicator. So, to call flow a source of enjoyment would be circular logic, with enjoyment leading to enjoyment, which is not possible. Task Engagement is defined here as the flow experience minus enjoyment itself, so that enjoyment can be treated as a separate variable. It can be operationalized by testing for all flow indicators except for Enjoyment or Autotelic Experience:

effortless concentration, sense of control, merging of action and awareness, loss of reflective self-consciousness, altered perception of time.

Flow and Self-Determination theories are frequently cited models to explain game enjoyment, but neither is a comprehensive model of what makes games fun. Because they focus on only a handful of specific factors, they offer an incomplete picture of what leads to digital game enjoyment. A comprehensive model of the sources of digital game enjoyment must include Task Engagement, and the flow conditions that lead to Task Engagement. But Task Engagement is only one source of enjoyment.

2. 2. 3. Positive Psychology

Positive Psychology is the empirical science of positive traits, experiences, relationships, and institutions (Seligman & Csikszentmihalyi, 2000). The present research is the first attempt the author is aware of to incorporate Positive Psychology theories and research other than Flow Theory in the study of game enjoyment.

Park, Peterson, and Seligman (2004) and Peterson and Seligman (2004) created a classification of 24 Character Strengths and Virtues (CSV) as Positive Psychology's response to Clinical Psychology's *Diagnostic and Statistical*

Manual of Mental Disorders (DSM). While the CSV focuses on the traits or qualities of people, one of the criteria used to develop the CSV was that each strength or virtue needs to be fulfilling. So, the experience of using each character strength or virtue provides a different fulfilling, positive experience. Each of these positive experiences may be potential sources of computer game enjoyment.

Peterson, Park, and Seligman (2005) suggested three sources of happiness: flow, pleasure, and meaning. Flow theory has been discussed in the preceding section above. A life of pleasure or hedonism is about maximizing sensory pleasure and minimizing pain. A life of meaning or eudemonia is about feeling that your life serves a greater purpose beyond yourself, typically by serving other people or humanity, making the world a better place, or feeling that your life will have a lasting positive impact that will continue after you die. Peterson, Park, and Seligman found that these three sources of happiness were empirically distinguishable and that an orientation towards flow, pleasure, and meaning each individually predicted life satisfaction and combined as a three-way interaction to predict life satisfaction. These three sources of happiness are most likely sources of positive experiences or enjoyment as well, but they are far from a comprehensive model of enjoyment sources.

Positive psychology research has also explored positive emotions. Fredrickson (2009) discussed ten positive emotions such as serenity, interest, hope, pride, and inspiration. Shiota (2014) explored how different positive emotions serve different adaptive functions, presenting a taxonomy of functionally discrete positive emotions that shows the evolutionary basis and benefit of eight emotions (see also Shiota et al., 2014). Shiota's taxonomy includes positive emotions such as enthusiasm, contentment, nurturant love, amusement, and awe. This taxonomy also lists the adaptive function of each emotion, such as contentment encouraging people to rest in safety to digest and encode routes to success, amusement leading people to develop flexible, complex cognitive-behavioral repertoires through play, and awe serving the adaptive function of accommodating new information from one's environment.

Condon, Wilson-Mendenhall, and Barrett (2014) suggested that there may be atypical positive instances of emotions that are typically considered negative. They called atypically positive instances of fear, anger, and sadness pleasant fear, pleasant anger, and pleasant sadness. So, the thrill of a rollercoaster ride may be an example of pleasant fear, and the anger audiences feel towards villains in a story could be an example of pleasant anger.

The existing models of what makes games enjoyable are not comprehensive enough. The present research is the first time research and theories from the field of Positive Psychology other than Flow Theory are being used to study game enjoyment, to the best of the author's knowledge. Incorporating these theories in the present research may help create a more comprehensive and accurate model of digital game enjoyment.

2. 3. Two Main Theories that Inspired Desire Fulfillment Theory

This literature review section is on the two main theories that inspired the Desire Fulfillment Theory presented in Chapter 3, Section 3. 2. below. Both of these theories are drawn from the psychology literature. This section consists of two subsections: 1) Expectancy Disconfirmation Theory and 2) Basic Human Desires Theory.

2. 3. 1. Expectancy Disconfirmation Theory

Oliver (1977) introduced Expectancy Disconfirmation Theory, which proposed that two factors predict or determine customer satisfaction: expectation and disconfirmation of expectations (or expectancy disconfirmation). Having higher expectations tends to have a positive impact on satisfaction. But when customers experience a product or service (Oliver called this the "performance"

of the product), there is a second effect that expectations can have on satisfaction called expectancy disconfirmation. Disconfirmation is when customers mentally compare their experience with a product or service with their expectations for that experience (Oliver 1981, p. 35). If the experience is better than expected, customers are pleasantly surprised. Oliver called this pleasant surprise "positive disconfirmation" of expectations. If the experience was as expected, customers' expectations are confirmed. If the experience is worse than expected, customers are disappointed. Oliver called this disappointment "negative disconfirmation" of expectations. Satisfaction is synonymous with enjoyment, with both terms sharing the same definition of the extent to which people positively evaluate their experience.

Higher expectations tends to lead to greater satisfaction, but expectations also create a frame of reference with which customers compare their experience. Oliver (1980) wrote that expectations first serve as a foundation to form initial attitudes, then serve as an adaptation level for later satisfaction decisions, citing Helson's (1948) research on adaptation levels and frames of reference. Helson drew on data from perceptual psychology to propose that all judgements are made by comparing perceptions to a frame of reference, and then extended this frame of reference theory to attitude formation. Frames of reference are formed when

people pool available stimuli being compared to develop an adaptation level, a point or region of points they consider neutral or to which they are indifferent. Then, people form judgements about each stimulus or experience along a range of extent around that neutral adaptation level.

So, the expectancy disconfirmation effect comes from people comparing experiences with their expectations. The expected experience serves as the adaptation level or neutral standard with which the experience is compared. Expectancy disconfirmation can range from disappointment (negative disconfirmation), to confirmation of expectations, to the pleasant surprise of the experience exceeding expectations (positive disconfirmation).

Given that expectancy disconfirmation is in theory a result of the contrast between an experience and one's expectations for that experience, one would think there would be a negative correlation between expectations and expectancy disconfirmation. However, Oliver (1977, 1980) actually proposed that expectation and disconfirmation were two independent effects. Oliver (1977, p. 483) wrote, "…when expectations, performance, and disconfirmation are largely subjective, no necessary relation between expectation and disconfirmation would be expected even though one's expectation level may provide a baseline for disconfirmation in an objective performance situation."

Another reason Oliver (1977) gave for why the effects were independent was because the two effects were measured at different times, with expectations measured before exposure to the product and disconfirmation measured after exposure to the product. Oliver (1980) also showed two independent effects impacting satisfaction, expectations measured before exposure to the product and disconfirmation measured after exposure to the product. Figure 1 below shows the two independent effects of Expectancy Disconfirmation Theory.

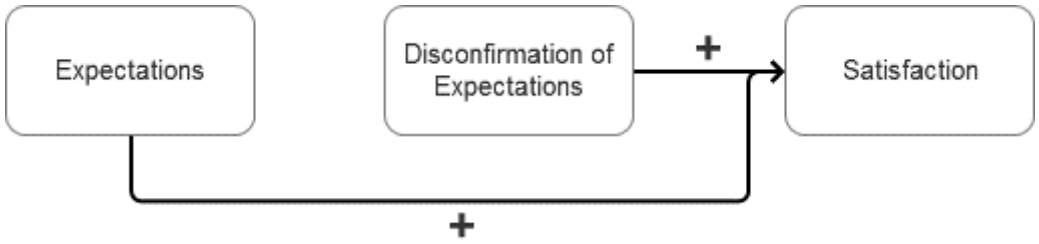

Figure 1. Expectancy Disconfirmation Theory.

Oliver (1977) demonstrated both the expectation and expectancy disconfirmation effects with a three-stage quasi-experimental field study of customer reactions to new automobile models. Oliver (1980) provided further evidence for Expectancy Disconfirmation Theory using path analysis. Oliver (1980) measured disconfirmation with a scale ranging from “worse than expected” to “better than expected” (p. 463), and Oliver (1981) included a mid-point label of “just as expected”.

Bhattacherjee (2001) extended Expectancy Disconfirmation Theory to people's intention to continue using an online banking system. Bhattacherjee showed that it was possible to measure positive disconfirmation of expectations with a three-item questionnaire measure after participants used the system. They asked participants to rate how much they agree with statements like "My experience with using [the online banking system] was better than what I expected," on seven-point Likert scales ranging from "strongly disagree" to "strongly agree". Bhattacherjee made a good case for the benefits of this method of measuring perceived expectancy disconfirmation after using a system, comparing it with other measurement approaches (p. 360), and the measure had sufficient construct validity (factor loadings >.75) and reliability (.82). Bhattacherjee called this factor Confirmation, but this conflicts with how Oliver defined confirmation and disconfirmation of expectations. It would be more accurate to call their measure Positive Expectancy Disconfirmation because they were measuring how much the experience was better than expected. Confirmation, as Oliver defined it, would be how much the experience was just as expected.

In summary, expectations have two separate effects on satisfaction according to Expectancy Disconfirmation Theory. When people expect a better experience,

their experience tends to be more satisfying. This is the Expectation Effect. For example, participants rate wine as tasting better when they are told before they taste it that it received a high rating from an expert because they expect it to taste better (Siegrist & Cousin, 2009). A similar effect has been found with digital games. More positive reviews by professional critics had a positive impact on game sales (Sherrick & Schmierbach, 2016), user ratings of games (Livingston et al. 2011; Jenkins et al. 2010), and whether or not players would accept the game they played instead of $10 in cash as an incentive to participate (Jenkins et al., 2010). However, higher expectations may also lead to a range of experiences from disappointment to pleasant surprise depending on how well the experience measures up to the standard set by the expectations. This second effect is the Expectancy Disconfirmation Effect. Both Expectation and Expectancy Disconfirmation have an independent positive impact on Satisfaction according to Expectancy Disconfirmation Theory.

2. 3. 2. Basic Human Desires Theory

Reiss (2004) presented 16 fundamental or basic human desires and proposed that these desires are the underlying motivations that drive human behavior. Reiss and Havercamp (1998) wrote that a fundamental motive is one that is a universal motivator, meaning all people find it motivating, one that has

psychological significance, meaning it explains everyday behavior, and one that is an end goal. An end goal is one pursued for its own sake, not as a means to reach a different end goal.

The 16 basic human desires Reiss (2004) proposed were Power, Curiosity, Independence, Status, Social Contact, Vengeance, Honor, Idealism, Physical Exercise, Romance, Family, Order, Eating, Acceptance, Tranquility, and Saving. It is possible that future research may identify other fundamental human desires, but Reiss's 16 were intended to be comprehensive.

While all human beings may have these basic human desires to some extent, there are individual differences in the extent to which people are motivated by each fundamental human desire. Reiss and Havercamp called the study of these individual differences in how much people are motivated by each fundamental desire Sensitivity Theory. Havercamp (1998) presented their measure of these individual differences, called the *Reiss Profile of Fundamental Goals and Motivation Sensitivities*. Reiss and Havercamp (1998) and Havercamp (1998) validated the factor structure and reliability of Reiss's Profile.

To create a theory of Basic Human Desires, Reiss (2004) built on and extended previous theories such as Murray's (1938) theory of needs and Maslow's (1943) hierarchy of basic needs. Reiss (2002) noted that Murray's list of basic

psychological needs was itself built on the previous work of James (1890) and McDougall (1921). There is a long history of psychologists trying to understand and list the fundamental needs that drive human behavior, going back to at least as early as William James in 1890. But unlike these previous researchers, Reiss and his colleague Havercamp had the benefit of computers and software that were able run factor analysis with survey data from a large sample of participants. Reiss (2002) conducted four factor analysis studies, three exploratory and one confirmatory, with a combined total of 2,554 participants. Using this process, Reiss took 328 items drawn from the literature and reduced them to 15 factors, and then Havercamp's (1998) research added a 16th factor, saving or the desire to collect, and confirmed the validity and reliability of a 16-factor model with the revised 128-item profile or measure.

Similar to how Oliver discussed expectations, Reiss (2004) called the extent of an individual's desire for each of the 16 fundamental desires that person's set point or sensitivity. However, Reiss hypothesized that people are motivated by discrepancies between their desired set point and their experience. Reiss wrote: "...what is motivating are discrepancies between the amount of an intrinsic satisfier that is desired and the amount that was recently experienced" (p. 188). So, if a person was experiencing less socializing than desired, they were

motivated to socialize more, and if they were experiencing more socializing than desired, they were motivated to socialize less (p. 187-188). However, Reiss (2004) did not present any empirical evidence supporting this hypothesis that over-fulfilling desires has a negative impact rather than a positive impact.

If desires serve as an adaptation level with which experiences can be compared, in the way that expectations do in Expectancy Disconfirmation Theory, then over-fulfillment of desires would have a positive impact rather than a negative impact. Reiss and Oliver may have conceptualized and worded over-fulfillment differently. Reiss (2004) thought of over-fulfillment of desires as an experience providing more than a desired set point of the desired experience, such as experiencing more socializing than desired. Reiss hypothesized that experiencing more than the desired amount would be worse than experiencing the desired amount, though Reiss did not test this hypothesis. Oliver conceptualized positive expectancy disconfirmation as an experience being better than expected, which his research showed was better than the amount that was just as expected. To resolve this difference, over-fulfillment of a desire, or simply desire fulfillment, was conceptualized as an experience that more than fulfills a desire, which is closer to Oliver's concept of an experience being better than expected.

CHAPTER 3. THEORETICAL FRAMEWORK AND MODEL

To create a more comprehensive model of the sources of digital game enjoyment, a card sorting study was conducted. Based on the findings of that study, and inspired by two established theories, Desire Fulfillment Theory is proposed. A Model of Desire Fulfillment in Digital Games is presented based on this new theory, and hypotheses based on this model are proposed.

3. 1. Card Sorting to Develop a New Model

A card sorting study was conducted to create a new model of the sources of computer game enjoyment (Schaffer & Fang, 2017, 2018). A card sorting method was used that is similar to the method developed by Moore and Benbasat (1991), which is a method that has been used to create new measures of enjoyment and flow in computer games (Fang et al. 2013, 2010).

This study began with a literature review, reviewing the literature from Psychology, Game Design, Anthropology studies of play and games, Information Systems, and Human-Computer Interaction. From this review of the literature, 167 sources of digital game enjoyment and their definitions were gathered. This literature review included the theories and research discussed in Chapter 2 Sections 2. 1. and 2. 2..

Independent open card sorting sessions were done to categorize the sources of enjoyment. 167 cards were printed, each with one source of enjoyment and its definition. In separate sessions, three members of the author's research team worked on their own to sort the cards into groups and label the groups of cards with category names. Synthesizing these results gave us 24 initial categories of enjoyment sources (Schaffer & Fang, 2017).

Sixty participants then sorted the cards into the categories. The participants were students at a university in the Midwest region of the United States, 17 were female, 41 were male, and 2 were gender-neutral or non-binary people, and they had a mean average age of 23.47 years. To recruit participants with experience playing digital games, participants were screened before the study and only participants who said they typically played video or computer games at least once per week were recruited. In the background questionnaire at the end of the study, 58 of the 60 participants (96.67%) reported that they played video or computer games at least once per week. Participants reported that they had played video or computer games for an average of 16.21 years.

To gather as much information as possible to improve the categories, the first forty participants were given more options to express themselves during the card sorting. They were asked to put cards in more than one category if a card fit best

in more than one category (sticky notes were used to create copies of cards for this purpose upon request). They were asked to create new categories if cards were a potential source of computer game enjoyment but did not fit in any of the existing categories. And they were asked to sort cards into a category called "Not a Potential Source of Computer Game Enjoyment" if they thought the card could not be a source of enjoyment for people playing computer games. The first forty participants were also asked at the end of the card sorting if there were any sources of computer game enjoyment that they felt were missing from the cards and categories in front of them, and they were able to create new cards and categories if they felt anything was missing.

The last twenty participants were not given the option to create new cards, create new categories, sort cards into more than one category, or sort cards into a category called "Not a Potential Source of Computer Game Enjoyment". The last twenty were not given those options so that inter-rater reliability among those participants could be calculated.

After every round of ten participants, the results of the sorting were manually entered into a spreadsheet. R Studio was used to create a frequency table of the number of participants in the last round of ten who sorted each card into each category. The cells of that frequency table were color-coded in a spreadsheet,

with 1-2 participants colored red to indicate likely noise, 3-5 participants colored orange to indicate a weak signal or a split between categories, and 6-10 participants colored green to indicate a strong signal, because more than half of that round's 10 participants had sorted that card into that category. Next, the rows of the table were sorted to group together the cards that were being sorted under the same categories, and the participant-created cards and categories were grouped together.

Looking through the sorted, color-coded frequency tables made it much easier to analyze the results and make changes to the cards and categories between each round of ten participants. Cards that were not consistently sorted into the same category by participants were either dropped, their names and definitions were revised, or the categories and their descriptions were revised. If a card was split between two categories, the card was either dropped if it was too ambiguous or the card or categories or their definitions or descriptions were edited to make it clear where the card fit. Redundant or duplicate cards and categories were dropped or combined.

Throughout this revision process, notes taken during the sessions of participants' responses to follow-up questions were useful to identify and revise ambiguous or confusing text in the cards, categories, definitions, or descriptions.

The aim was to improve the categories so that they were as comprehensive and clear as possible. Sixty participants sorted the cards into the categories on their own in one-on-one sessions with the researcher that each lasted about an hour and a half. Cards and categories and their definitions and descriptions were added, removed, and revised as needed after every round of ten participants. Initially, there were 167 cards and 24 categories. By the final round of ten participants and at the end of the study, there were 94 cards and 34 categories (43.7% less cards and 41.7% more categories).

Through this process, a new, more comprehensive model of the sources of computer game enjoyment made up of 34 categories of enjoyment sources was developed (see Table 1 below; Schaffer & Fang, 2018). The iterative card sorting approach generated a model grounded in both the sources of enjoyment drawn from the literature to create the initial 167 cards and in participants' experience playing games.

Table 1. Sources of Enjoyment in Digital Games: 34 Categories of Positive Experiences from Card Sorting Study.

Source of Enjoyment	Description
Friendship,	Forming and maintaining strong, stable relationships and

Relationships, Love, Kindness, & Belonging	friendships with others. Close relations with mutual sharing of help, caring, comfort, and acceptance. Giving and receiving help and care, and seeing others help and take care of each other. Feeling like an accepted member of a group, family, or community.
Cooperation & Teamwork	Working together with others toward shared goals.
Leading & Directing Others	Guiding the actions of others, such as leading a team or directing a play. Having power or authority to influence the actions of others.
Competition & Social Superiority	Competing with others to show your superiority. Feeling superior to others or higher than others in the social hierarchy. Working towards goals that conflict with the goals of others.
Control, Choice, & Autonomy	Feeling able to direct, determine, or influence desired outcomes, including how you reach those outcomes. Feeling that you have freely chosen to do what you are doing, the way you are doing it, when you are doing it, and the criteria that will be used to evaluate your actions.
Creating, Customizing & Improvisation	Bringing new objects, ideas, or behaviors into existence, modifying existing ones, or expressing yourself in a creative way. Could include creating and customizing characters, items, powers, or environments. Creating and creative expression, whether carefully crafted or improvised in real time.

Presence, Role-Playing, & Identification with Player Character	Feeling like you are actually there in the game. Feeling transported into the virtual world of the game. Imagining you are or pretending to be your character in the game. Feeling similar to or wanting to become more like your character in the game. Feeling like you are your character in the game.
Effortless Focusing of Full Attention	Doing an activity that takes up all of your attention, so that none is left over to think about anything other than what you are doing. Easily focusing your full attention on your actions.
Interest in Theme or Topic	Having a long-term positive attitude towards the theme or topic of the game that attracts and focuses your attention. For example, enjoying a game about baseball because you are interested in baseball. Other themes or topics could include vampires, World War II, dancing, playing guitar – whatever the game is about.
Story	Experiencing a story and the dramatic unfolding of events. The story includes narrative elements such as the plot and setting and narrative techniques such as foreshadowing and backstory.
Learning, Improving Skills, Exploring, & Discovering	Fulfilling a desire to improve your knowledge, skills, or abilities. Exploring or investigating a world, an opportunity for action, or a new situation. Finding or knowing things that were not known before.
Optimal Variety &	An optimal level of variation and newness among your

Novelty	actions or in your ongoing experience. An amount of variety and novelty that is neither so low that it is boring nor so high that it is overwhelming.
Self-Worth & Integrity	Maintaining a positive evaluation of yourself. Having experiences that improve how you see yourself. Presenting yourself in a genuine and authentic way. Feeling that your actions are consistent with how you see yourself. Doing what you say and saying what you do.
Achievement & Completion	Triumph you feel when you accomplish desired outcomes through great effort. Finishing or completing a major task, and the feeling of closure and accomplishment that finishing the task gives you.
Making Progress	Making progress or moving forward towards desired outcomes.
Your Perception of Your Own Ability, Competence, & Effectiveness	Feeling that you have the skills and abilities needed to reach desired outcomes. Believing your actions will be effective. Feeling skilled at what you are doing.
Danger, Uncertain Outcomes, Suspense, Surprise, & Bravery	The thrilling fear of danger and risk, whether the threat of harm is real or a fictional simulation. Suspenseful anticipation of uncertain, chance, or surprising outcomes and the surprise of finding out the outcome. Unexpected or sudden events. Feeling afraid of the dangers and risks involved with taking action and taking action anyway.
Vitality & Feeling	Feeling vigorous, high-spirited, and alert. Doing an activity

Energetic	or having an experience that makes you feel energetic and alive.
Optimal Pacing	Doing an activity at a speed or rate that is neither too fast to be overwhelming, nor too slow to be boring. An activity speed that stretches your ability to keep up.
Optimal Challenge	Doing an activity that is difficult enough to stretch your skills to their limits without being so difficult that it overwhelms you.
Clear Goals & Step-By-Step Guidance	The experience of knowing what to do next throughout an activity. Receiving information about both overall goals and the goals of each step of the activity. Feeling supported or guided so you always know what to do.
Goal Attainability	Believing that desired outcomes can possibly happen. Receiving information that suggests it is possible to reach your current goal.
Continuous Feedback	Receiving continuous information about the results of your actions. This could include information about how close you are to reaching your desired outcomes, how well you are doing the activity, or how you could get better at doing the activity.
Collecting & Accumulating	Gathering up and owning objects within the game.
Strategizing, Problem Solving, & Critical	Thinking through the best way to do an activity. Finding solutions to problems or puzzles by thinking them through. Deciding on the best course of action while taking into

Thinking	account different perspectives and new evidence with an open mind.
Body Movement & Exercise	The experience of moving your body. Moving your body enough to increase your heart rate.
Significance, Meaning, Purpose, & Legacy	Knowing why your actions are important, significant, or meaningful. Feeling that your actions are giving your life meaning or helping fulfill your life's purpose. The sense that your actions will have a lasting, meaningful impact.
Subversion & Lack of Real-World Consequences	Breaking the social rules, norms, and expectations of the real world in a game world knowing that your actions will not have any negative real-world consequences. Feeling secure that your actions in the game world will not have negative consequences for yourself or others in the real world.
Relaxation & Serenity	A calm state free from physical or mental tension or concern. Conserving or regenerating your energy. Resting to recover from feeling stressed or overwhelmed. A peaceful, comfortable feeling of satisfaction with the way things are now. Being free of worries and unpleasant thoughts.
Savoring	Paying attention to and appreciating positive experiences. Reflecting on past, present, or future enjoyable experiences to increase their intensity or duration.
Humor & Laughter	Laughter and playful joy resulting from humor, or unexpected incongruity in a safe social context.

Sensory Pleasure, Sexual Desire, & Appreciation of Beauty	Pleasure from the direct experience of any of your five senses: sight, sound, smell, taste, and touch. Appreciating the beauty of nature, art, and music. Sexual excitement, such as by attractive characters in a game.
Schadenfreude (German), Cruelty, & Pleasant Anger	Enjoying the suffering of others. Causing others mental or physical pain. Feeling anger that is justified or socially acceptable, such as feeling anger towards a villain in a game.
Intuitive Controls	Playing a game with controls that are easy to learn, easy to use, make sense, and are easily mastered.

Participants in the last two rounds of ten participants had inter-rater reliabilities of 0.9381 and 0.9367, as calculated with Randolph's (2005) free-marginal multi-rater kappa. The card sorting study was a formative study focused on creating a new model of the sources of digital game enjoyment. After every ten participants, cards, categories, and their descriptions and definitions were revised based on the results of the card sorting.

The 34 sources of enjoyment found in the card sorting study are specific positive experiences that lead to digital game enjoyment. These 34 categories can be used by practitioners as a framework or a set of guidelines to design interactive systems for enjoyment. However, these 34 categories of positive experiences do not take into account individual differences in motivation. In addition, the author

has yet to find a logical way to organize the 34 categories into a shorter, more readable and memorable set.

After the card sorting study was completed, the author was introduced to Reiss's (2004) theory of basic human desires. It became clear that basic human desires were the underlying motivations driving the positive experiences found in the card sorting study. In other words, the positive experiences found in the card sorting study were the result of basic human desires being fulfilled. Understanding how fulfillment of basic human desires relates to enjoyment has more fundamental and generalizable theoretical implications than providing a design framework or set of design guidelines. For example, understanding fulfillment of basic human desires may inform the design of future systems for enjoyment that have not yet been imagined.

The results of the card sorting study and reading about Reiss's (2004) Theory of Basic Human Desires led to the premise of the present study: the root cause of digital game enjoyment is fulfillment of basic human desires. Still, at first it was unclear how individual motivation for each basic human desire and the experience of desire fulfillment related to enjoyment. Oliver's (1977, 1980, 1981) Expectancy Disconfirmation Theory (EDT) provided a model that explained how basic human desires and desire fulfillment could relate to enjoyment. Desires and

desire fulfillment could relate to enjoyment the same way expectations and experiences relate to satisfaction in EDT (see Figure 1 above). So, the results of the card sorting study inspired the creation of Desire Fulfillment Theory.

3. 2. Desire Fulfillment Theory

Desire Fulfillment Theory is presented as a new theory to explain enjoyment of digital games, integrating concepts from Oliver's Expectancy Disconfirmation Theory (EDT), Reiss's Theory of 16 Basic Human Desires, and Csikszentmihalyi's Flow Theory. The premise of Desire Fulfillment Theory is that human enjoyment results from the fulfillment of basic human desires. As a result, enjoyment is a function of individual desire or motivation and the experience of desire fulfillment for each basic human desire.

The relationships of Expectancy Disconfirmation Theory (EDT) were adapted to each of Reiss's 16 desires, and this was expanded on to create a Desire Fulfillment Model of Digital Game Enjoyment (see Figure 2 below).

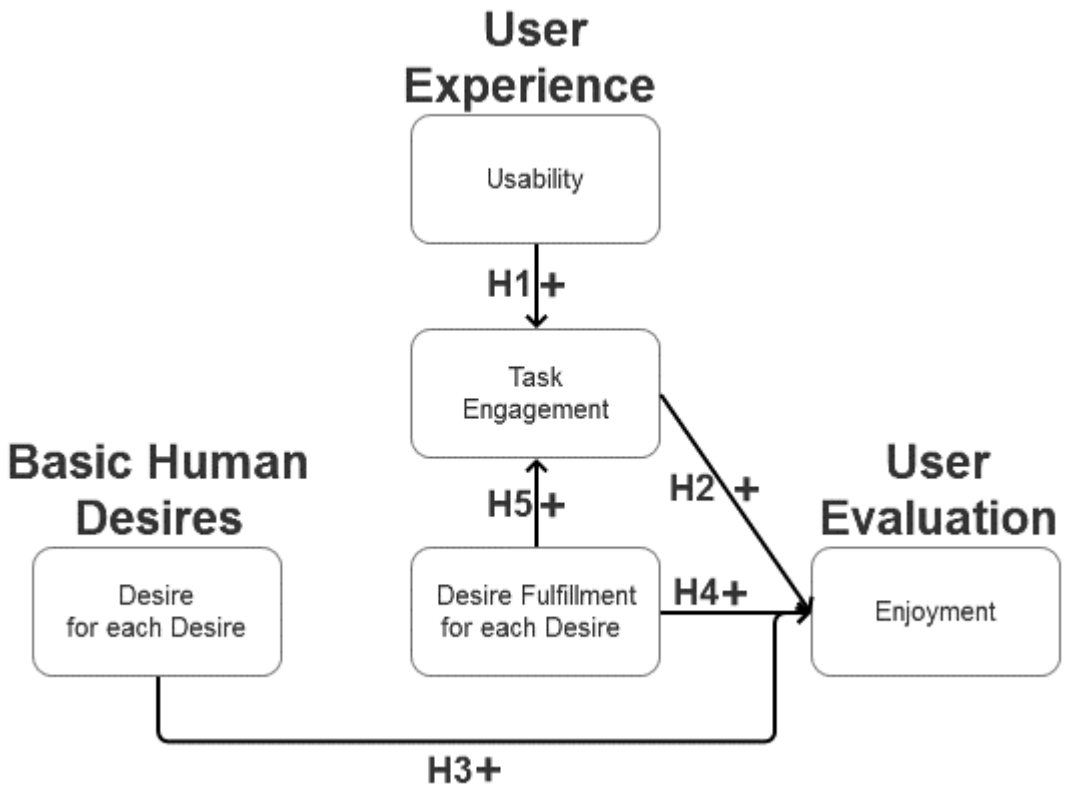

Figure 2. Desire Fulfillment Model of Digital Game Enjoyment.

It was hypothesized that if the proposed Desire Fulfillment Model in Figure 2 was correct, how much individuals were motivated by each of Reiss's basic human desires would have a positive impact on Enjoyment (H3). This path was similar to how the Expectation Effect of Expectancy Disconfirmation Theory (EDT) stated that expectations have a positive impact on satisfaction (see Figure 1 above). Desire Fulfillment for each of Reiss' basic human desires were

hypothesized to have a positive impact on Enjoyment (H4). Desire Fulfillment is defined here by the author as how much the experience playing the game more than fulfilled each basic human desire. It was hypothesized that game players mentally compare their experience with the extent to which they desire each basic human desire just as experiences are compared with expectations in Expectancy Disconfirmation Theory (EDT). This hypothesized positive effect of desire fulfillment on enjoyment (H4) was similar to how Expectancy Disconfirmation has an independent effect on Satisfaction in EDT (see Figure 1 above).

Usability and Task Engagement were integrated into the proposed model as well. Usability and Task Engagement were included because they were critical to understanding, explaining, and predicting digital game enjoyment and they were not well represented by only including Desire and Desire Fulfillment in the model. The experience of Task Engagement was a separate factor from Desires and Desire Fulfillment, but flow theory suggested that Task Engagement was an important factor that would have a positive impact on Enjoyment. It was hypothesized that the experience of Task Engagement was made possible by high perceived Usability, with the perceived ease of use of the system leading to more task engagement. If the proposed model was correct, Usability would have a positive impact on Task Engagement (H1), which in turn would have a positive

impact on Enjoyment (H2). Additionally, if the proposed model was correct, the extent to which participants experienced Desire Fulfillment for each basic human desire would positively impact Task Engagement (H5). So, based on the above Desire Fulfillment Model (Figure 2), the following five hypotheses were proposed.

3. 3. Hypotheses

3. 3. 1. H1: Usability is positively associated with Task Engagement

Users' perceptions of system Usability would be positively associated with their level of Task Engagement. System designs with better Usability would make it easier for users to experience Task Engagement. When Usability is high, there would be less usability problems getting in the way of the user smoothly going from one task to the next, which was hypothesized as necessary to experience Task Engagement. So, users who perceived greater system Usability would be more likely to report greater Task Engagement.

H1 was derived from Flow Theory. Flow Theory suggested that flow would be higher when clear proximal goals and immediate progress feedback were higher, and these were hypothesized to be facets or sub-dimensions of Usability. Task Engagement was defined here by the author as the flow experience minus

enjoyment itself (see Section 2. 5. above and Section 4. 1. 2. below), so it was hypothesized that the factors that lead to flow would lead to Task Engagement.

3. 3. 2. H2: Task Engagement is positively associated with Enjoyment

Users' level of Task Engagement was hypothesized to be positively associated with their Enjoyment. People who experienced more Task Engagement would be more likely to experience more Enjoyment.

H2 was derived from Flow Theory. The dimensions of flow theory have often been presented as a single set intended to measure how much a person is in flow (Fang et al., 2013; Jackson & Marsh, 1996). But that set of dimensions included factors that lead to Task Engagement, factors that indicate how much Task Engagement a person experiences, and enjoyment itself. When trying to understand how these dimensions relate to each other in a specific enough way that practitioners and researchers can design systems that facilitate Task Engagement and Enjoyment, it is important to separate these three kinds of factors.

The author had yet to see a study of flow that measured Enjoyment and Task Engagement as separate factors and showed how they were related. The present study was able to investigate the relationship between these two factors because Task Engagement was defined here as the factors that indicate how much a person

is experiencing flow not including enjoyment itself, and not including the factors that lead to flow. So, H2 was not only derived from Flow Theory; it had the potential to advance Flow Theory.

3. 3. 3. H3A-H3P: Desire for each basic human desire is positively associated with Enjoyment

Users' level of Desire would be positively associated with their level of Enjoyment. Users who had greater desire for each basic human desire would be more likely to experience more Enjoyment. The more that users wanted each basic human desire, the more likely they would be to experience more Enjoyment.

H3 was derived from the proposed Desire Fulfillment Theory, which states that Enjoyment is a function of Desire, or motivation to fulfill basic human desires, and Desire Fulfillment, the experience of satisfying those desires. The impact of Desire on Enjoyment is analogous to the impact of Expectations on Satisfaction in Expectancy Disconfirmation Theory. Desires and expectations create a frame of reference with which experiences can be compared (see Chapter 2, Section 2. 7. above; Helson, 1948; Oliver, 1980). In setting that frame of reference, desires and expectations influence the person's attitude toward the experience and thereby how the person perceives the experience. Expecting a better experience tends to lead to a more positive experience. Likewise, it was

hypothesized that being more motivated to fulfill each basic human desire would lead to more satisfying experiences and thereby to greater Enjoyment. For example, a person motivated to experience Social Contact would expect more social contact; that person will then tend to perceive their experience as having more of the desired social contact, which would then lead to more enjoyment than a person who is not as motivated to experience social contact. Therefore, it was hypothesized that the greater a person's Desire for each basic human desire, the more that person would tend to experience Enjoyment.

The following 16 sub-hypotheses were proposed, one for each of Reiss's 16 basic human desires:

- H3A: Desire for Social Contact is positively associated with Enjoyment
- H3B: Desire for Curiosity is positively associated with Enjoyment
- H3C: Desire for Honor is positively associated with Enjoyment
- H3D: Desire for Family is positively associated with Enjoyment
- H3E: Desire for Independence is positively associated with Enjoyment
- H3F: Desire for Power is positively associated with Enjoyment
- H3G: Desire for Order is positively associated with Enjoyment
- H3H: Desire for Idealism is positively associated with Enjoyment
- H3I: Desire for Status is positively associated with Enjoyment

- H3J: Desire for Vengeance is positively associated with Enjoyment
- H3K: Desire for Eating is positively associated with Enjoyment
- H3L: Desire for Romance is positively associated with Enjoyment
- H3M: Desire for Physical Exercise is positively associated with Enjoyment
- H3N: Desire for Acceptance is positively associated with Enjoyment
- H3O: Desire for Tranquility is positively associated with Enjoyment
- H3P: Desire for Saving is positively associated with Enjoyment

3. 3. 4. H4A-H4P: Desire Fulfillment is positively associated with Enjoyment

It was hypothesized that users' level of Desire Fulfillment would be positively associated with their level of Enjoyment. Users who experience a greater extent of Desire Fulfillment for each basic human desire would be more likely to experience more Enjoyment. This was a central claim of Desire Fulfillment Theory, that the more that an experience fulfills basic human desires, the more that experience would lead to enjoyment (see Chapter 3). Desire Fulfillment Theory was grounded in both Reiss's theory of basic human desires and in Expectancy Disconfirmation Theory (see Chapter 2).

The following 16 sub-hypotheses were proposed, one for each of Reiss's 16 basic human desires:

- H4A: Fulfillment of Desire for Social Contact is positively associated with Enjoyment
- H4B: Fulfillment of Desire for Curiosity is positively associated with Enjoyment
- H4C: Fulfillment of Desire for Honor is positively associated with Enjoyment
- H4D: Fulfillment of Desire for Family is positively associated with Enjoyment
- H4E: Fulfillment of Desire for Independence is positively associated with Enjoyment
- H4F: Fulfillment of Desire for Power is positively associated with Enjoyment
- H4G: Fulfillment of Desire for Order is positively associated with Enjoyment
- H4H: Fulfillment of Desire for Idealism is positively associated with Enjoyment
- H4I: Fulfillment of Desire for Status is positively associated with Enjoyment
- H4J: Fulfillment of Desire for Vengeance is positively associated with Enjoyment
- H4K: Fulfillment of Desire for Eating is positively associated with Enjoyment

- H4L: Fulfillment of Desire for Romance is positively associated with Enjoyment
- H4M: Fulfillment of Desire for Physical Exercise is positively associated with Enjoyment
- H4N: Fulfillment of Desire for Acceptance is positively associated with Enjoyment
- H4O: Fulfillment of Desire for Tranquility is positively associated with Enjoyment
- H4P: Fulfillment of Desire for Saving is positively associated with Enjoyment

3. 3. 5. H5A-H5P: Desire Fulfillment is positively associated with Task Engagement

It was hypothesized that users' level of the Desire Fulfillment would be positively associated with their level of Task Engagement. Users who experienced a greater extent of Desire Fulfillment for each basic human desire would be more likely to experience more Task Engagement.

When basic human desires are fulfilled, attentional resources allocated to pursuing those desires are freed up. That attention can then be focused more on the task at hand, reducing distraction and increasing Task Engagement. For this

reason, Desire Fulfillment was hypothesized to lead not only to more Enjoyment, but to greater Task Engagement as well. If H2 above is supported, Task Engagement would itself be a desirable experience. So, H5 was an important part of the contribution of Desire Fulfillment Theory.

The following 16 sub-hypotheses were proposed, one for each of Reiss's 16 basic human desires:

- H5A: Fulfillment of Desire for Social Contact is positively associated with Task Engagement
- H5B: Fulfillment of Desire for Curiosity is positively associated with Task Engagement
- H5C: Fulfillment of Desire for Honor is positively associated with Task Engagement
- H5D: Fulfillment of Desire for Family is positively associated with Task Engagement
- H5E: Fulfillment of Desire for Independence is positively associated with Task Engagement
- H5F: Fulfillment of Desire for Power is positively associated with Task Engagement

- H5G: Fulfillment of Desire for Order is positively associated with Task Engagement
- H5H: Fulfillment of Desire for Idealism is positively associated with Task Engagement
- H5I: Fulfillment of Desire for Status is positively associated with Task Engagement
- H5J: Fulfillment of Desire for Vengeance is positively associated with Task Engagement
- H5K: Fulfillment of Desire for Eating is positively associated with Task Engagement
- H5L: Fulfillment of Desire for Romance is positively associated with Task Engagement
- H5M: Fulfillment of Desire for Physical Exercise is positively associated with Task Engagement
- H5N: Fulfillment of Desire for Acceptance is positively associated with Task Engagement
- H5O: Fulfillment of Desire for Tranquility is positively associated with Task Engagement

- H5P: Fulfillment of Desire for Saving is positively associated with Task Engagement

CHAPTER 4. METHOD

An online survey of digital game players was conducted to test the hypotheses described at the end of Chapter 3 above. Multiple linear regression was used to test each relationship in the proposed model (see Figure 2 above), one dependent variable at a time. Multiple regression is a robust method for testing these relationships. Structural Equation Modeling (SEM) was used to test the overall fit of the proposed model (see Figure 2 above) with the survey data collected. SEM allows the entire model to be tested while mathematically taking into account measurement error.

4. 1. Variables

In Structural Equation Modeling (SEM), variables that do have path arrows pointing to them from other variables are called endogenous variables, similar in meaning to dependent variables. The endogenous variables in the present study were Enjoyment and Task Engagement. Enjoyment was the main outcome variable of interest. Variables that have no path arrows pointing to them from other variables are called exogenous variables, similar in meaning to independent variables. The exogenous variables in the present study were Usability, Desire, and Desire Fulfillment.

The questionnaire measures presented to participants asked about their experience playing the game they named as the last digital game they played for longer than thirty minutes. Participants were asked how much they agreed with each statement on a seven-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree" with each scale point labeled.

The order of the questionnaires was chosen to put dependent variables before independent variables to avoid biasing their responses to the dependent variable questions. For example, Enjoyment questions were asked before questions about desire or desire fulfillment. The order of the items within each questionnaire was randomized to avoid order effects. The full measures can be found in Appendices A-G.

4. 1. 1. Enjoyment

Enjoyment is the extent to which participants positively evaluate their experience. Enjoyment, interest, fun, and doing an activity that is rewarding in itself are all roughly equivalent concepts. In the author's previous study of flow in games (Schaffer & Fang, 2016), items with these concepts all converged on a single factor that was called Autotelic Experience, a term from flow theory for intrinsically motivating experiences (see Chapter 2, Section 2. 5.). The aim of

Desire Fulfillment Theory was to explain and predict enjoyment, so Enjoyment was the main dependent variable for this study.

An 11-item measure of Enjoyment was adapted from a previous study the author conducted (Schaffer & Fang, 2016). This *Enjoyment Questionnaire* is presented in Appendix B. This measure included five items adapted from the Interest-Enjoyment subscale of the Intrinsic Motivation Inventory (IMI), a previously validated measure of enjoyment (McAuley, Duncan, & Tammen, 1989). In the author's previous study on flow in games, one of the Interest-Enjoyment IMI items failed to converge during factor analysis and was dropped: "While playing this game, I was thinking about how much I enjoyed it." This item was included in the present study to include all five previously validated items from the Interest-Enjoyment IMI. Sample items include, "I enjoyed this game very much," "Playing this game was rewarding in itself," and the reverse-scored "I wished I was doing something else."

4. 1. 2. Task Engagement

Task Engagement is the extent to which participants experience flow not including Enjoyment itself (see Chapter 2, Section 2. 5.). So, Task Engagement is the extent to which participants experience Effortless Concentration, a Sense of

Control, Merging of Action and Awareness, Loss of Reflective Self-Consciousness, and Altered Perception of Time.

Effortless Concentration is the focusing or narrowing of attention on the limited stimulus field of the task at hand such that all of one's attention is taken up by the task, and the ease with which that mental concentration takes place. Csikszentmihalyi and Nakamura (2010) analyzed data from a large-sample Experience Sampling Method study that suggested high concentration leads to more enjoyment when ease of concentration is also high. In the author's previous study of flow in games (Schaffer & Fang, 2016), ease of concentration items were included, but ease of concentration and concentration converged into a single factor when factor analysis was conducted to validate the measures for that study. That single factor was called Effortless Concentration.

Sense of Control is how much participants feel they are in control of their own actions, or how much they are able to handle the situation they are in because they feel they know how to respond to whatever happens next (Nakamura & Csikszentmihalyi, 2014). Merging of Action and Awareness is how much participants "become so involved in what they are doing that the activity becomes spontaneous, almost automatic" (Csikszentmihalyi, 2008, p. 53). Loss of Reflective Self-Consciousness is how much participants are so focused on the

task they are doing that they are not thinking about how they are presenting themselves, what others may be thinking of them. All of their attentional resources are taken up due to concentration on the task, so no attention is left over with which to be self-conscious. Altered Perception of Time is the extent to which participants feel that time is passing at a different rate than normal, typically faster than normal. Merging of Action and Awareness, Loss of Reflective Self-Consciousness, and Altered Perception of Time in theory all result from a lack of attentional resources due to concentration on the task at hand.

Flow is the experience of overcoming challenging activities for the sake of the enjoyment they provide. Flow is the psychological state sometimes called "getting in the zone", or the experience that "time flies when you are having fun". Flow indicators are the factors that indicate how much a person is in flow. One of the flow indicators is Autotelic Experience, which is basically Enjoyment. To assert that Autotelic Experience leads to Enjoyment would be circular logic, with enjoyment leading to enjoyment. Task Engagement is defined as the flow experience not including enjoyment itself so that Enjoyment can be treated as a separate variable. So, Task Engagement is made up of all flow indicators except for Autotelic Experience (or Enjoyment).

A 33-item measure of Task Engagement was used. The *Task Engagement Questionnaire* is presented in Appendix C. This measure was made up of five sub-dimensions or sub-scales: Effortless Concentration, Altered Perception of Time, Loss of Self-Consciousness, Merging of Action & Awareness, and Sense of Control.

To measure Task Engagement, a measure called the *Flow Indicator Questionnaire* was adapted from the author's previous study of flow in games (Schaffer & Fang, 2016). In that previous study, the factors that lead to flow, or the flow conditions, were separated from the factors that indicate how much a person is in flow, or the flow indicators. So, the *Flow Indicator Questionnaire* measures how much a person is in the psychological state of flow, or in other words how engaged the person is with the task they are doing.

Items from the *Flow Indicator Questionnaire* for the Autotelic Experience factor have not been included in the *Task Engagement Questionnaire* used in this study because Autotelic Experience is synonymous with Enjoyment. If Autotelic Experience were included, it would create circular logic, with Enjoyment leading to Enjoyment. This is why Task Engagement was defined here as the flow experience not including Enjoyment. In addition, Task Engagement includes only

flow indicators; it does not include any flow conditions, or the factors that lead to flow.

Sample items include, “My attention was focused entirely on the game that I was playing,” “It felt like time went by quickly,” “I was not concerned with what others may have been thinking of me,” “I played the game without thinking about trying to do so,” and “I felt that I had everything under control.”

4. 1. 3. Usability

Usability is how much participants perceive their interaction with the digital game as easy. Usability is synonymous with Perceived Ease of Use from the Technology Acceptance Model (TAM; Venkatesh & Davis, 2000), and in the context of digital games it is synonymous with Intuitive Controls from the Player Experience of Need Satisfaction (PENS) model (Ryan, Rigby, & Przybylski, 2006). Usability includes the controls the player uses to act upon the game, the layout and design of the game’s graphical user-interface, and the ease with which players can navigate their way through menus. Usability could also include ease of navigation through virtual space in the game, such as navigating a character or avatar from a current position to an objective.

Flow Theory suggests that two aspects of digital game Usability are especially important and would have a positive impact on Task Engagement: Clear Proximal Goals and Immediate Progress Feedback (see Chapter 2, Section 2.5. for more on Flow Theory). Clear Proximal Goals is the extent to which participants perceive that they know what to do next throughout the game. This was conceptualized as a facet or sub-dimension of Usability because game designs with excellent usability effectively communicate information about the goal of the player's next step throughout the game. Immediate Progress Feedback is the extent to which participants perceive that they know how well they are playing the game. This was conceptualized as a facet or sub-dimension of Usability because game designs with excellent Usability provide continuous feedback to players about their performance and progress through the game.

A 25-item measure of Usability was used, made up of three measures drawn from the literature and two measures from a previous study the author conducted. This *Usability Questionnaire* can be found in Appendix D. The factor structure and reliability of each of these measures was validated by previous research. The 10-item System Usability Scale (Brooke, 1996; Lewis & Sauro, 2009; Bangor, Kortum, & Miller, 2008) was adapted to the context of digital games. The 4-item measure of Perceived Ease of Use was adapted from the Technology Acceptance

Model (Venkatesh & Davis, 2000). The 3-item measure of Intuitive Controls was adapted from the Player Experience of Needs Satisfaction measure (Ryan et al., 2006).

A 4-item measure of Clear Proximal Goals and a 4-item measure of Immediate Progress Feedback were adapted from the author's previous study on flow in games (Schaffer & Fang, 2016). These two Flow Conditions were conceptualized as specific aspects of system Usability that lead to flow or Task Engagement (Nakamura & Csikszentmihalyi, 2014; Schaffer & Fang, 2016). Specifically, Clear Proximal Goals refers to how well players know what to do next throughout the game, and Immediate Progress Feedback is how much players know how well they are playing the game.

Sample items from the 25-item Usability measure include, "I thought the controls of the game were easy to use" "I found it easy to get the game to do what I wanted it to do using the controls of the game" "My next steps were clearly defined" and "It was really clear to me how I was doing in the game."

4. 1. 4. Desire and Desire Fulfillment

Desire is defined as the extent to which participants are motivated by each basic human desire (see Chapter 2, Section 2.8 for more on Basic Human Desires Theory). In the model shown in Figure 2 above, Desire is one of 16 separate

factors that were measured and analyzed in 16 separate SEM models, one for each of Reiss's 16 basic human desires. The basic human desires Reiss (2004) proposed were Power, Curiosity, Independence, Status, Social Contact, Vengeance, Honor, Idealism, Physical Exercise, Romance, Family, Order, Eating, Acceptance, Tranquility, and Saving. Future research may identify other fundamental human desires, but Reiss's 16 desires were intended to be comprehensive.

Desire Fulfillment is defined here by the author as the extent to which participants' experience playing the game satisfies or more than fulfills their desire for each of Reiss's (2004) 16 basic human desires (see Chapter 2, Section 2.8). Desire Fulfillment is similar to Expectancy Disconfirmation from Expectancy Disconfirmation Theory (see Chapter 2, Section 2.7) in that Desire Fulfillment is a result of a mental comparison participants make between their desire and their experience, while Expectancy Disconfirmation is a result of a mental comparison between expectations and experience. Expectancy Disconfirmation is how much an experience is better than expected. Desire Fulfillment is how much an experience more than fulfills the participants' desire for each basic human desire. Both are defined as how much the experience

exceeds the adaptation level, reference point, or frame of reference with which the experience is being compared (Oliver, 1980; Helson, 1948).

In the model shown in Figure 2 above, Desire Fulfillment was operationalized as 16 separate factors that were measured and analyzed in 16 separate models analyzed with multiple regression and SEM, one for each of Reiss's 16 basic human desires. For example, Desire Fulfillment: Independence was defined as how much the experience playing the game more than fulfilled the player's desire for Independence.

The *Reiss Profile of Fundamental Goals and Motivation Sensitivities* (Havercamp, 1998) was adapted to create measures of individual Desire and Desire Fulfillment, each with 132 items. The *Desire Fulfillment Questionnaire* is presented in Appendix E, and the *Desire Questionnaire* is presented in Appendix F. Reiss and Havercamp (1998) and Havercamp (1998) validated the factor structure and reliability of Reiss's Profile. The *Desire Fulfillment Questionnaire* and the *Desire Questionnaire* each had 132 items with 8-10 items for each of Reiss's 16 basic human desires.

To reduce participant fatigue, participants were not asked to fill out all 264 Desire and Desire Fulfillment items. Instead, participants were first asked which of the 16 basic human desires were fulfilled or satisfied by their experience

playing the game, with checkboxes to select all desires that apply and short definitions of each desire adapted from Reiss (2004). Participants were then only presented with the Desire and Desire Fulfillment Questionnaires for each Desire they checked. These checkboxes were intended to assess which desires were relevant or applicable to their gameplay experience.

Havercamp (1998) found that the test-retest reliability of Desire was high over a four-week interval (r = .80). This means Desires are quite stable over time. They appear to be more stable over time than Expectations. Desires are enduring trait-like constructs similar to personality traits, but are individual differences in motivation rather than personality.

Reiss's Profile had eight items to measure each of the sixteen desires, making it a 128-item measure. Some items in Reiss's Profile were worded as aversion to negative experiences rather than attraction to positive experiences. Herzberg's motivation-hygiene theory or satisfier-dissatisfier theory suggests that apparent opposites can actually be separate factors that either satisfy or dissatisfy rather than different ends of the same spectrum of a single factor (Herzberg, 1974, 2003). So, some items were changed to focus on attraction to positive experiences or satisfiers rather than avoidance of dissatisfiers. Items about wanting to avoid social rejection were changed to focus on desiring social

acceptance, and items about avoiding aversive sensations were changed to focus on desiring relaxation. These changes were in line with how Reiss (2004) labeled these factors, as Acceptance and Tranquility respectively. Items about avoiding relying on others or asking for help were changed to focus on wanting to make one's own decisions for the Independence factor. Four items from the Status or Social Prestige factor were specific to consumerism, work, or housing, so they were changed to make more sense in the context of digital games. For example, "Designer labels impress me" was replaced with "I love having the best things in games." As part of this process of adapting the measure, some original items were created. The measures for Honor and Independence had 10 items, while other desires had 8 items.

The *Desire Questionnaire* began with: "Please rate how much you agree with the following statements about yourself." Sample items include, "I enjoy learning about something in depth" (Curiosity) "Self-reliance is one of my most important goals" (Independence) and "I would rather lose my life than lose my honor" (Honor).

Reiss's profile was adapted to create a *Desire Fulfillment Questionnaire* that would be to Desire what Expectancy Disconfirmation was to Expectations (see Chapter 2, Section 2.7 above on Expectancy Disconfirmation Theory). To do

this, items began with “My experience more than fulfilled my desire to…” For example, one Desire for Social Contact item that read “I enjoy meeting new people” became “My experience more than fulfilled my desire to meet new people”. So, this item measured how much their experience playing the game fulfilled their desire for social contact, or more precisely how much their experience exceeded their desire for social contact. This mental comparison between experience and desire is analogous to how Expectancy Disconfirmation measures how much an experience was better than expected. Sample items include, “My experience more than fulfilled my desire to learn new skills” (Curiosity) “My experience more than fulfilled my desire to direct group activities” (Power) and “My experience more than fulfilled my desire to serve my community” (Idealism).

4. 2. Online Survey System

An online survey research platform was used, Qualtrics, which had several features that helped ensure the quality of the survey data. To avoid one participant filling out the survey multiple times, each participant was only able to complete the survey once from the same IP address.

To allow participants to take breaks and return to continue the survey, participants’ answers were saved after each page of the survey, allowing them to

take breaks and return to continue the survey within two weeks. At the top of each page of the survey after the first page, the following message was displayed: "Your answers so far have been saved. If you need to take a break, please bookmark this website. You will need to return to this website within two weeks on the same computer using the same browser to complete the survey. If you have not returned to this website and completed the survey after two weeks, your answers will be discarded." This was intended to reduce participant fatigue by allowing participants to complete the survey in multiple sessions.

The time each participant took to fill out each page of the survey was tracked using the Timing feature of Qualtrics. These data were summed to track the time each participant took to fill out the survey. These data were checked to ensure participants were not rapidly answering the questionnaire without reading the questions, but there were no outliers with unusually low survey completion times.

4. 3. Participants and Procedure

An online survey of digital game players was conducted. Participants were recruited with social media, email lists, verbal announcements, and flyers. Participants were presented with an information sheet on informed consent at the top of the survey.

Participants were presented the following definition of a digital game: "A digital game is any game that you play on a computerized device, like a video game console, Personal Computer (PC), smartphone, or on the Internet." Then participants were asked to name the last digital game they played for longer than thirty minutes. They were asked what genre the game is in, and then asked how long ago they played the game. Only respondents who played the game for longer than thirty minutes within the last six months were recruited to participate in the study, while others were thanked and dismissed. The question asking them to name the game asks about the *last* game they played for longer than thirty minutes, so only participants who went on to indicate that their experience playing the game they named was within the last six months were recruited to participate. This screening was done and participants who had played a game in the last 6 months for at least 30 minutes were chosen to ensure that participants had enough recent experience playing a digital game to draw on to answer the questionnaire questions about their experience playing that game. The initial questions and screening question are presented in Appendix A.

Next, participants filled out the questionnaires described in Chapter 4, Section 4. 1. above. Most of these questionnaires assessed their experience playing the game they identified as the last digital game they played for longer

than thirty minutes, which will be referred to here as the game. However, the game that the participant named and typed in as their answer to that initial question was inserted into the survey questions to ensure that participants knew that the questions were asking about their experience playing that particular game that they indicated they had played for longer than 30 minutes within the last six months.

The questionnaires assessed their Enjoyment and Task Engagement, then the perceived Usability of the game. Participants were then asked which of the 16 basic human desires were fulfilled or satisfied by their experience playing the game, with checkboxes to select all desires that apply and short definitions of each desire adapted from Reiss (2004). Then the questionnaires assessed how much playing the game provided Desire Fulfillment for each Desire the participant checked, then their level of Desire for each Desire the participant checked. Separate analyses were conducted for each basic human desire with the subset of participants who checked that desire. All of these questionnaires focused on their experience playing the game they identified except for the questionnaire about their individual level of Desire, which was about the participants themselves. The order of these questionnaires was chosen to ask about dependent or endogenous variables before independent or exogenous

variables, to avoid the experience of answering questions about the independent variables priming or biasing their answers about the dependent variables.

Participants then filled out a demographics and digital game playing habits questionnaire, which is presented in Appendix G. This questionnaire asked participants how many years they had been playing digital games, how often they played digital games, and what genres of digital games they typically played, with checkboxes allowing them to check all genres that they typically played. This information was collected to ensure a diverse sample of participants were recruited in terms of their experience playing digital games and their game-playing habits. Next, the questionnaire asked the first language participants learned or their native language, their age, and their gender. These questions were asked to ensure a diverse sample of participants were recruited in terms of their demographics and background.

Finally, participants provided their email address if they wished to be entered into a drawing to receive a prize. As an incentive to participate, eight participants who completed the study were randomly selected to receive either a gaming console system bundled with a game or a tablet computer (from $237.99 to $464.98 in value).

Data were collected from 315 valid participants, which exceeded the minimum sample size of 305 participants estimated before the study was conducted. This minimum sample size was chosen to meet a 5:1 ratio of sample size to the number of unknown model parameters that require statistical estimates for Structural Equation Modeling (Bentler & Chou, 1987; Kenny, 2015). This was assuming each measure would be reduced to 10 items after instrument validation and that one factor loading for each measure will be fixed (45 factor loadings + 5 factor variances + 5 path coefficients + 3 covariances between exogenous variables + 2 residual variances for endogenous variables + 1 covariance between residuals = 61 parameters; 61 × 5 = 305). This was a conservative estimate because each measure could have been reduced to less than 10 items. After stopping the online survey, the lists of email addresses from the pilot and main studies were combined and eight participants were randomly selected to receive the incentive prizes. Respondents who gave bogus or random answers were excluded from analysis and not entered into the prize drawing.

The questionnaire data were analyzed using stepwise multiple linear regression and Structural Equation Modeling (SEM), using the hypothesized model presented in Figure 2 above. Sixteen separate analyses were run, one for each of Reiss's basic human desires, using the Desire and Desire Fulfillment

items for each desire. Multiple regression was used to test the relationships in the model, one dependent variable at a time. SEM tested the fit of the overall model with the survey data for each desire while taking measurement error into account. This approach tested the impact of Desire and Desire Fulfillment for each of Reiss's basic human desires on Task Engagement and Enjoyment.

CHAPTER 5. RESULTS

This chapter describes the results of the online survey conducted to test the proposed hypotheses. Analysis was conducted with IBM SPSS and AMOS. The chapter is organized as follows: 1) Data Preparation and Checking of Assumptions, 2) Instrument Validation, 3) Participant Demographics and Background, 4) Relevance or Applicability of Each Basic Human Desire, and 5) Hypothesis Testing.

5. 1. Data Preparation and Checking of Assumptions

There were 315 valid responses. To be a valid response, participants needed to have played a digital game for at least 30 minutes within the last 6 months. Also, one response was removed because the participant answered with more than one game when asked to name the last digital game they played for longer than 30 minutes. Participants who had played a game in the last 6 months for at least 30 minutes were chosen to be sure they had enough recent experience playing a digital game to draw on to answer the questionnaire questions about their experience playing that game.

Reversed items were reverse-scored for analysis. The standard deviation of all Likert scale items were checked for each participant to screen for unengaged

responses. None of the participants answered with the same scale point throughout the whole survey. The total time taken to complete the survey was examined as well. The fastest completion time was 5 minutes and 24 seconds and the median time to complete it was 16 minutes and 53 seconds. There were upper outliers on the time to complete measure who presumably left the survey open on their computer for some time before completing it. Even the fastest completion time was plausible and not an outlier compared to the other responses. The names of the games named as the last digital game they played were manually examined to ensure they were real names of digital games and check for nonsense answers, but each remaining response was valid. So, all 315 of the remaining responses were considered valid.

To check the assumption of multivariate normality, the skewness and kurtosis of the distribution of scores for each item was checked to be sure the absolute value of the skewness was less than 3 and the absolute value of the kurtosis was less than 8, following the guidelines outlined by Kline (2015, p. 76-77). Two items violated these assumptions (ENJOY03 had a Kurtosis of 8.7 and DACPT04 had a skewness of 3.4 and a kurtosis of 16.2), but both of these two items were dropped during the instrument validation process and not used in the final analysis.

5. 2. Instrument Validation

To validate the measures used, factor analysis and reliability analysis was conducted. The factors that made up Task Engagement and Usability failed to converge into second-order factors, so the first-order factors that made up these higher-level, more abstract constructs were used in the analysis. The following sub-sections describe the steps of this instrument validation process.

5. 2. 1. Factor Analysis

Initially, factor analysis was run with all variables except the desire variables to use the full sample size of 315 participants. This was done because the questions about the 16 basic human desires – both desire and desire fulfillment – were only asked if they checked the checkbox for that desire to indicate that desire was satisfied or fulfilled by the last digital game the participant indicated that they played for at least 30 minutes (see Section 4.3 above for details).

PROMAX rotation was used because it is more conservative and less forgiving, making it easier to identify problems and find a stable factor solution. For most of the analysis Maximum Likelihood extraction was used because it is the standard extraction method used by IBM AMOS for Structural Equation Modeling (SEM), making the transition to SEM in later analysis more seamless.

Items that did not load onto a single factor or that were split across multiple factors were dropped one at a time until a stable factor structure was found. The retained items had factor loadings above .4 and any cross-loadings were at least .2 less than the main factor loading.

In the factor analysis, four of the System Usability Scale items, two Ease of Use items, and three Intuitive Controls items converged into a single factor which was labeled Usability of Controls because these items measured the usability of the controls of the game. Two items from the System Usability Scale loaded onto their own factor which was labeled Learnability because they were about how easy it was to learn to play the game. Rather than converging with Usability of Controls or Learnability, the items for Immediate Progress Feedback and Clear Proximal Goals loaded onto their own separate factors.

In a previous study the author conducted (Schaffer & Fang, 2016), items that represented Ease of Concentration had converged with Concentration to form Effortless Concentration. But in the present study, these Ease of Concentration items did not meet the criteria described above to survive instrument validation. So, Effortless Concentration was renamed to Concentration to reflect the meaning of the retained items. In addition to Learnability, two of the Task Engagement factors only retained two items each: Merging of Action and Awareness and Loss

of Reflective Self-Consciousness. These two constructs from Flow Theory are difficult to capture, and many of the items intended to measure them were splitting into their own factors or loading onto unintended factors. The factor loadings of each of the retained items can be found in Appendix H.

After identifying the items for the non-desire factors, separate factor analyses were conducted with all of the non-desire variables and the Desire and Desire Fulfillment items for one desire at a time. In this way, items for each desire with sufficient construct validity were identified. All of the retained items can be found in Appendix H.

Again, it was necessary to do the analyses for each desire separately because data were only collected from each participant about those desires that were relevant to their experience (see Section 4.3 above for details). This instrument validation process is also consistent with the planned analysis because we planned to analyze the desires separately.

For the desires Idealism, Physical Exercise, Family, Eating, and Romance, only 18-39 participants checked the checkboxes to indicate these desires were satisfied or fulfilled and therefore applicable to their experience playing the game. This meant we had a lower sample size for the data about these desires. As a

result, the factor analysis would not run with Maximum Likelihood extraction, yielding a non-positive definite matrix error. So, for these desires, factor analysis was run with Principal Component Analysis as an extraction method instead of Maximum Likelihood. With Principal Component Analysis, the analysis ran without error and items with sufficient construct validity were identified.

5. 2. 2. Internal Consistency Reliability

To test the internal consistency reliability of the measures, the Cronbach's Alpha was calculated for each scale measuring each factor. Each scale had Alpha levels above .7 with two exceptions, Learnability and Loss of Reflective Self-Consciousness, which each had Alpha levels above .6 and only had two items. Most of the scales had Cronbach's Alpha levels above .8, indicating a high degree of internal consistency reliability. See Appendix H for the Cronbach's Alpha levels of each scale.

5. 2. 1. Using First-Order Factors Rather Than Second-Order Factors for Usability and Task Engagement

Finally, analysis was conducted to decide whether to use the first-order factors that make up Task Engagement and Usability in the analysis or to combine these first-order factors into second-order (higher-level) factors. In the proposed

model (see Figure 2 above), Usability and Task Engagement were included. These factors are higher level, more abstract concepts made up of multiple sub-dimensions. In other words, they are second-order factors made up of multiple first-order factors. After instrument validation, Usability was made up of Usability of Controls, Learnability, Clear Proximal Goals, and Immediate Progress Feedback. And Task Engagement was made up of Sense of Control, Altered Perception of Time, Concentration, Merging of Action and Awareness, and Loss of Reflective Self-Consciousness.

The hope was that if there was sufficient convergent validity across these sub-dimensions, these second-order factors could be used for analysis. However, when examining the relationships between all non-desire factors in AMOS (to use the maximum available sample size), it became clear that not all of the first-order factors loaded well onto the second-order factors. To put that another way, the lower-level factors that were in theory supposed to make up Usability and Task Engagement were not varying together well.

In Figure 3 below, the numbers on the arrows from Usability and Task Engagement to the sub-dimensions that make up these second-order factors show the standardized estimates of the regression beta weights, and the numbers above each sub-dimension show the squared multiple correlations or R^2, which shows

the proportion of variance among each first-order factor explained by its second-order factor.

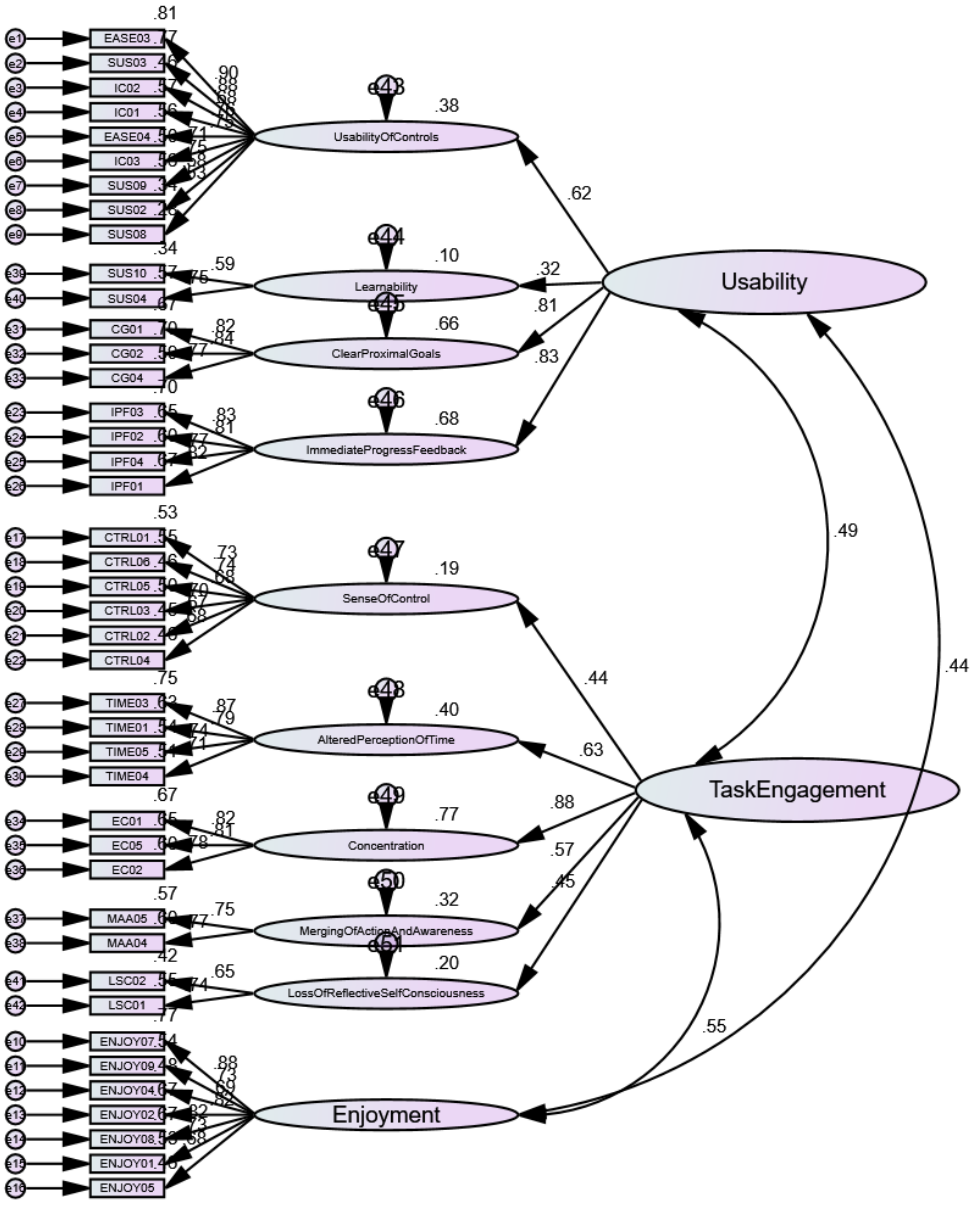

Figure 3. Structural Equation Model Showing Sub-Dimensions of Usability and Task Engagement Failing to Converge Well on Their Second-Order Factors.

So, while Task Engagement explained 77% of the variance in Concentration, it only explained 19% of the variance in Sense of Control. And, while Usability explained 68% of the variance in Immediate Progress Feedback, it explained only 10% of the variance in Learnability. These results indicated these second-order factors had insufficient convergent validity, meaning their components or sub-dimensions did not vary together well and instead acted like separate factors. Since these sub-dimensions acted like separate factors, the analysis that follows treated them as separate factors. Another benefit of this approach is that it may identify which of these sub-dimensions has the greatest impact on enjoyment, which may have practical implications for those who wish to design interactive systems for enjoyment.

5. 3. Participant Demographics and Background

Participants were recruited both online through social media and through fliers distributed on the campus of a Midwestern university with a diverse student body. There were 315 total valid responses to the online survey. The

demographics and background of the participants are summarized in Table 2 below.

Table 2. Summary of Participant Demographics and Background.

Total Valid N	315 participants (100%)
Female	86 (27.35%)
Male	222 (70.5%),
Other (e.g. “Non-Binary”, “undecided”, etc.)	7 (2.2%)
Mean Average Age	24.07 years
Age Range	18-49 years
English as only first language learned	220 (69.84%)
Other languages as first language learned	93 (29.52%)
Played digital games at least once per week	291 (92.38%)
Played digital games once per month or less frequently	24 (7.62%)
Played digital games every day or more frequently	141 (44.76%)
Mean average years playing digital games	15.59 years
Range of years played digital games	1-38 years

There were 86 female participants (27.35%), 222 male participants (70.5%), and 7 other participants (2.2%) who chose “Other” as their gender, some of whom typed in self-identifications such as “Non-Binary”, “Trans/Gender Non-Conforming”, “undecided”, or “N/A”. The participants ranged in age from 18 to 49 with a mean average age of 24.07 years.

220 participants (69.84%) reported English as the only first language they learned or their only native language, 2 participants reported English as one of

two first or native languages, and the remaining 93 participants (29.52%) reported other languages as the first language they learned or their native language. People with 29 different first or native languages participated. 30 reported Spanish and 17 reported Danish, and 8 reported Polish as their first or native language.

291 participants (92.38%) reported playing digital games at least once per week, while only 24 participants (7.62%) reported playing digital games once per month or less frequently. 141 participants (44.76%) reported playing digital games every day. When asked how many years they have been playing digital games, one participant entered 2005; this was assumed to be the specific year the person started playing games and was recoded to 14 years based on the year the data was collected (2019-2005). Participants reported a range of experience from 1 to 38 years of experience playing digital games, and a mean average of 15.59 years of experience playing digital games.

5. 4. Relevance or Applicability of Each Basic Human Desire

Before testing hypotheses, there was a question about which of the 16 basic human desires identified by Reiss and Havercamp were relevant or applicable to the recent experience playing digital games that were the focus of this online survey. To test which desires were relevant or applicable to the experience of

playing the game they named as the last digital game they played for longer than 30 minutes, participants were asked “Which of the following desires were satisfied or fulfilled while playing [this game]?” with the name of the game they had given automatically inserted into the question, followed by a series of checkboxes, one for each of the 16 basic human desires identified by Reiss and Havercamp, each with a short definition, plus an Other option that allowed them to type in an additional desire of their choice (see Section 4.3 above for details and Appendix E below for the survey measure). The number and percent of participants who indicated each desire was relevant or applicable to their recent gameplay experience is shown in Table 3 below.

Table 3. Relevance or Applicability of Each Basic Human Desire to Participants’ Recent Digital Gameplay Experiences, as shown by the Number and Percent of Participants who Indicated Each Basic Human Desire was Satisfied or Fulfilled by their Experience.

		Count	Column Valid N %
Which of the following desires were satisfied or fulfilled while playing [this game]?	Curiosity: Desire to explore, discover, or learn new knowledge or skills	200	63.5%
	Tranquility: Desire for relaxation	163	51.7%
	Independence: Desire to make your own decisions	158	50.2%
	Social contact: Desire for peer companionship (including desire to spend time with friends)	131	41.6%
	Saving: Desire to collect things	129	41.0%

Power: Desire to influence, lead, or direct others	127	40.3%
Vengeance: Desire to get even (including desire to compete, to win)	120	38.1%
Status: Desire for prestige, social standing, and positive attention	102	32.4%
Order: Desire to organize or make things orderly	82	26.0%
Honor: Desire to do the right thing according to a code of conduct (including ethics, morality, tradition, or integrity)	78	24.8%
Acceptance: Desire to be accepted or liked by others	55	17.5%
Idealism: Desire to improve society (including public service, altruism, and social justice)	39	12.4%
Other:	28	8.9%
Physical exercise: Desire for body movement that increases your heart rate or exercises your muscles	27	8.6%
Family: Desire to spend time with your own family	23	7.3%
Eating: Desire to eat (including seeing food you want to eat)	20	6.3%
Romance: Desire for sexual behavior, sexual arousal, or sexual fantasies (including flirting, courting, or being turned on)	18	5.7%
Total	315	100.0%

As shown in Table 3, Curiosity, Tranquility, and Independence were the most frequently checked desires, each checked by more than half of the participants. This means the desire to learn, the desire to relax, and the desire to make one's own decisions were the basic human desires that were most frequently reported as satisfied or fulfilled by participants' recent digital gameplay experiences.

In contrast, Physical Exercise, Family, Eating, and Romance were the basic human desires least frequently reported as fulfilled or satisfied by participants' recent gameplay experiences.

5. 5. Hypothesis Testing

To test each of the hypothesized relationships shown in the Desire Fulfillment Model of Digital Game Enjoyment (see Figure 2 above), analyses were conducted separately for each desire. Analyses will be presented for each desire where significant effects were found. For each of these analyses, multiple regression was conducted using stepwise linear regression to test each hypothesized relationship, and then Structural Equation Modeling was conducted to test the entire model for that desire.

5. 5. 1. Curiosity

Curiosity is the desire to explore, discover, or learn new knowledge or skills. Curiosity was the desire most frequently checked as fulfilled or satisfied by participants, with 200/315 (63.5%) checking Curiosity and therefore answering the Desire and Desire Fulfillment Questionnaires for Curiosity.

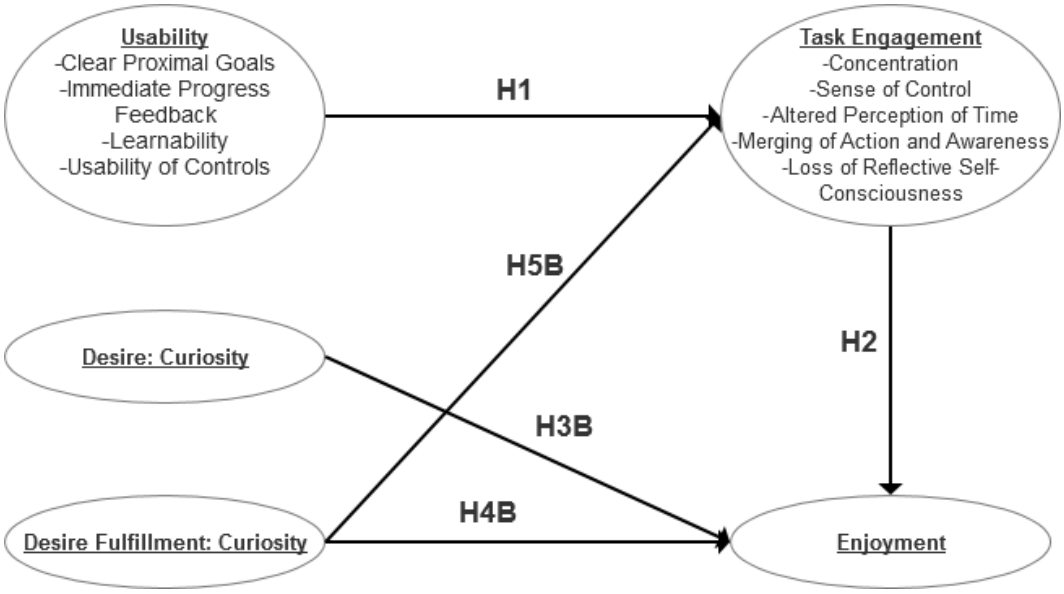

Figure 4. Conceptual Desire Fulfillment Model for Curiosity Showing Hypothesized Relationships.

Applying the proposed Desire Fulfillment Model (see Figure 2) to Curiosity, Figure 4 above shows the proposed Desire Fulfillment Model for Curiosity and its hypothesized relationships. The analysis for Curiosity began with stepwise multiple linear regression by testing each hypothesized relationship in the proposed model with separate analyses for one dependent variable at time. Mean average scores on each measurement scale were used for all regression analyses rather than weighting them by factor loadings so that each item was evenly

weighted. The results of this analysis are shown in Table 4 below, with the separate analysis for each dependent variable in separate boxes.

Table 4. Results of Stepwise Multiple Linear Regression Analysis of the Desire Fulfillment Model for Curiosity.

Relationship	R^2 Change	Significance for this relationship (*p*-value from Coefficients table *t*-tests)	Significance for the overall model (*p*-value from ANOVA table *F* test)
Sense Of Control -> Enjoyment	.189	< .001	< .001
Desire Fulfillment: Curiosity -> Enjoyment	.117	< .001	< .001
Concentration -> Enjoyment	.051	< .001	< .001
Immediate Progress Feedback -> Sense of Control	.124	< .001	< .001
Desire Fulfillment: Curiosity -> Sense of Control	.031	.008	< .001
Clear Proximal Goals -> Sense of Control	.023	.019	< .001
Desire Fulfillment: Curiosity -> Concentration	.123	< .001	< .001
Clear Proximal Goals -> Concentration	.067	< .001	< .001
Immediate Progress Feedback -> Concentration	.013	.070 (n.s.)	< .001
Desire: Curiosity -> Desire Fulfillment: Curiosity	.035	.008	.008

The analysis shown in Table 4 began by testing the impact of Task Engagement, Desire Fulfillment: Curiosity, and Desire: Curiosity on Enjoyment. The components or sub-dimensions of Task Engagement were used rather than Task Engagement (as discussed in Section 5. 2. 1. above). Because variables were entered into the model using Stepwise regression, these results identify the strongest relationships present, or the factors having the most impact while controlling for the other variables entered so far. The Task Engagement sub-

dimensions Sense of Control and Concentration both had a significant impact on Enjoyment, supporting H2. The other Task Engagement factors, Altered Perception of Time, Merging of Action and Awareness, and Loss of Reflective Self-Consciousness did not have a significant impact on Enjoyment while controlling for the other factors in the model.

Desire Fulfillment: Curiosity also had a significant impact on Enjoyment, while a person's individual level of desire for curiosity, Desire: Curiosity, did not have a significant impact on Enjoyment while controlling for Desire Fulfillment: Curiosity, Sense of Control, and Concentration. This provides some evidence supporting H4B, but did not support H3B.

Since the relationship between an individual's level of Desire for curiosity (Desire: Curiosity) did not have a significant impact on Enjoyment while controlling for the other factors in the model, the impact of this Desire: Curiosity factor on how much the experience fulfilled their desire for curiosity (Desire Fulfillment: Curiosity) was also tested, even though this was not a previously hypothesized relationship. Desire Fulfillment: Curiosity was found to have a significant impact on Desire Fulfillment: Curiosity (see Table 4 above). Rather than being a separate independent factor impacting Enjoyment directly, the impact of an individual's level of Desire on Enjoyment is mediated by Desire

Fulfillment, at least for Curiosity. Indeed, linear regression shows Desire: Curiosity significantly predicts Enjoyment if no other factors are controlled for (R^2 = .023; p = .032), but this relationship becomes non-significant when Desire Fulfillment: Curiosity is controlled for (R^2 Change = .005; p = .26) by using Hierarchical Linear Regression to enter Desire Fulfillment: Curiosity and then Desire: Curiosity into the model to predict Enjoyment. So, this meets the requirements laid out by Baron and Kenny (1986) to identify mediation. Having a greater desire to learn (Desire: Curiosity) leads people to experience more fulfillment of that desire to learn (Desire Fulfillment: Curiosity), which in turn leads to Enjoyment.

Usability and Desire Fulfillment: Curiosity were hypothesized to have an impact on Task Engagement. Since only Sense of Control and Concentration were identified by stepwise multiple regression as having a significant impact on Enjoyment while controlling for other variables in the model, the Usability sub-dimensions and Desire Fulfillment: Curiosity were regressed onto Sense of Control and Concentration using the same stepwise multiple regression method. These results are shown in Table 4 above. The Usability sub-dimensions Immediate Progress Feedback and Clear Proximal Goals both had significant impacts on Sense of Control while controlling for other variables in the model.

Clear Proximal Goals had a significant impact on Concentration and Immediate Progress Feedback had an impact on Concentration that was nearly statistically significant (R^2 Change = .013; p = .07) controlling for other variables in the model. These results provide some evidence supporting H1, that Usability has a significant impact on Task Engagement. These results also specifically highlight these sub-dimensions as having the largest impact on Enjoyment.

Desire Fulfillment: Curiosity also had a significant impact on both Sense of Control and Concentration, the Task Engagement sub-dimensions that had significant impacts on Enjoyment. This provides evidence supporting H5B, that Desire Fulfillment: Curiosity has a positive impact on Task Engagement.

To summarize, all hypothesized relationships in the Desire Fulfillment Model for Curiosity were supported by the results except for the relationship between Desire: Curiosity and Enjoyment (H3B). Instead, Desire: Curiosity was found to have an impact on Desire Fulfillment: Curiosity, which in turn impacted Task Engagement and Enjoyment. In other words, having more Desire: Curiosity leads people to experience more Desire Fulfillment: Curiosity when they play games, which in turn leads to more Task Engagement and Enjoyment. In addition, the sub-dimensions of Task Engagement that had the most significant impact on Enjoyment were Sense of Control and Concentration, and the sub-dimensions of

Usability that had the most significant impact on Task Engagement were Clear Proximal Goals and Immediate Progress Feedback.

It may be helpful to show the conceptual Desire Fulfillment Model as it applies to Curiosity. Figure 5 below shows this conceptual model along with both the hypothesized relationships and the new relationship identified between Desire: Curiosity and Desire Fulfillment: Curiosity.

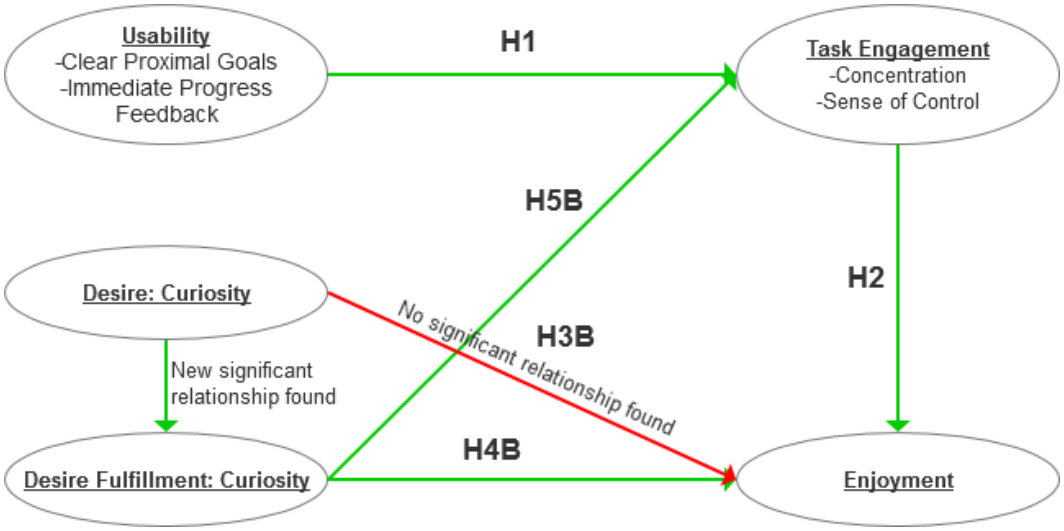

Figure 5. Conceptual Desire Fulfillment Model for Curiosity Showing Hypothesized Relationships and One Newly Identified Relationship.

Structural Equation Modeling (SEM) was conducted next. While multiple regression is a more robust and traditional method, SEM allows the entire model

to be tested all at once while mathematically taking measurement error into account. SEM allows for the overall fit of the whole model with the data to be tested. SEM was conducted with IBM Amos.

The initially specified model included all hypothesized relationships plus a line between Desire: Curiosity and Desire Fulfillment: Curiosity. Many of the path coefficients in this model were non-significant. This initial model was lacking in parsimony with all of those non-significant paths included, which was using up the available degrees of freedom without adding predictive power. Starting with this initial model, the *p*-values of the path coefficients were examined and paths which were non-significant in the SEM analysis were removed. Factors with no remaining paths directly or indirectly to Enjoyment were removed. The resulting model is shown in Figure 6 below and fit well with the data (χ^2 = 1091.978; df = 687; $p < 0.001$; N = 200; *CMIN/DF* = 1.589; *CFI* = .904; *RMSEA* = .054; *SRMR* = .072; *PClose* = .115). According to the thresholds laid out by Hu and Bentler (1999), each of these model fit measures showed the model had an excellent fit with the data (*CMIN/DF* between 1 and 3; *SRMR* < .08; *RMSEA* < .06; *PClose* > .05), except for *CFI* which showed the model had an acceptable fit (*CFI* between .9 and .95).

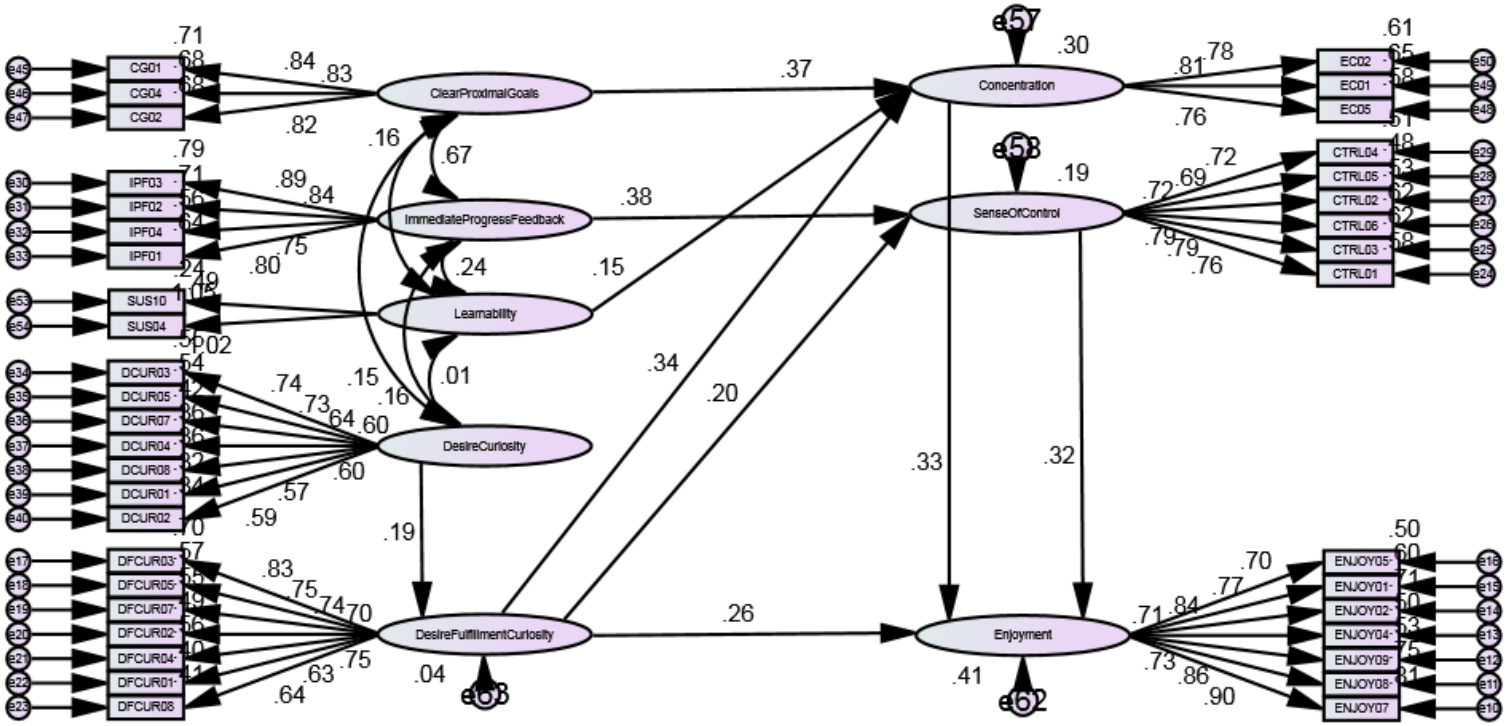

Figure 6. Structural Equation Model for the Desire Fulfillment Model for Curiosity.

To briefly summarize how to interpret a Structural Equation Model like that shown in Figure 6, the ovals in the center of the model show the latent constructs, and the rectangles on the left and right sides show the items that make up those latent constructs. So, the numbers on the arrows from the latent constructs to their items show how well the factors load onto the items. The four latent constructs at the upper left of the model are exogenous variables, meaning there are no path arrows pointing at them. The double-headed arrows between these four exogenous variables are a standard part of SEM models that account for the covariances between them. The single-headed arrows are the paths in the model, and the numbers on these arrows are the standardized path coefficients or standardized beta weights.

In the SEM analysis, the path from Clear Proximal Goals to Sense of Control was not significant (standardized beta = .15; $p = .171$), while this relationship was significant in the multiple regression analysis. And the path from Learnability to Concentration was significant at the $p < .05$ level (standardized beta = .15; $p = .034$), while this relationship was not significant in the multiple regression analysis. These two minor differences may be because SEM tests the entire model, including indirect effects that the multiple regression could not capture, or it could be because SEM takes measurement error into account. With both of

these paths, the relationships were rather weak, with SEM showing both having a standardized beta of only .15.

To summarize, just as with the multiple regression analysis, all hypothesized relationships in the Desire Fulfillment Model for Curiosity were supported by the SEM results except for the relationship between Desire: Curiosity and Enjoyment (H3B). Instead, Desire: Curiosity was found to have an impact on Desire Fulfillment: Curiosity, which in turn impacted Task Engagement and Enjoyment.

Concentration and Sense of Control were still the sub-dimensions of Task Engagement that had a significant impact on Enjoyment along with Desire Fulfillment: Curiosity. Clear Proximal Goals, Desire Fulfillment: Curiosity, and Learnability had a significant impact on Concentration. Immediate Progress Feedback and Desire Fulfillment: Curiosity had a significant impact on Sense of Control. Finally, Desire: Curiosity had a significant impact on Desire Fulfillment: Curiosity.

To show the paths without the measurement model (items), factors scores were imputed and the path model was created in Amos. The path model is shown in Figure 7 below. Imputing factor scores rather than using the full model as was done in Figure 6 above had the effect of lowering the degrees of freedom, so the

RMSEA and *PClose* fit statistics for the path model below were not as good as the full model above, but the CFI was acceptable and the SRMR showed an excellent fit (χ^2 = 44.893; df =13; $p < 0.001$; N = 200; *CMIN/DF* = 3.453; *CFI* = .934; *RMSEA* = .111; *SRMR* = .079; *PClose* = .003). Kenny, Kaniskan, and McCoach (2015) argued to not even calculate *RMSEA* for models with low degrees of freedom, and *PClose* is derived from *RMSEA* (Kenny, 2015).

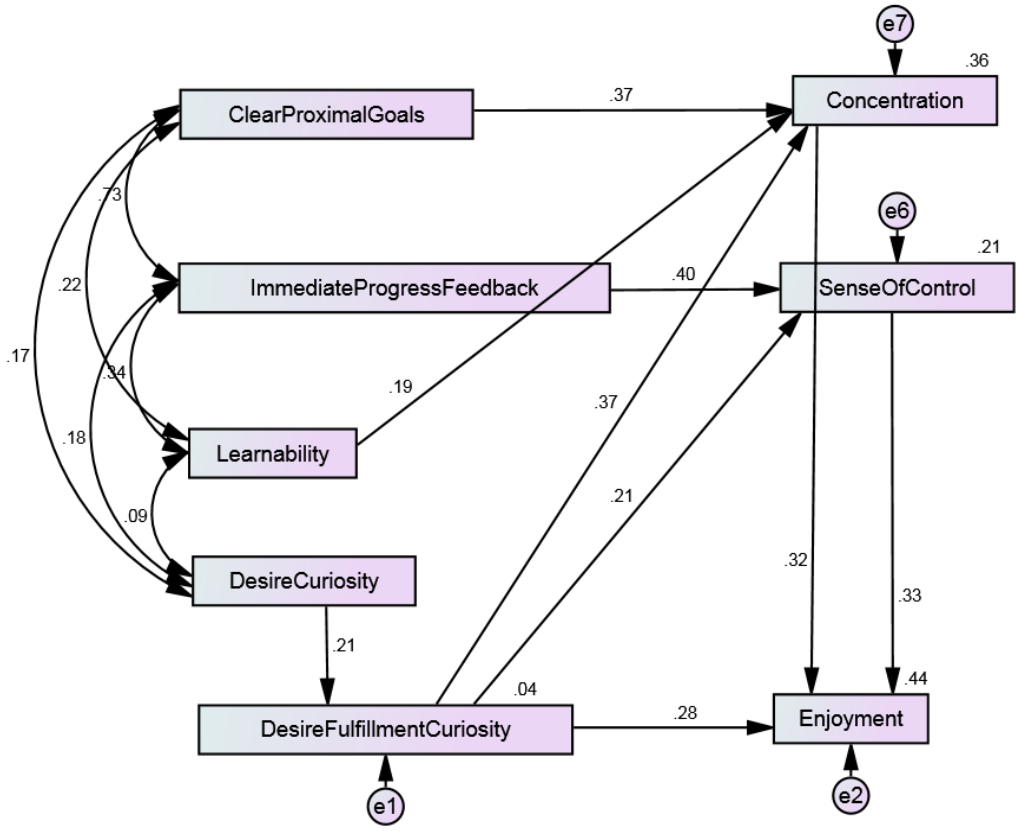

Figure 7. Path Model for the Desire Fulfillment Model for Curiosity.

The path model in Figure 7 may be easier to read and interpret than the full SEM model in Figure 6 without all the items shown in the model. However, this additional path analysis step with imputed factor scores did not seem to add any new information beyond what was learned from testing and examining the full SEM model, so this optional extra step was excluded from the SEM analysis for the other desires.

The R^2 for Enjoyment was .445, so Amos estimated that the predictors of Enjoyment in the path model explained 44.5% of the variance in Enjoyment. The R^2 for Desire Fulfillment: Curiosity was quite low (R^2 = .04), so while participants' individual level of desire to learn had a significant impact on their experience of that desire being fulfilled, Desire: Curiosity only predicted 4% of the variance in Desire Fulfillment: Curiosity. In other words, how much a person feels like they were learning while playing the game is only 4% determined by that person's individual level of desire to learn. Desire had an impact on Desire Fulfillment, but there may be room for other factors related to the content and design of the game to have an impact on Desire Fulfillment: Curiosity as well.

To illustrate these results, Figure 8 below shows the revised conceptual model of the Desire Fulfillment Model for Curiosity. Learnability has been added under Usability and the non-significant path from Desire: Curiosity to Enjoyment

(H3B) was removed. This conceptual model is somewhat simplified, with Usability and Task Engagement shown as single entities in the model with their sub-dimensions that had a significant impact (in either the regression or SEM analyses) listed within them. But this simplification serves the purpose of summarizing the relationships found at a high level and can help make sense of the results in the more detailed Figures 6 and 7 shown above. Figures 7 and 8 are also laid out in a similar manner to make them easier to interpret and compare.

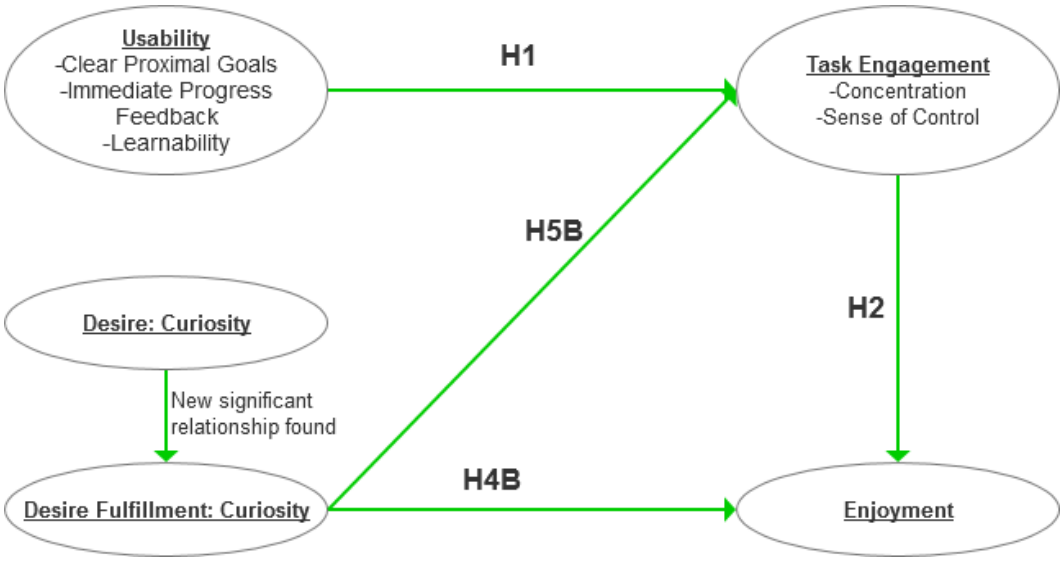

Figure 8. Revised Conceptual Desire Fulfillment Model for Curiosity.

5. 5. 2. Tranquility

Tranquility is the desire for relaxation. Tranquility was the desire second most frequently checked as fulfilled or satisfied by participants, with 163/315 (51.7%) checking the box for Tranquility and therefore answering the Desire and Desire Fulfillment Questionnaires for Tranquility.

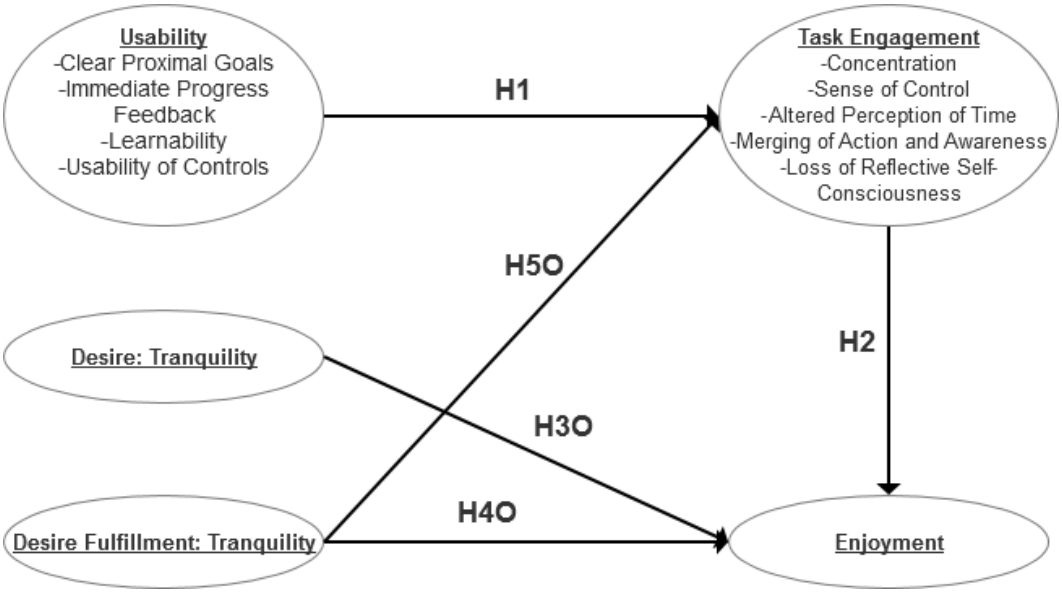

Figure 9. Conceptual Desire Fulfillment Model for Tranquility Showing Hypothesized Relationships.

Applying the proposed Desire Fulfillment Model (see Figure 2) to Tranquility, Figure 9 above shows the proposed Desire Fulfillment Model for Tranquility and its hypothesized relationships. The analysis for Tranquility began

with stepwise multiple linear regression by testing each hypothesized relationship in the proposed model with separate analyses for one dependent variable at time. Mean average scores on each measurement scale were used for all regression analyses rather than weighting them by factor loadings so that each item was evenly weighted. The results of this analysis are shown in Table 5 below, with the separate analysis for each dependent variable in separate boxes.

Table 5. Results of Stepwise Multiple Linear Regression Analysis of the Desire Fulfillment Model for Tranquility.

Relationship	R^2 Change	Significance for this relationship (*p*-value from Coefficients table *t*-tests)	Significance for the overall model (*p*-value from ANOVA table *F* test)
Sense Of Control -> Enjoyment	.189	< .001	< .001
Concentration -> Enjoyment	.104	< .001	< .001
Immediate Progress Feedback -> Sense of Control	.124	< .001	< .001
Desire Fulfillment: Tranquility -> Sense of Control	.033	.013	< .001
Clear Proximal Goals -> Sense of Control	.024	.032	< .001
Clear Proximal Goals -> Concentration	.098	< .001	< .001
Desire Fulfillment: Tranquility -> Concentration	.039	.008	< .001
Desire: Tranquility -> Desire Fulfillment: Tranquility	.259	< .001	< .001

The Task Engagement sub-dimensions Sense of Control and Concentration had significant impacts on Enjoyment, supporting H2. When controlling for this effect though, the impact of Desire Fulfillment: Tranquility on Enjoyment was no

longer significant (p = .225), and the impact of Desire: Tranquility on Enjoyment was not significant (p = .443). This means the results did not support H3O or H4O. Perhaps a larger sample size would have found significant relationships, but with an N of 163 for the Tranquility questions, evidence was not found to support these two hypotheses.

Desire Fulfillment: Tranquility had significant impacts on both of the Task Engagement sub-dimensions Concentration and Sense of Control, supporting H5O.

H1 was also supported by the results. The Usability sub-dimension Clear Proximal Goals had a significant impact on both Concentration and Sense of Control, the Task Engagement sub-dimensions that had an impact on Enjoyment. The other Usability sub-dimension, Immediate Progress Feedback, had a significant impact on Sense of Control.

Finally, as was found with Curiosity, Desire: Tranquility had a significant impact on Desire Fulfillment: Tranquility. Figure 10 shows the conceptual model visualizing the findings from the multiple linear regression analysis.

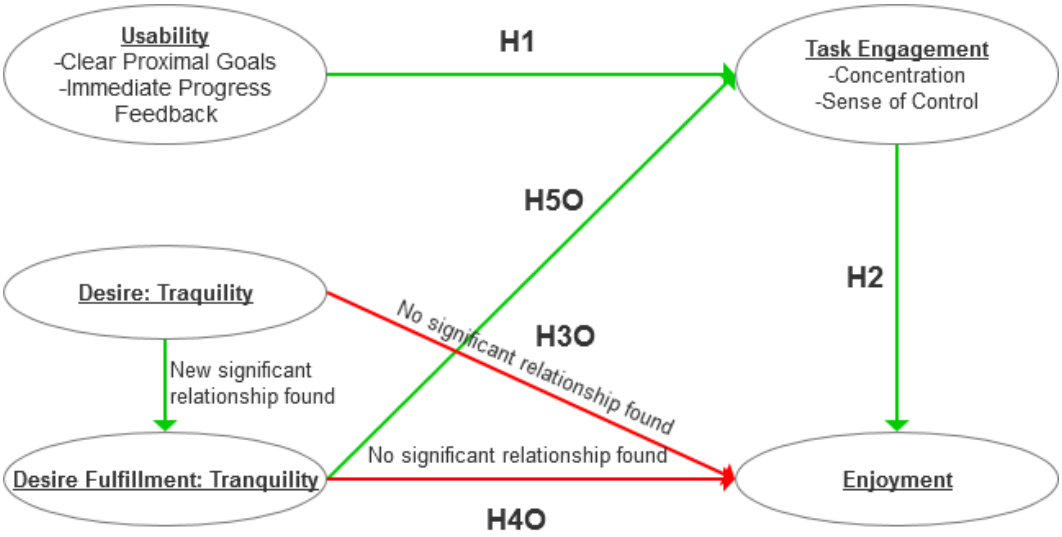

Figure 10. Conceptual Desire Fulfillment Model for Tranquility Showing Findings from Multiple Linear Regression.

Structural Equation Modeling (SEM) was conducted next. While multiple regression is a more robust and traditional method, SEM allows the entire model to be tested all at once while mathematically taking measurement error into account. SEM allows for the overall fit of the whole model with the data to be tested. SEM was conducted with IBM Amos.

The initially specified model included all hypothesized relationships plus a line between Desire: Tranquility and Desire Fulfillment: Tranquility. Many of the path coefficients in this model were non-significant. This initial model was lacking in parsimony with all of those non-significant paths included, which was

using up the available degrees of freedom without adding predictive power. Starting with this initial model, the *p*-values of the path coefficients were examined and paths which were non-significant in the SEM analysis were removed. Factors with no remaining paths directly or indirectly to Enjoyment were removed. The resulting model is shown in Figure 11 below and fit well with the data (χ^2 = 972.626; df = 620; $p < 0.001$; N = 163; *CMIN/DF* = 1.569; *CFI* = .901; *SRMR* = .093; *RMSEA* = .059; *PClose* = .019). According to the thresholds laid out by Hu and Bentler (1999), the CMIN/DF and RMSEA showed the model had an excellent fit with the data (*CMIN/DF* between 1 and 3; *RMSEA* < .06), and the other fit statistics examined showed the model had an acceptable fit (*CFI* between .9 and .95; *SRMR* between .08 and .10; *PClose* between .05 and .01).

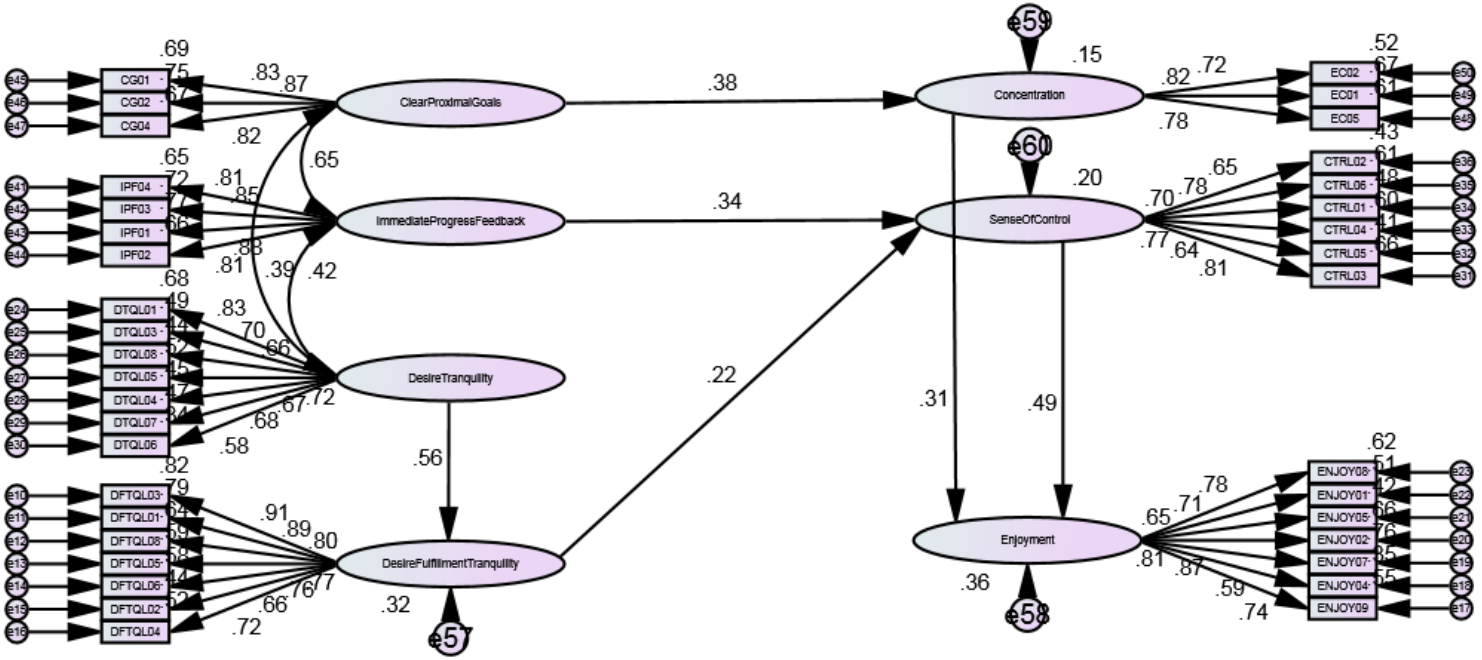

Figure 11. Structural Equation Model for the Desire Fulfillment Model for Tranquility.

In the SEM analysis, the path from Clear Proximal Goals to Sense of Control was not significant (standardized beta = .15; p = .185), while this relationship was significant in the multiple regression analysis. Other than that one path, the SEM results were consistent with the findings from multiple regression. This difference may be because SEM tests the entire model, including indirect effects that the multiple regression could not capture, or it could be because SEM takes measurement error into account. This path was also a rather weak relationship, with SEM showing it had a standardized beta of only .15.

To summarize, just as with the multiple regression analysis, all hypothesized relationships in the Desire Fulfillment Model for Tranquility were supported by the SEM results except for the relationship between Desire: Tranquility and Enjoyment (H3O) and the relationship between Desire Fulfillment: Tranquility and Enjoyment (H4O). Just as with Curiosity, Desire: Tranquility had a significant impact on Desire Fulfillment: Tranquility.

Concentration and Sense of Control had a significant impact on Enjoyment. Clear Proximal Goals and Immediate Progress Feedback were the Usability sub-dimensions that had a significant impact on Task Engagement. Clear Proximal Goals had a significant impact on Concentration. Immediate Progress Feedback and Desire Fulfillment: Tranquility had significant impacts on Sense of Control.

Finally, Desire: Tranquility had a significant impact on Desire Fulfillment: Tranquility.

The R^2 for Enjoyment was .36, so Amos estimated that the predictors of Enjoyment in the SEM model explained 36% of the variance in Enjoyment. The R^2 for Desire Fulfillment: Tranquility was .32. So, participants' individual level of desire to relax predicted 32% of the variance in how much they experienced relaxation. In other words, how much a person feels like they had a relaxing experience while playing the game is 32% determined by that person's individual level of desire to relax.

Turning to the higher level conceptual model with Usability and Task Engagement treated as single entities, the pattern of the results from the SEM is consistent with the pattern of the results from the multiple regression analysis shown in the conceptual model above (see Figure 10). The significant relationships found with both analysis methods are summarized at a high level in the revised conceptual model below (see Figure 12).

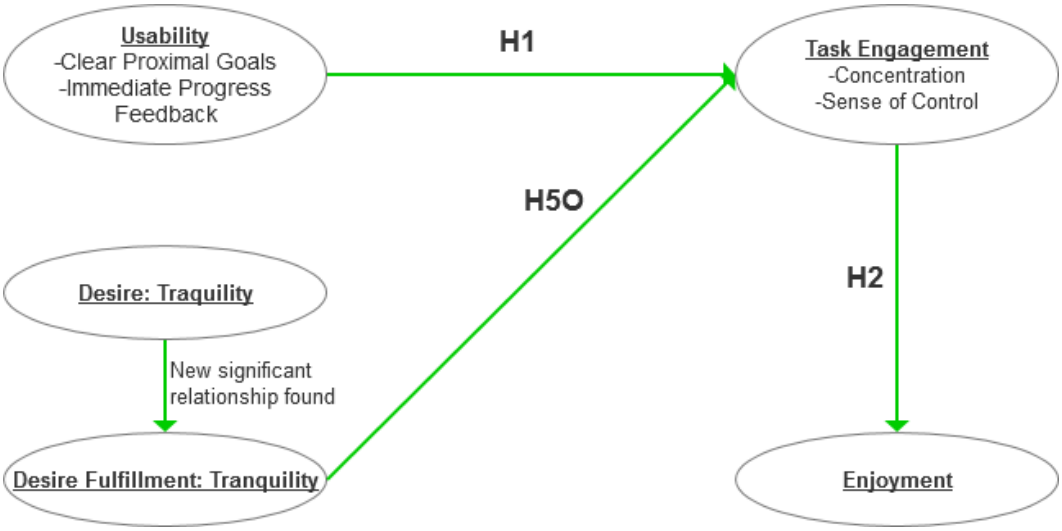

Figure 12. Revised Conceptual Desire Fulfillment Model for Tranquility.

5. 5. 3. Independence

Independence is the desire to make one's own decisions. Independence was the desire third most frequently checked as fulfilled or satisfied by participants, with 158/315 (50.2%) checking the box for Independence and therefore answering the Desire and Desire Fulfillment Questionnaires for Independence.

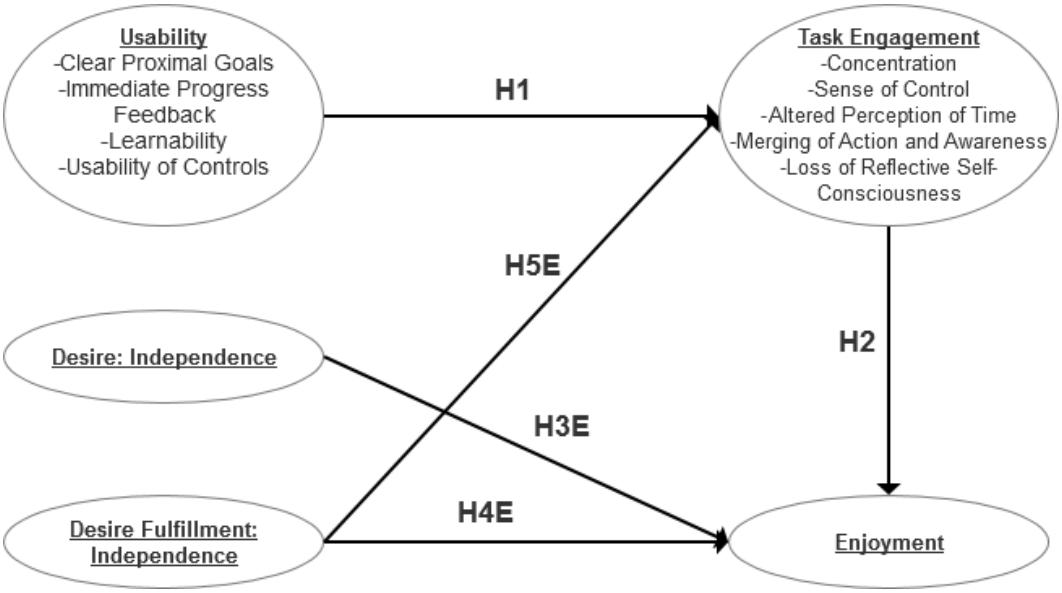

Figure 13. Conceptual Desire Fulfillment Model for Independence Showing Hypothesized Relationships.

Applying the proposed Desire Fulfillment Model (see Figure 2) to Independence, Figure 13 above shows the proposed Desire Fulfillment Model for Independence and its hypothesized relationships. The analysis for Independence began with stepwise multiple linear regression by testing each hypothesized relationship in the proposed model with separate analyses for one dependent variable at time. Mean average scores on each measurement scale were used for all regression analyses rather than weighting them by factor loadings so that each

item was evenly weighted. The results of this analysis are shown in Table 6 below, with the separate analysis for each dependent variable in separate boxes.

Table 6. Results of Stepwise Multiple Linear Regression Analysis of the Desire Fulfillment Model for Independence.

Relationship	R^2 Change	Significance for this relationship (*p*-value from Coefficients table *t*-tests)	Significance for the overall model (*p*-value from ANOVA table *F* test)
Sense Of Control -> Enjoyment	.189	< .001	< .001
Concentration -> Enjoyment	.104	< .001	< .001
Desire Fulfillment: Independence -> Enjoyment	.018	.046	< .001
Immediate Progress Feedback -> Sense of Control	.124	< .001	< .001
Desire Fulfillment: Independence -> Sense of Control	.035	.012	< .001
Clear Proximal Goals -> Sense of Control	.020	.057 (n.s.)	< .001
Clear Proximal Goals -> Concentration	.098	< .001	< .001
Desire Fulfillment: Independence -> Concentration	.053	.002	< .001
Desire: Independence -> Desire Fulfillment: Independence	.017	.002	.002

Looking at the results of the stepwise multiple linear regression, Sense of Control and Concentration both had significant impacts on Enjoyment ($p < .05$). This supports H2, that Task Engagement has a positive impact on Enjoyment. Controlling for these effects, Desire Fulfillment: Independence still had a significant impact on Enjoyment, supporting H4E. Desire: Independence did not have a significant impact on Enjoyment while controlling for these other effects, meaning that H3E was not supported.

Desire Fulfillment: Independence also had a significant impact on both Sense of Control and Concentration, both of the Task Engagement sub-dimensions that significantly impacted Enjoyment. These results support H5E, that Desire Fulfillment: Independence has a positive impact on Task Engagement.

Clear Proximal Goals had a significant impact on Concentration. The impact of Clear Proximal Goals on Sense of Control was not quite significant ($p = .057$). Immediate Progress Feedback had a significant impact on Sense of Control. These results support H1, that Usability has a positive impact on Task Engagement.

Finally, as was found with Curiosity and Tranquility, Desire: Independence had a significant impact on Desire Fulfillment: Independence. Figure 14 shows the conceptual model visualizing the findings from the multiple linear regression analysis.

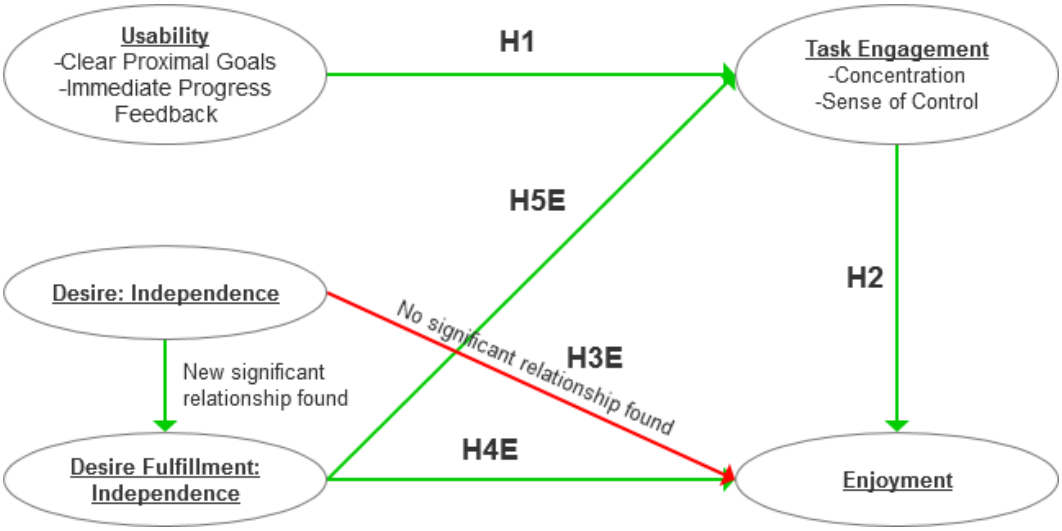

Figure 14. Conceptual Desire Fulfillment Model for Independence Showing Findings from Multiple Linear Regression.

Structural Equation Modeling (SEM) was conducted next. SEM was conducted with IBM Amos.

The initially specified model included all hypothesized relationships plus a line between Desire: Independence and Desire Fulfillment: Independence. Many of the path coefficients in this model were non-significant. This initial model was lacking in parsimony with all of those non-significant paths included, which was using up the available degrees of freedom without adding predictive power. Starting with this initial model, the *p*-values of the path coefficients were

examined and paths which were non-significant in the SEM analysis were removed.

A significant negative path was found from Loss of Reflective Self-Consciousness to Enjoyment (standardized beta = -.25; p = .013); this path being negative did not make sense according to theory, so this path was removed. This path may have been a result of the low reliability of Loss of Reflective Self-Consciousness (Cronbach's Alpha = .649) due to only two items measuring it surviving the instrument validation process. This Loss of Reflective Self-Consciousness sub-dimension of Flow and Task Engagement remains difficult to measure with accuracy, as was found in the author's previous study of flow in games (Schaffer & Fang, 2016). Conceptually, Loss of Reflective Self-Consciousness is about not having attention or cognitive resources available to worry about one's presentation of self or what others are thinking. This lack of cognitive resources is due to all attention being taken up by the task at hand. In other words, Loss of Reflective Self-Consciousness may be a secondary effect of Concentration and not a part of Task Engagement that causes Enjoyment. So, because the focus of the present study is Enjoyment and what leads to Enjoyment, this path was removed.

Factors with no remaining paths directly or indirectly to Enjoyment were removed. The resulting model is shown in Figure 15 below and fit well with the data (χ^2 = 1090.162; df = 849; $p < 0.001$; *N* = 158; *CMIN/DF* = 1.284; *CFI* = .943; *SRMR* = .072; *RMSEA* = .043; *PClose* = .956). According to the thresholds laid out by Hu and Bentler (1999), each of these model fit measures showed the model had an excellent fit with the data (*CMIN/DF* between 1 and 3; *SRMR* < .08; *RMSEA* < .06; *PClose* > .05), except for *CFI* which showed the model had an acceptable fit (*CFI* between .9 and .95).

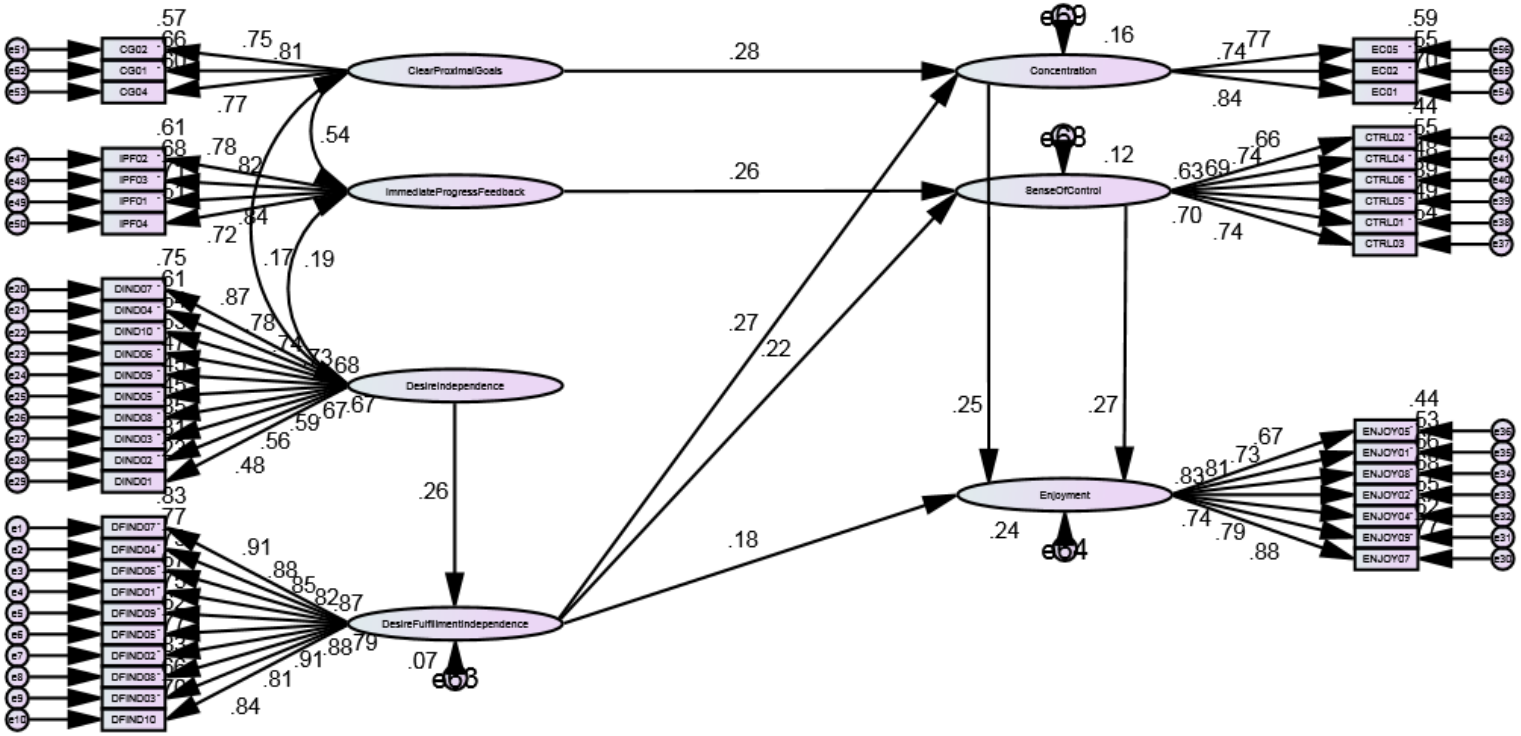

Figure 15. Structural Equation Model for the Desire Fulfillment Model for Independence.

The SEM results were consistent with the findings from multiple regression.

To summarize, just as with the multiple regression analysis, all hypothesized relationships in the Desire Fulfillment Model for Independence were supported by the SEM results except for the relationship between Desire: Independence and Enjoyment (H3E). Although it was not a hypothesized path, Desire: Independence had a significant impact on Desire Fulfillment: Independence.

Concentration and Sense of Control had a significant impact on Enjoyment. Clear Proximal Goals and Immediate Progress Feedback were the Usability sub-dimensions that had a significant impact on Task Engagement. Clear Proximal Goals and Desire Fulfillment: Independence had a significant impact on Concentration. Immediate Progress Feedback and Desire Fulfillment: Independence had significant impacts on Sense of Control.

The R^2 for Enjoyment was .24, so Amos estimated that the predictors of Enjoyment in the SEM model explained 24% of the variance in Enjoyment. The R^2 for Desire Fulfillment: Independence was .07. So, participants' individual level of desire to decide for themselves what they would do predicted 7% of the variance in how much they experienced making decisions for themselves when they played the game. In other words, how much a person feels like they had a

independence while playing the game is only 7% determined by that person's individual level of desire for independence.

Turning to the higher level conceptual model with Usability and Task Engagement treated as single entities, the pattern of the results from the SEM is consistent with the pattern of the results from the multiple regression analysis shown in the conceptual model above (see Figure 14). The significant relationships found with both analysis methods are summarized at a high level in the revised conceptual model below (see Figure 16).

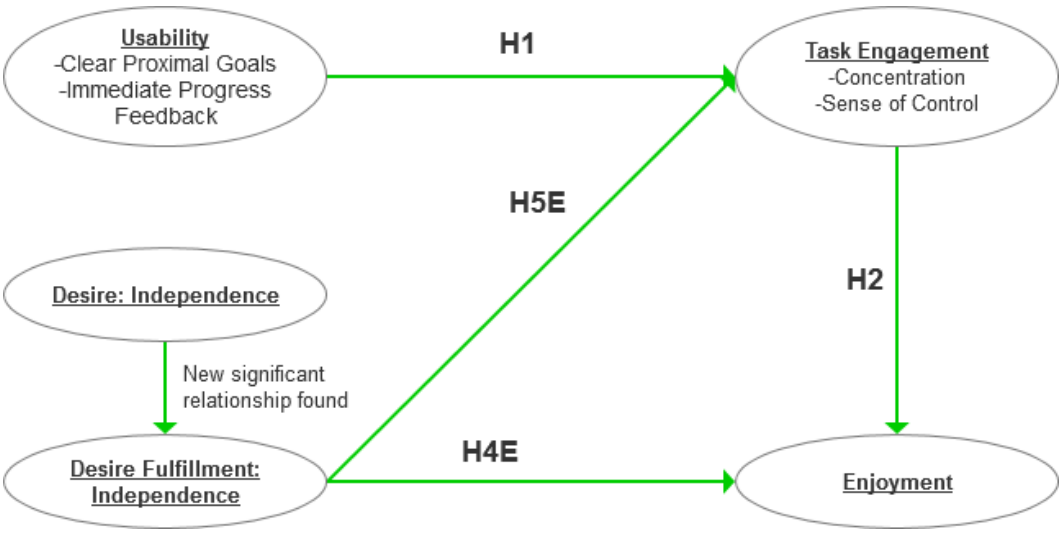

Figure 16. Revised Conceptual Desire Fulfillment Model for Independence.

5. 5. 4. Saving

Saving is the desire to collect things. Saving was the desire fifth most frequently checked as fulfilled or satisfied by participants, with 129/315 (41.0%) checking the box for Saving and therefore answering the Desire and Desire Fulfillment Questionnaires for Saving.

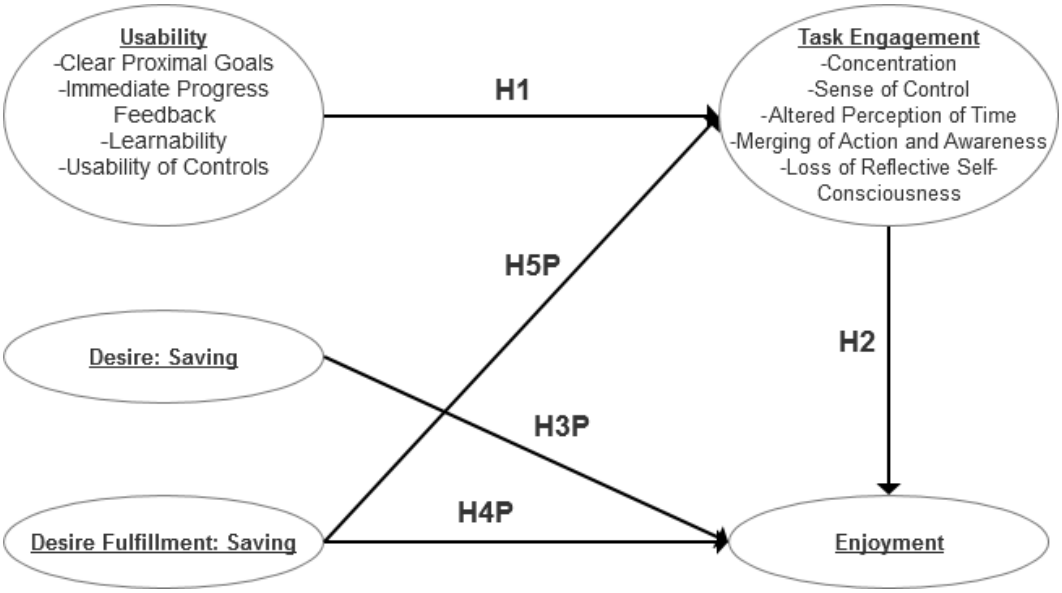

Figure 17. Conceptual Desire Fulfillment Model for Saving Showing Hypothesized Relationships.

Applying the proposed Desire Fulfillment Model (see Figure 2) to Saving, Figure 17 above shows the proposed Desire Fulfillment Model for Saving and its hypothesized relationships. The analysis for Saving began with stepwise multiple

linear regression by testing each hypothesized relationship in the proposed model with separate analyses for one dependent variable at time. Mean average scores on each measurement scale were used for all regression analyses rather than weighting them by factor loadings so that each item was evenly weighted. The results of this analysis are shown in Table 7 below, with the separate analysis for each dependent variable in separate boxes.

Table 7. Results of Stepwise Multiple Linear Regression Analysis of the Desire Fulfillment Model for Saving.

Relationship	R^2 Change	Significance for this relationship (*p*-value from Coefficients table *t*-tests)	Significance for the overall model (*p*-value from ANOVA table *F* test)
Sense Of Control -> Enjoyment	.189	< .001	< .001
Concentration -> Enjoyment	.104	< .001	< .001
Immediate Progress Feedback -> Sense of Control	.124	< .001	< .001
Clear Proximal Goals -> Sense of Control	.030	.037	< .001
Clear Proximal Goals -> Concentration	.098	< .001	< .001
Desire Fulfillment: Saving -> Concentration	.029	.043	< .001
Desire: Saving -> Desire Fulfillment: Saving	.084	.001	.001

Looking at the results of the stepwise multiple linear regression, Sense of Control and Concentration both had significant impacts on Enjoyment ($p < .05$). This supports H2, that Task Engagement has a positive impact on Enjoyment. Desire Fulfillment: Saving and Desire: Saving did not have significant impacts on

Enjoyment while controlling for these other effects on Enjoyment, meaning that H3P and H4P were not supported.

Desire Fulfillment: Saving had a significant impact on Concentration, one of the Task Engagement sub-dimensions that significantly impacted Enjoyment. These results support H5P, that Desire Fulfillment: Saving has a positive impact on Task Engagement.

Clear Proximal Goals had significant impacts on both Concentration and Sense of Control. Immediate Progress Feedback had a significant impact on Sense of Control. These results support H1, that Usability has a positive impact on Task Engagement.

Finally, Desire: Saving had a significant impact on Desire Fulfillment: Saving. Figure 18 shows the conceptual model visualizing the findings from the multiple linear regression analysis. The pattern of results for Saving was similar to the results for Tranquility.

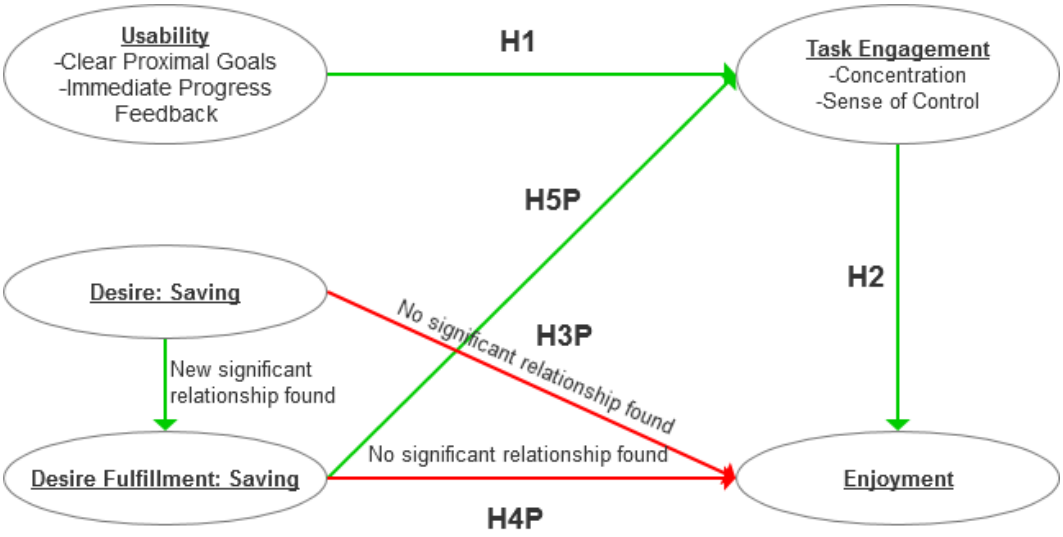

Figure 18. Conceptual Desire Fulfillment Model for Saving Showing Findings from Multiple Linear Regression.

Structural Equation Modeling (SEM) was conducted next. SEM was conducted with IBM Amos.

With the smaller sample size in this analysis (N = 129), the Task Engagement sub-dimension Loss of Reflective Self-Consciousness failed to converge into a single factor. LSC01 loaded onto Immediate Progress Feedback and LSC02 loaded onto its own factor. This may have been because only two items for Loss of Reflective Self-Consciousness survived instrument validation, and as a result it was lacking in internal consistency reliability (Cronbach's Alpha = .649). So, the

Loss of Reflective Self-Consciousness factor was dropped from this SEM analysis.

The initially specified model included all hypothesized relationships plus a line between Desire: Saving and Desire Fulfillment: Saving. Many of the path coefficients in this model were non-significant. This initial model was lacking in parsimony with all of those non-significant paths included, which was using up the available degrees of freedom without adding predictive power. Starting with this initial model, the *p*-values of the path coefficients were examined and paths which were non-significant in the SEM analysis were removed. Factors with no remaining paths directly or indirectly to Enjoyment were removed.

The resulting model is presented in Figure 19 below. Each of the model fit statistics examined except for *CFI* indicated the model fit well with the data (χ^2 = 761.351; df = 517; $p < 0.001$; $N = 129$; *CMIN/DF* = 1.473; *CFI* = .895; *SRMR* = .086; *RMSEA* = .061; *PClose* = .031). According to the thresholds laid out by Hu and Bentler (1999), the *CMIN/DF* between 1 and 3 indicated the model had an excellent fit with the data. The *CFI* indicated a poor fit between the model and the data (*CFI* < .9), possibly due to a lower sample size in this analysis leading to less degrees of freedom. The other fit statistics examined showed an acceptable fit between the model and the data. Collecting more data from people who

indicate that Saving was relevant or applicable to their gameplay experience may result in a higher *CFI*.

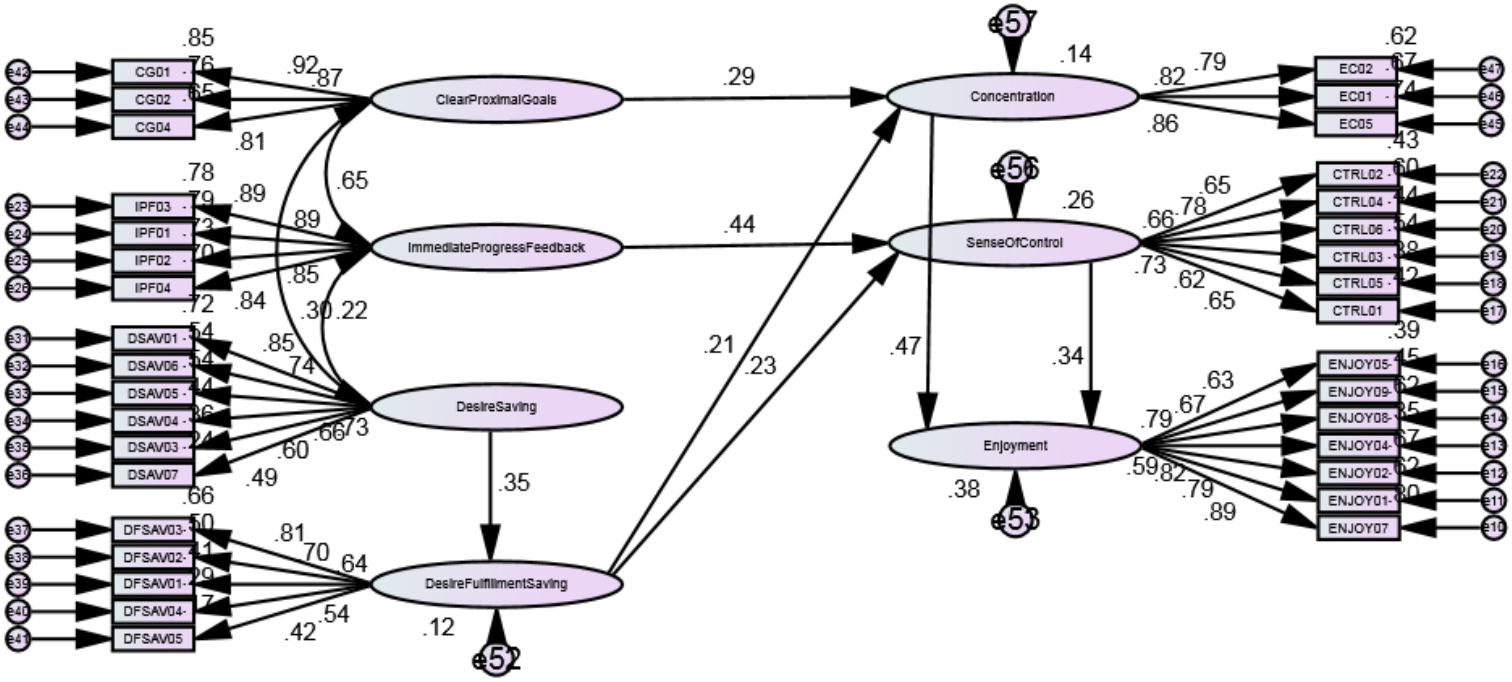

Figure 19. Structural Equation Model for the Desire Fulfillment Model for Saving.

The SEM results were consistent with the findings from multiple regression.

To summarize, just as with the multiple regression analysis, all hypothesized relationships in the Desire Fulfillment Model for Saving were supported by the SEM results except for the relationship between Desire: Saving and Enjoyment (H3P) and the relationship between Desire Fulfillment: Saving and Enjoyment (H4P). Although it was not a hypothesized path, Desire: Saving had a significant impact on Desire Fulfillment: Saving.

Concentration and Sense of Control had a significant impact on Enjoyment. Clear Proximal Goals and Immediate Progress Feedback were the Usability sub-dimensions that had a significant impact on Task Engagement. Clear Proximal Goals and Desire Fulfillment: Independence had a significant impact on Concentration. Immediate Progress Feedback and Desire Fulfillment: Independence had significant impacts on Sense of Control.

The R^2 for Enjoyment was .38, so Amos estimated that the predictors of Enjoyment in the SEM model explained 38% of the variance in Enjoyment. The R^2 for Desire Fulfillment: Saving was .12. So, participants' individual level of desire to decide collect things in the game predicted 12% of the variance in how much they experienced collecting things when they played the game. In other

words, how much a person feels like they collected things while playing the game is only 12% determined by that person's individual level of desire to collect things.

Turning to the higher level conceptual model, the pattern of the results from the SEM is consistent with the pattern of the results from the multiple regression analysis shown in the conceptual model above (see Figure 18). The significant relationships found with both analysis methods are summarized at a high level in the revised conceptual model below (see Figure 20).

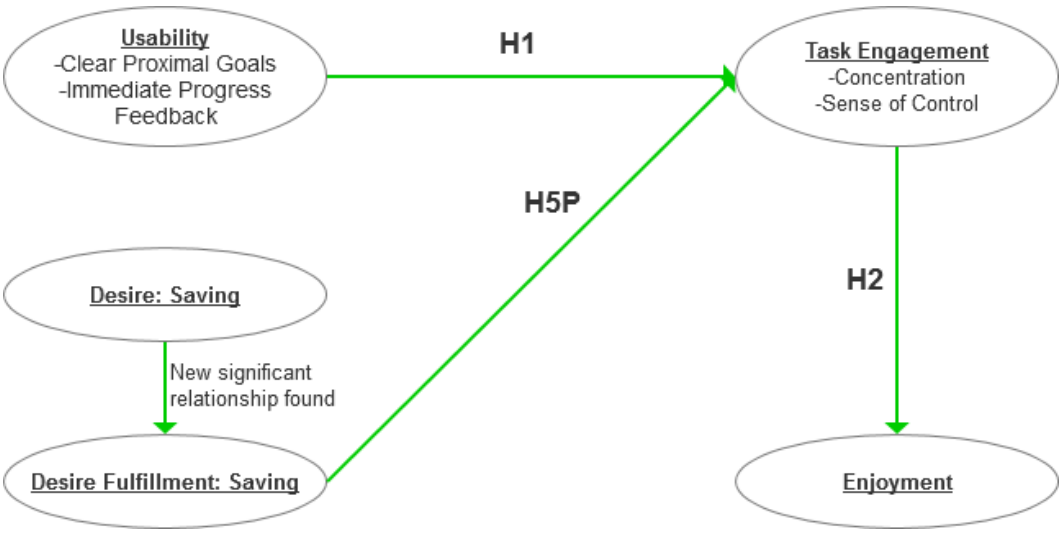

Figure 20. Revised Conceptual Desire Fulfillment Model for Saving.

5. 5. 5. Power

Power is the desire to influence, lead, or direct others. Power was the desire sixth most frequently checked as fulfilled or satisfied by participants, with 127/315 (40.3%) checking the box for Power and therefore answering the Desire and Desire Fulfillment Questionnaires for Power.

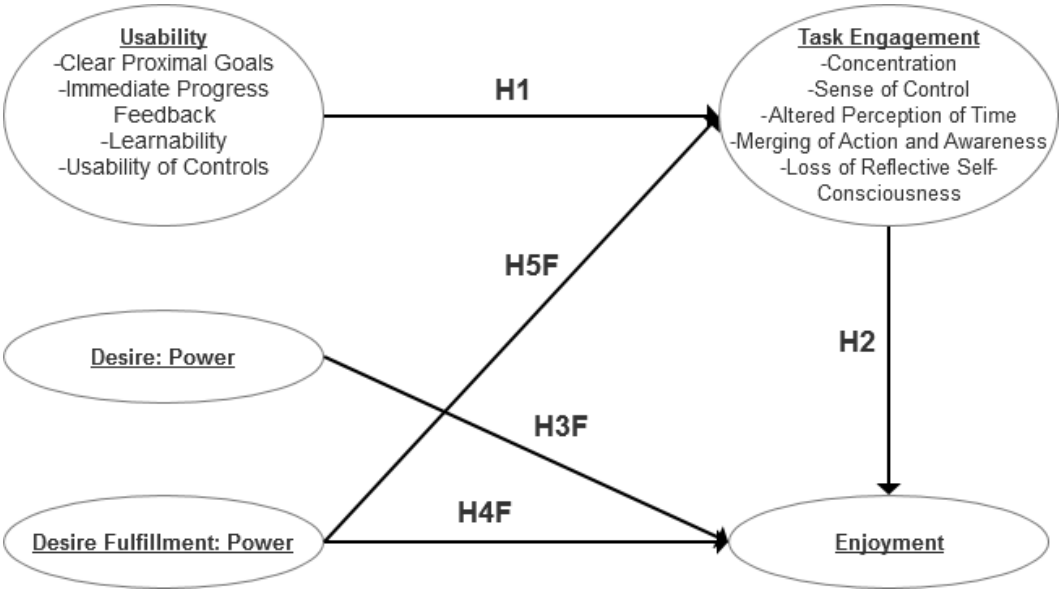

Figure 21. Conceptual Desire Fulfillment Model for Power Showing Hypothesized Relationships

Applying the proposed Desire Fulfillment Model (see Figure 2) to Power, Figure 21 above shows the proposed Desire Fulfillment Model for Power and its hypothesized relationships. The analysis for Power began with stepwise multiple

linear regression by testing each hypothesized relationship in the proposed model with separate analyses for one dependent variable at time. Mean average scores on each measurement scale were used for all regression analyses rather than weighting them by factor loadings so that each item was evenly weighted. The results of this analysis are shown in Table 8 below, with the separate analysis for each dependent variable in separate boxes.

Table 8. Results of Stepwise Multiple Linear Regression Analysis of the Desire Fulfillment Model for Power.

Relationship	R^2 Change	Significance for this relationship (*p*-value from Coefficients table *t*-tests)	Significance for the overall model (*p*-value from ANOVA table *F* test)
Sense Of Control -> Enjoyment	.189	< .001	< .001
Concentration -> Enjoyment	.104	< .001	< .001
Immediate Progress Feedback -> Sense of Control	.124	< .001	< .001
Clear Proximal Goals -> Sense of Control	.030	.044	< .001
Clear Proximal Goals -> Concentration	.098	< .001	< .001
Desire Fulfillment: Power -> Concentration	.040	.018	< .001
Desire: Power -> Desire Fulfillment: Power	.125	< .001	< .001

Looking at the results of the stepwise multiple linear regression, the pattern of results for Power was similar to the pattern for Tranquility and Saving. Sense of Control and Concentration both had significant impacts on Enjoyment ($p <$ .05). This supports H2, that Task Engagement has a positive impact on

Enjoyment. Desire Fulfillment: Power and Desire: Power did not have significant impacts on Enjoyment while controlling for these other effects on Enjoyment, meaning that H3F and H4F were not supported.

Desire Fulfillment: Power had a significant impact on Concentration, one of the Task Engagement sub-dimensions that significantly impacted Enjoyment. These results support H5F, that Desire Fulfillment: Power has a positive impact on Task Engagement.

Clear Proximal Goals had significant impacts on both Concentration and Sense of Control. Immediate Progress Feedback had a significant impact on Sense of Control. These results support H1, that Usability has a positive impact on Task Engagement.

Finally, Desire: Power had a significant impact on Desire Fulfillment: Power. Figure 22 shows the conceptual model visualizing the findings from the multiple linear regression analysis.

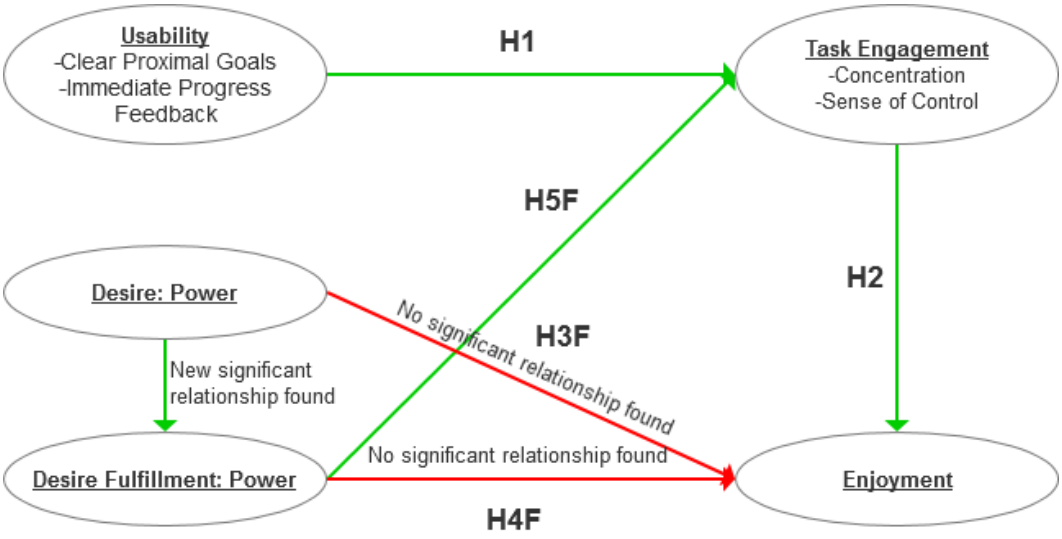

Figure 22. Conceptual Desire Fulfillment Model for Power Showing Findings from Multiple Linear Regression.

Structural Equation Modeling (SEM) was conducted next. SEM was conducted with IBM Amos.

With the smaller sample size in this analysis (N = 127), one of the Enjoyment items, ENJOY07, failed to converge with the other Enjoyment items into a single factor. So, this item was dropped from this SEM analysis. With this item dropped, Enjoyment still had 6 items and had sufficient internal consistency reliability (Cronbach's Alpha = .820, which is above the .7 standard minimum).

Using the full SEM model failed to produce useful, significant results due to the lower sample size. While the overall model fit well with the data, several paths became non-significant, and removing those paths made the model fall apart or become meaningless. Imputing factor scores with Amos and creating a path model rather than the full SEM model led to significant paths, but the overall model did not fit well with the data.

In summary, the sample size available of those who checked the box to indicate Power was a desire that was satisfied or fulfilled by their gameplay experience was too small to effectively run SEM analysis. This subset of 127 participants seems to be too small of a sample size to effectively run SEM.

Turning to the higher level conceptual model, while SEM could not be used to confirm the overall model for Power, the results from the multiple regression were enough to inform the revised conceptual model below (see Figure 23).

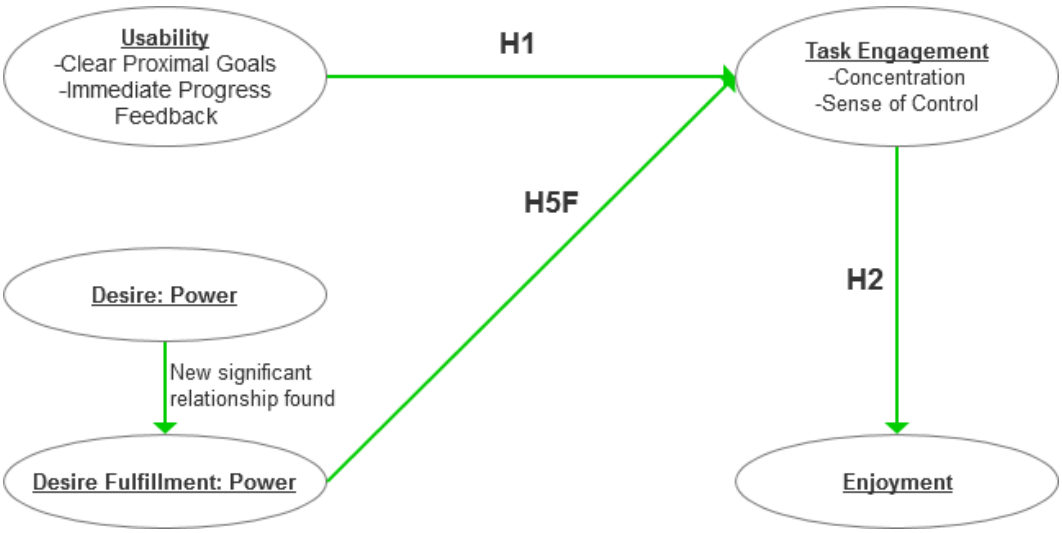

Figure 23. Revised Conceptual Desire Fulfillment Model for Power.

5. 5. 6. Order

Order is the desire to organize or make things orderly. Order was the desire ninth most frequently checked as fulfilled or satisfied by participants, with 82/315 (26.0%) checking the box for Order and therefore answering the Desire and Desire Fulfillment Questionnaires for Order.

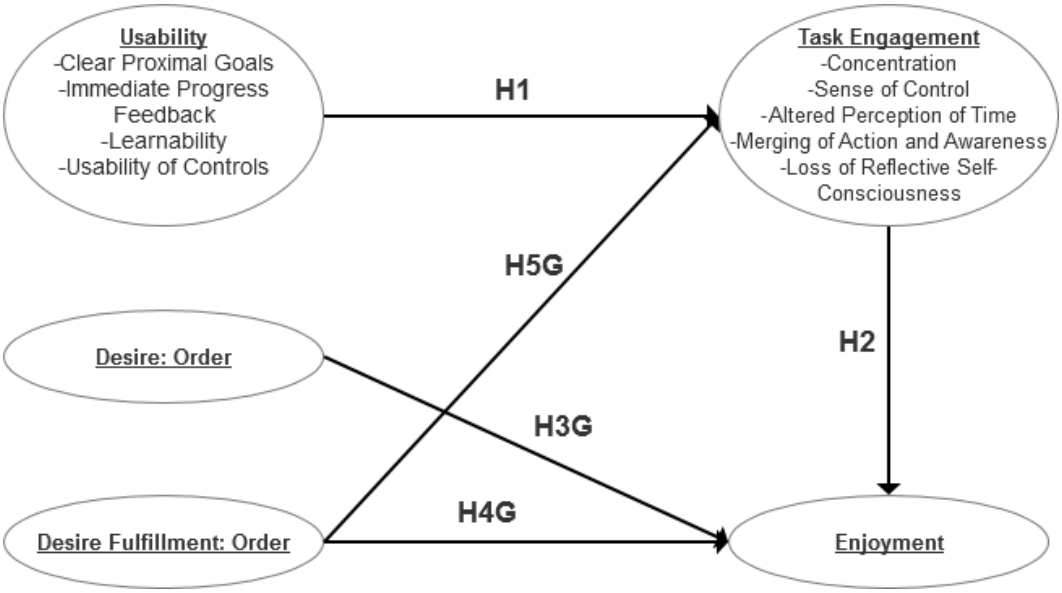

Figure 24. Conceptual Desire Fulfillment Model for Order Showing Hypothesized Relationships.

Applying the proposed Desire Fulfillment Model (see Figure 2) to Order, Figure 24 above shows the proposed Desire Fulfillment Model for Order and its hypothesized relationships. The analysis for Order began with stepwise multiple linear regression by testing each hypothesized relationship in the proposed model with separate analyses for one dependent variable at time. Mean average scores on each measurement scale were used for all regression analyses rather than weighting them by factor loadings so that each item was evenly weighted. The

results of this analysis are shown in Table 9 below, with the separate analysis for each dependent variable in separate boxes.

Table 9. Results of Stepwise Multiple Linear Regression Analysis of the Desire Fulfillment Model for Order.

Relationship	R^2 Change	Significance for this relationship (*p*-value from Coefficients table *t*-tests)	Significance for the overall model (*p*-value from ANOVA table *F* test)
Sense Of Control -> Enjoyment	.189	< .001	< .001
Concentration -> Enjoyment	.104	.001	< .001
Desire: Order -> Enjoyment	.037	.041	< .001
Immediate Progress Feedback -> Sense of Control	.124	.001	.001
Clear Proximal Goals -> Concentration	.098	.004	.004
Desire Fulfillment: Order -> Concentration	.081	.007	< .001
Desire: Order -> Desire Fulfillment: Order	.080	.010	.010

Looking at the results of the stepwise multiple linear regression, Sense of Control and Concentration both had significant impacts on Enjoyment ($p < .05$). This supports H2, that Task Engagement has a positive impact on Enjoyment. While controlling for these effects, Desire: Order had a significant impact on Enjoyment, supporting H3G. However, Desire Fulfillment: Order did not have significant impacts on Enjoyment while controlling for these other effects on Enjoyment, meaning that H4G was not supported.

Desire Fulfillment: Order had a significant impact on Concentration, one of the Task Engagement sub-dimensions that significantly impacted Enjoyment. This supports H5G, that Desire Fulfillment: Order has a positive impact on Task Engagement.

Clear Proximal Goals had a significant impact on Concentration. Immediate Progress Feedback had a significant impact on Sense of Control. These results support H1, that Usability has a positive impact on Task Engagement.

Finally, Desire: Order had a significant impact on Desire Fulfillment: Order. Figure 25 shows the conceptual model visualizing the findings from the multiple linear regression analysis.

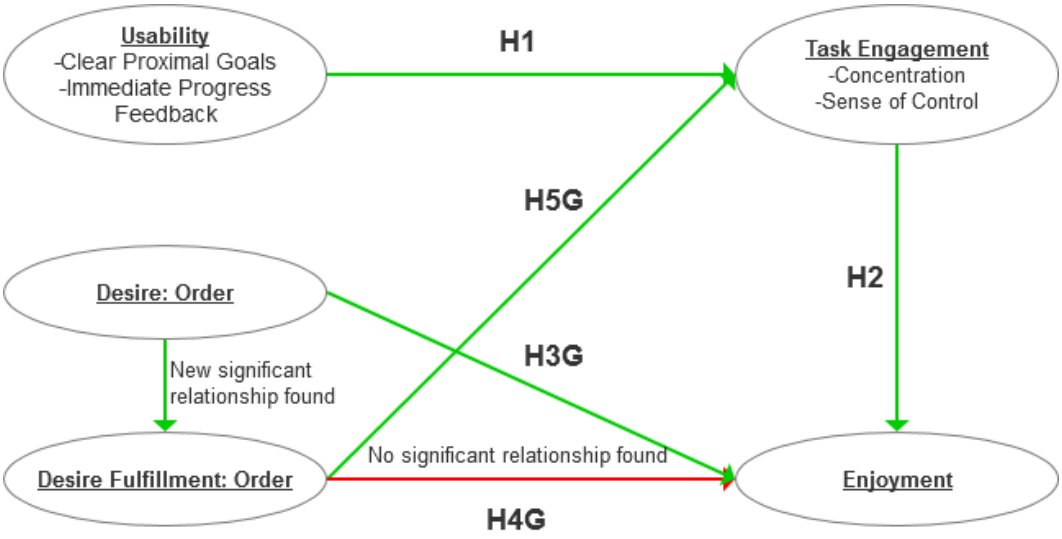

Figure 25. Conceptual Desire Fulfillment Model for Order Showing Findings from Multiple Linear Regression.

With the smaller sample size in this analysis (N = 82), it was not possible to conduct SEM analysis with both the measurement model and path model. The factor analysis to build the measurement model failed to extract the factors due to the smaller sample size. This made imputing factor scores not possible as well, so a path model based on factor scores could not be created and tested.

In summary, the sample size available of those who checked the box to indicate Order was a desire that was satisfied or fulfilled by their gameplay experience was too small to effectively run SEM analysis. This subset of 82 participants seems to be too small of a sample size to effectively run SEM.

Turning to the higher level conceptual model, while SEM could not be used to confirm the overall model for Order, the results from the multiple regression were enough to inform the revised conceptual model below (see Figure 26).

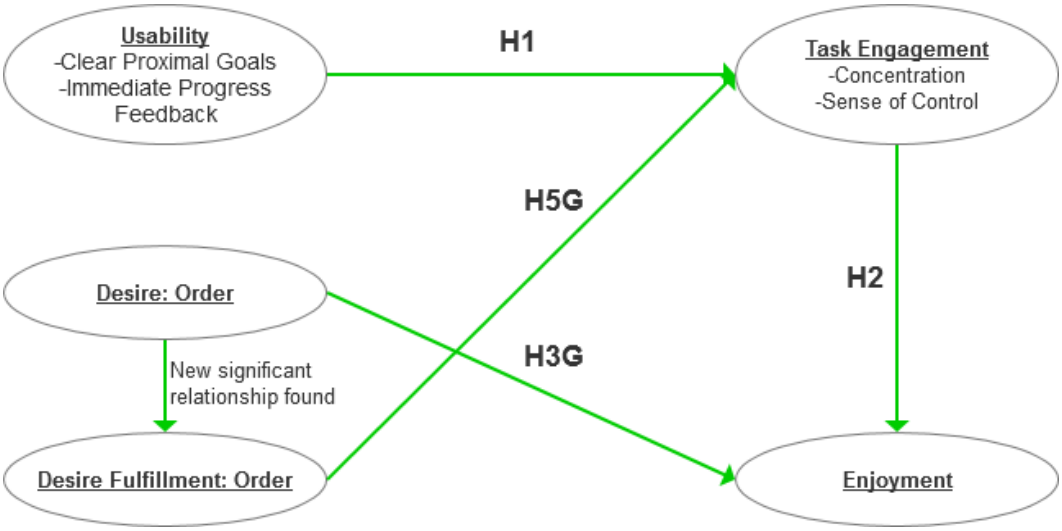

Figure 26. Revised Conceptual Desire Fulfillment Model for Order.

5. 5. 7. Honor

Honor is the desire to do the right thing according to a code of conduct (including ethics, morality, tradition, or integrity). Honor was the desire tenth most frequently checked as fulfilled or satisfied by participants, with 78/315 (24.8%) checking the box for Honor and therefore answering the Desire and Desire Fulfillment Questionnaires for Honor.

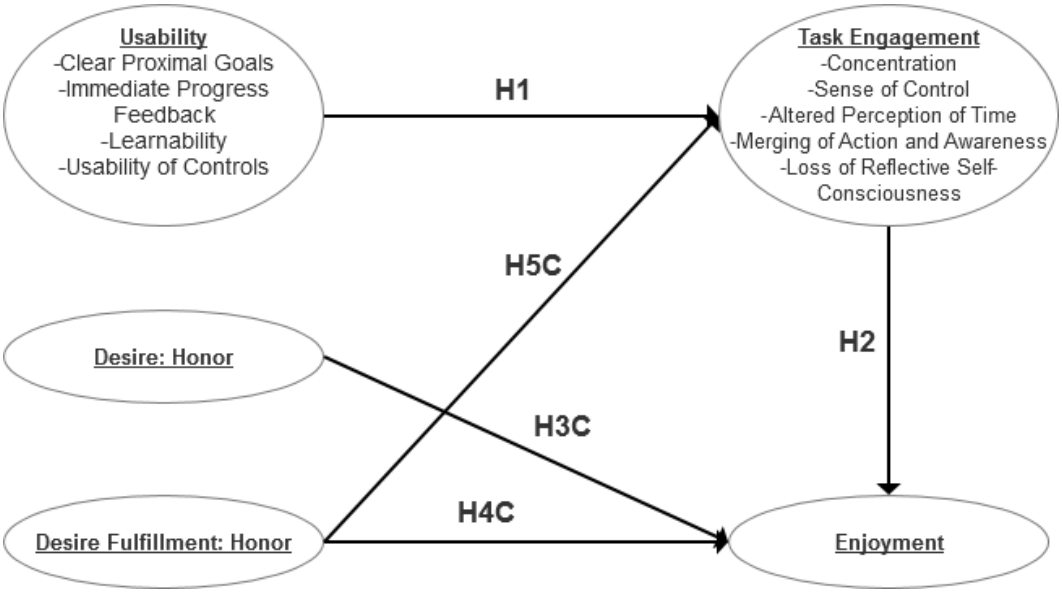

Figure 27. Conceptual Desire Fulfillment Model for Honor Showing Hypothesized Relationships.

Applying the proposed Desire Fulfillment Model (see Figure 2) to Honor, Figure 27 above shows the proposed Desire Fulfillment Model for Honor and its hypothesized relationships. The analysis for Honor began with stepwise multiple linear regression by testing each hypothesized relationship in the proposed model with separate analyses for one dependent variable at time. Mean average scores on each measurement scale were used for all regression analyses rather than weighting them by factor loadings so that each item was evenly weighted. The

results of this analysis are shown in Table 10 below, with the separate analysis for each dependent variable in separate boxes.

Table 10. Results of Stepwise Multiple Linear Regression Analysis of the Desire Fulfillment Model for Honor.

Relationship	R^2 Change	Significance for this relationship (*p*-value from Coefficients table *t*-tests)	Significance for the overall model (*p*-value from ANOVA table *F* test)
Sense Of Control -> Enjoyment	.189	< .001	< .001
Concentration -> Enjoyment	.104	.001	< .001
Desire Fulfillment: Honor -> Enjoyment	.034	.057 (n.s.)	< .001
Desire Fulfillment: Honor -> Sense of Control	.154	< .001	< .001
Immediate Progress Feedback -> Sense of Control	.085	.005	< .001
Clear Proximal Goals -> Concentration	.098	.005	.005
Desire Fulfillment: Honor -> Concentration	.044	.053 (n.s.)	.003
Desire: Honor -> Desire Fulfillment: Honor	.042	.071 (n.s.)	.071

Looking at the results of the stepwise multiple linear regression, the pattern of results for Honor was similar to the pattern for Tranquility, Saving, and Power, except the relationship between Desire and Desire Fulfillment was not significant. Sense of Control and Concentration both had significant impacts on Enjoyment ($p < .05$). This supports H2, that Task Engagement has a positive impact on Enjoyment. While the impact of Desire Fulfillment: Honor on Enjoyment was nearly significant ($p = .057$), Desire Fulfillment: Honor and Desire: Honor did not have significant impacts on Enjoyment while controlling for effects of Sense of

Control and Concentration on Enjoyment, meaning that H3C and H4C were not supported.

Desire Fulfillment: Honor had a significant impact on Sense of Control, one of the Task Engagement sub-dimensions that significantly impacted Enjoyment. This supports H5C, that Desire Fulfillment: Honor has a positive impact on Task Engagement. Desire Fulfillment: Honor also had a nearly significant impact on Concentration ($p = 0.53$).

Clear Proximal Goals had a significant impact on Concentration. Immediate Progress Feedback had a significant impact on Sense of Control. These results support H1, that Usability has a positive impact on Task Engagement.

Finally, the impact of Desire: Honor on Desire Fulfillment: Honor was not significant ($p = .071$). This result did not support the new relationship between Desire and Desire Fulfillment which has been found significant for each desire examined so far.

It is possible that the relationships that were not significant could be found significant if a larger sample size was collected, as the sample size for this analysis consists of the 78 participants who checked the box to indicate that their recent experience playing the digital game they named satisfied or fulfilled a

desire for Honor. These results do not rule out these non-significant relationships, but the available evidence was not enough to support them.

Figure 28 shows the conceptual model visualizing the findings from the multiple linear regression analysis.

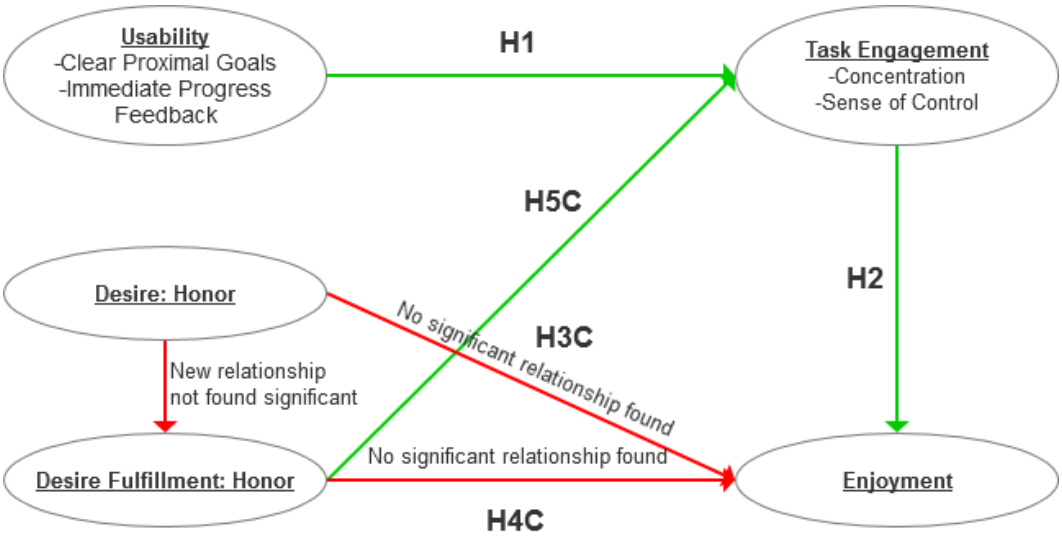

Figure 28. Conceptual Desire Fulfillment Model for Honor Showing Findings from Multiple Linear Regression.

With the smaller sample size in this analysis (N = 78), it was not possible to conduct SEM analysis with both the measurement model and path model. The factor analysis to build the measurement model failed to extract the factors due to

the smaller sample size. This made imputing factor scores not possible as well, so a path model based on factor scores could not be created and tested.

In summary, the sample size available of those who checked the box to indicate Honor was a desire that was satisfied or fulfilled by their gameplay experience was too small to effectively run SEM analysis. This subset of 78 participants seems to be too small of a sample size to effectively run SEM.

Turning to the higher level conceptual model, while SEM could not be used to confirm the overall model for Order, the results from the multiple regression were enough to inform the revised conceptual model below (see Figure 29).

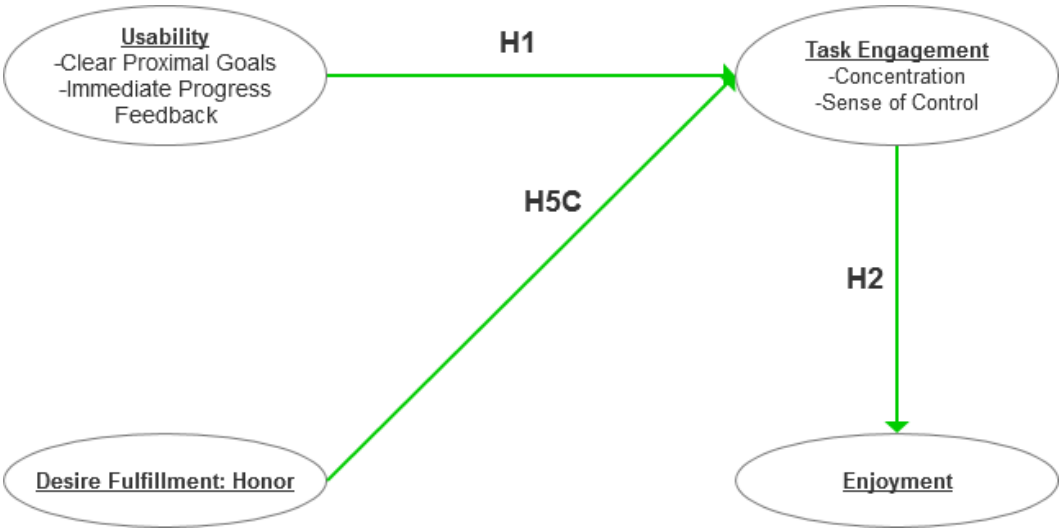

Figure 29. Revised Conceptual Desire Fulfillment Model for Honor.

5. 5. 8. Idealism

Idealism is the desire to improve society (including public service, altruism, and social justice). Idealism was the desire twelfth most frequently checked as fulfilled or satisfied by participants, with 39/315 (12.4%) checking the box for Idealism and therefore answering the Desire and Desire Fulfillment Questionnaires for Idealism.

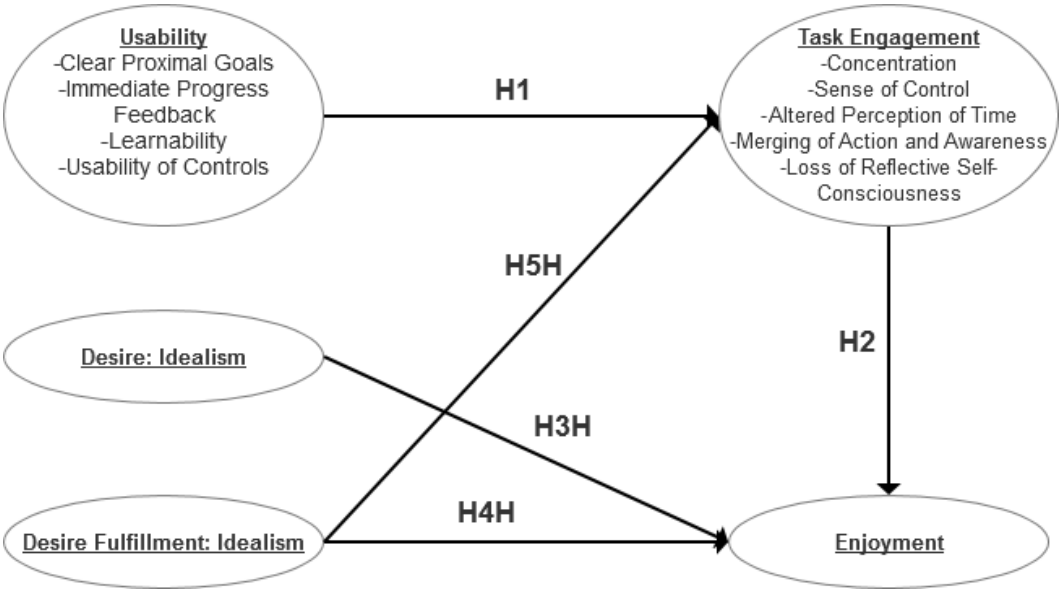

Figure 30. Conceptual Desire Fulfillment Model for Idealism Showing Hypothesized Relationships.

Applying the proposed Desire Fulfillment Model (see Figure 2) to Idealism, Figure 30 above shows the proposed Desire Fulfillment Model for Idealism and

its hypothesized relationships. The analysis for Idealism began with stepwise multiple linear regression by testing each hypothesized relationship in the proposed model with separate analyses for one dependent variable at time. Mean average scores on each measurement scale were used for all regression analyses rather than weighting them by factor loadings so that each item was evenly weighted. The results of this analysis are shown in Table 11 below, with the separate analysis for each dependent variable in separate boxes.

Table 11. Results of Stepwise Multiple Linear Regression Analysis of the Desire Fulfillment Model for Idealism.

Relationship	R^2 Change	Significance for this relationship (*p*-value from Coefficients table *t*-tests)	Significance for the overall model (*p*-value from ANOVA table *F* test)
Sense Of Control -> Enjoyment	.189	.006	.006
Concentration -> Enjoyment	.104	.027	.002
Desire Fulfillment: Idealism -> Sense of Control	.196	.005	.005
Immediate Progress Feedback -> Sense of Control	.121	.016	.001
Desire Fulfillment: Idealism -> Concentration	.190	.006	.006
Immediate Progress Feedback -> Concentration	.079	.056 (n.s.)	.004

Looking at the results of the stepwise multiple linear regression, the pattern of results for Idealism was similar to the pattern for Honor. Sense of Control and Concentration both had significant impacts on Enjoyment ($p < .05$). This supports H2, that Task Engagement has a positive impact on Enjoyment. Desire

Fulfillment: Idealism and Desire: Idealism did not have significant impacts on Enjoyment while controlling for effects of Sense of Control and Concentration on Enjoyment, meaning that H3H and H4H were not supported.

Desire Fulfillment: Idealism had significant impacts on both Sense of Control and Concentration, the two Task Engagement sub-dimensions that significantly impacted Enjoyment. This supports H5H, that Desire Fulfillment: Idealism has a positive impact on Task Engagement.

Immediate Progress Feedback had a significant impact on Sense of Control. This support H1, that Usability has a positive impact on Task Engagement. The impact of Immediate Progress Feedback on Concentration was nearly but not quite significant (p = .056).

Finally, the impact of Desire: Idealism on Desire Fulfillment: Idealism was not significant (p = .278). This result did not support the new relationship between Desire and Desire Fulfillment which has been found significant for each desire except for Honor examined so far.

It is possible that the relationships that were not significant could be found significant if a larger sample size was collected, as the sample size for this analysis consists of the 39 participants who checked the box to indicate that their

recent experience playing the digital game they named satisfied or fulfilled a desire for Idealism. These results do not rule out these non-significant relationships, but the available evidence was not enough to support them.

Figure 31 shows the conceptual model visualizing the findings from the multiple linear regression analysis.

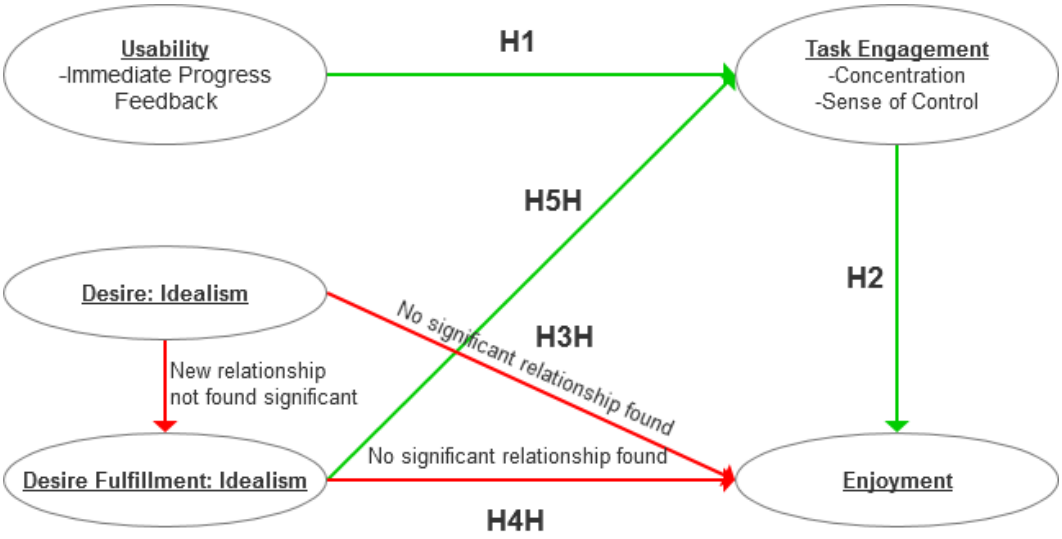

Figure 31. Conceptual Desire Fulfillment Model for Idealism Showing Findings from Multiple Linear Regression.

With the very small sample size in this analysis (N = 39), it was not possible to conduct SEM analysis. The factor analysis to build the measurement model produced a non-positive definite matrix error due to the small sample size. This

made imputing factor scores not possible as well, so a path model based on factor scores could not be created and tested.

In summary, the sample size available of those who checked the box to indicate Idealism was a desire that was satisfied or fulfilled by their gameplay experience was much too small to effectively run SEM analysis. This subset of 39 participants was much too small of a sample size to effectively run SEM.

Turning to the higher level conceptual model, while SEM could not be used to confirm the overall model for Idealism, the results from the multiple regression were enough to inform the revised conceptual model below (see Figure 32).

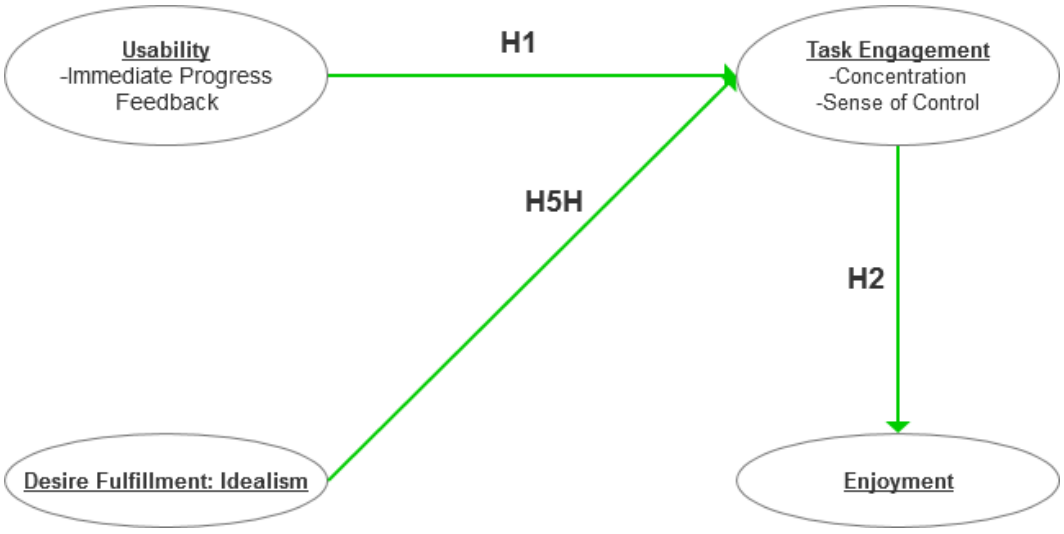

Figure 32. Revised Conceptual Desire Fulfillment Model for Idealism.

5. 5. 9. Other Desires

The other desires tested either did not have a large enough sample size to show a significant impact on Enjoyment (due to not enough of the participants indicating that the desire was relevant to the game-playing experience in question), or fulfilling those desires did not show a significant impact on Enjoyment.

The stepwise multiple linear regression results showed that fulfilling desires for Acceptance and Social Contact did not have a statistically significant impact on Enjoyment or Task Engagement. Desire Fulfillment: Acceptance did not have a statistically significant impact on Enjoyment ($p = .688$), Concentration ($p = .736$), or Sense of Control ($p = .678$). Desire Fulfillment: Social Contact did not have a statistically significant impact on Enjoyment ($p = .916$), Concentration ($p = .085$), or Sense of Control ($p = .273$). These were the results even without controlling for other factors in the model. If a larger sample size were collected, perhaps Desire Fulfillment: Social Contact would be found to have a significant impact on Concentration, as the relationship was nearly but not quite significant.

Only 20-27 participants checked the box to indicate that Physical Exercise ($N = 27$), Family ($N = 23$), or Eating ($N = 20$) were desires that were satisfied or

fulfilled by their gameplay experience, and therefore relevant to their experience. Because only this small subset of the participants answered the Desire and Desire Fulfillment questions in the survey, the available sample size for these desires was too small to find significant results with multiple regression.

Other than the link between Desire and Desire Fulfillment, significant results were not found with multiple regression for Status, Romance, or Vengeance. Because each dependent variable was analyzed separately in the multiple regression, this relationship between Desire and Desire Fulfillment was the only one analyzed without any other predictors in the model, making it easier to find significant results for that relationship. Without evidence that fulfilling a desire leads to Enjoyment (or indirectly leads to Enjoyment by increasing the Task Engagement sub-dimensions Concentration or Sense of Control which in turn increase Enjoyment), it may not be within the scope of the present research to examine what leads to fulfillment of that desire. However, perhaps these relationships will be useful for future research. Desire: Status had a significant impact on Desire Fulfillment: Status ($R^2 = .134$; $p < .001$). Desire: Romance had a significant impact on Desire Fulfillment: Romance ($R^2 = .282$; $p = .023$). Desire: Vengeance had a significant impact on Desire Fulfillment: Vengeance ($R^2 = .067$; $p = .004$). While the available sample size for Romance was quite small

(N = 18), the sample size for Status (N = 102) and Vengeance (N = 120) may have been large enough to show an effect if a large enough effect was present.

While this is not proof that fulfilling these desires Status and Vengeance has no effect on Enjoyment, it is theoretically possible that these desires may be fulfilled by games and at the same time not increase Enjoyment. Status is the desire for prestige, social standing, and positive attention. Vengeance is the desire to get even (including desire to compete, to win). People may want Status or Vengeance, but upon fulfilling those desires not find Enjoyment in that outcome.

CHAPTER 6. DISCUSSION

Overall, the results from the online survey of digital game players supported the proposed model of Desire Fulfillment Theory, with some revisions. The revised model based on the results from the above analysis is presented in this section, and the implications of these findings are discussed.

While Structural Equation Modeling confirmed that the overall model fit well with the data for several of the desires, it could only be used to analyze the desires with a larger sample size. So, the stepwise multiple linear regression analysis was more robust in that it could be used to analyze even the desires with a lower

sample size. Again, the sample size for the desires was less than the full 315 valid responses to the survey because the questions about the 16 basic human desires – both desire and desire fulfillment – were only asked if they checked the checkbox for that desire to indicate that desire was satisfied or fulfilled by the last digital game the participant indicated that they played for at least 30 minutes (see Section 4. 3. above for details).

The lower-level, first order factors intended to make up Usability and Task Engagement did not converge well onto higher-level, second-order factors, so the lower-level, first order factors were used for the analysis (see Section 5. 2. 1. above for the analysis supporting this decision). When these lower-level factors were used, a consistent pattern emerged from the analysis. Clear Proximal Goals led to Concentration, which led to Enjoyment. Immediate Progress Feedback led to Sense of Control, which led to Enjoyment. These relationships are shown in Figure 33 below.

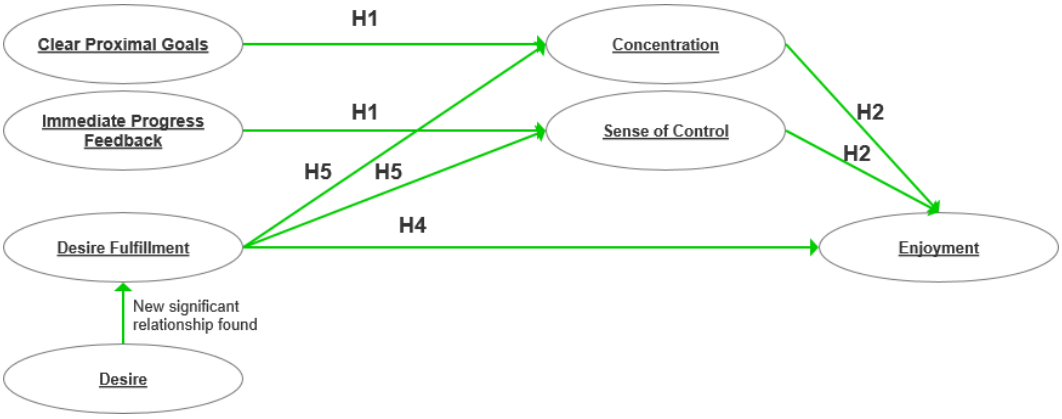

Figure 33. Revised Model of Desire Fulfillment Theory.

The revised model shown in Figure 33 above is derived from the pattern of results from the multiple regression analysis and confirmed by the results of the structural equation modeling. What was impacted by Desire Fulfillment did vary across desires (see Sub-Section 6. 2. below), so the relationships found with Desire Fulfillment: Curiosity were used in this model. Curiosity was chosen because it had the largest available sample size for analysis among all of the desires, so the results for Desire Fulfillment: Curiosity may be the more precise. In addition, this model shows both of the ways that Desire Fulfillment can impact Enjoyment depending on the desire: directly impacting Enjoyment and indirectly impacting Enjoyment by increasing the Task Engagement sub-dimensions Concentration and Sense of Control. So, this is a revised general model for Desire Fulfillment Theory based on the results across desires.

To break down the meaning of what was found, each part of the Revised Model of Desire Fulfillment Theory presented in Figure 33 above will be discussed. This discussion is organized into the following Sub-Sections: Clear Goals and Immediate Feedback Lead to Task Engagement which Leads to Enjoyment, Desire Fulfillment Impacts Task Engagement and Enjoyment, Desire Impacts Desire Fulfillment (and Does Not Directly Impact Enjoyment). Then the Practical Implications for Game Design and User Experience Practitioners are presented. Finally, Additional Analysis: Combining Desires explores the effects of multiple desires when they are combined and analyzed together.

6. 1. Clear Goals and Immediate Feedback Lead to Task Engagement which Leads to Enjoyment

The first set of relationships found in this research that will be discussed were hypothesized as Usability having a positive impact on Task Engagement, and that Task Engagement in turn having a positive impact on Enjoyment. Rather than using the higher-level, second-order factors of Usability and Task Engagement, the lower-level, first-order factors were used because these lower-level factors did not converge into single higher-level factors. Looking at these lower-level factors, the results from the multiple regression and SEM analyses showed that there were two main paths influencing Enjoyment. Clear Proximal

Goals leads to Concentration, which leads to Enjoyment. Immediate Progress Feedback leads to Sense of Control, which leads to Enjoyment.

As discussed in Section 2. 2. 2. above, Nakamura and Csikszentmihalyi (2014) conceptually separated the factors that lead to flow, or the flow conditions, from the factors that indicate how much a person is in flow, or the flow indicators. In the author's previous study of flow in games (Schaffer & Fang, 2016, 2015), the flow conditions and indicators were measured separately by adapting previously validated measures of flow (Fang et al., 2013; Jackson & Eklund, 2004; Jackson & Marsh, 1996). Before the author's study on flow in games, previous research on flow (Jackson & Eklund, 2004; Jackson & Marsh, 1996; Fang et al., 2013) did not separate the flow conditions from the flow indicators, and instead treated all of the dimensions or factors of flow as indicators of how much a person is in flow. Nakamura and Csikszentmihalyi (2014) conceptually separated the flow conditions from the flow indicators. Then the author's previous study of flow in games (Schaffer & Fang, 2016, 2015) separately measured the flow conditions and flow indicators.

In the present research, enjoyment was separately measured from the other flow indicators to show flow leading to enjoyment. This means that flow theory suggests the flow conditions lead to the flow indicators not including enjoyment,

which in turn lead to enjoyment. And this series of relationships was what was found in the present research. Clear Proximal Goals and Immediate Progress Feedback are flow conditions, and they lead to Concentration and Sense of Control which flow indicators, and these flow indicators in turn lead to Enjoyment. Although flow theory was not the original focus of the present research, the findings from this study are a step forward for flow theory by showing how these factors relate to each other and lead to enjoyment of digital games.

The findings from the present research are consistent with the author's previous study on flow in games, which found a causal link between Immediate Progress Feedback and Flow using a controlled experiment (Schaffer & Fang, 2016, 2015). However, the present research separates enjoyment from flow and shows how the relationship between Immediate Progress Feedback and Enjoyment is mediated by players' Sense of Control. The flow conditions, or factors that causes flow, Immediate Progress Feedback and Clear Proximal Goals, lead to the flow indicators, or factors that indicate a person is in a flow state, Concentration and Sense of Control, and those flow indicators in turn lead to Enjoyment, which is a more positive evaluation of one's experience.

Clear Proximal Goals and Immediate Progress Feedback were originally hypothesized in the present research as sub-dimensions of Usability in the present research, but the main first-order factor related to usability, Usability of Controls, did not have a significant impact on the Task Engagement factors in the stepwise multiple regression analysis. These two significant factors, clear goals and immediate feedback, were derived from Flow Theory's flow conditions. This means they are both system design factors that flow theory suggests lead to more flow. Concentration and Sense of Control are both flow indicators, meaning they are factors that indicate how much a person is in a flow state. Again, Task Engagement was defined as the flow state minus Enjoyment itself, and this was done so to avoid the circular logic of Enjoyment leading to Enjoyment. So, it may be more accurate to call Clear Proximal goals and Immediate Progress Feedback system design factors than Usability sub-dimensions, but it is more useful to focus on specifically what they mean and how they operate.

The first of the two effective paths at play here is Clear Proximal Goals leading to Concentration, and Concentration leading to Enjoyment. A high level of Clear Proximal Goals means users report knowing what to do next throughout the activity. When users know what to do next, they are more able to focus their attention and concentrate on the task at hand. This greater Concentration in turn

leads to more Enjoyment. Concentration is the core of Task Engagement or the flow state. When users are concentrating on the task at hand, flow theory suggests they have less attention left over to think about unpleasant things outside of the activity like regretting the past, worrying about the future, or social anxiety. But even beyond decreasing negative affect, the present research suggests concentrating attention on a task can be its own reward.

Concentration is not merely the absence of distractions. Concentration results from having clear goals for each next step of the activity. Knowing what to do next allows users to focus their attention on the task at hand. Systems must be designed with clear proximal goals, meaning next steps must be clear throughout the activity. This is how practitioners can design for this path from Clear Proximal Goals to Concentration to Enjoyment.

Knowing what to do next is not enough though. Users also need to know how well they are doing. Immediate Progress Feedback communicates to users how well they are performing the task and making progress at the activity. Receiving this feedback gives users a Sense of Control, a sense that they have everything under control or that they feel in control of the situation. That Sense of Control in turn increases user Enjoyment.

Receiving continuous feedback about how well they are doing gives users the opportunity to learn from mistakes, keep trying again and again, and eventually overcome obstacles to achieve their current goal in that moment (their proximal goal). This feedback gives users a Sense of Control because perceiving the results of their actions – whether or not they were successful on a given attempt – gives users a sense that they can control their environment through their actions, through persistent, repeated attempts until each sub-goal is reached and task success is achieved.

This Sense of Control is enjoyable because it is a fundamental motivation for human beings to be able to influence their environment to meet their needs and desires. Receiving immediate progress feedback tells users their actions are having some impact, whether the feedback indicated task success or was constructive feedback about what needed to be learned.

Clear Proximal Goals and Immediate Progress Feedback communicate the information users need to experience flow or Task Engagement. Having clear goals for each step of the activity leads to focused concentration and receiving feedback about progress towards those goals gives users a sense that they have the situation under control. This experience of focused concentration and a sense of

control is the active ingredient of Task Engagement, meaning it is this part of Task Engagement that significantly increases Enjoyment.

Concentration and a Sense of Control leads users to more positively evaluate their experience, and the extent to which people positively evaluate their experience is how the author has defined Enjoyment here. But this is not the only factor that has an impact on Task Engagement and Enjoyment. Fulfilling basic human desires can also have an impact on Task Engagement and Enjoyment.

6. 2. Desire Fulfillment Impacts Task Engagement and Enjoyment

Although they were each from separate analyses, it is useful here to examine the results from the stepwise multiple linear regression analyses, focusing on only the significant impacts that Desire and Desire Fulfillment had on Enjoyment, Concentration, and Sense of Control. These results, sorted first by dependent variable and then by R^2 Change, are shown in Table 12 below.

Table 12. Significant Impacts of Desire and Desire Fulfillment on Enjoyment, Concentration, and Sense of Control from Separate Multiple Linear Regression Results.

Relationship	R^2 Change	Significance for this relationship (*p*-value from Coefficients table *t*-tests)	N

Desire Fulfillment: Curiosity -> Enjoyment	.117	< .001	200
Desire: Order -> Enjoyment	.037	.041	82
Desire Fulfillment: Independence -> Enjoyment	.018	.046	158
Desire Fulfillment: Idealism -> Concentration	.190	.006	39
Desire Fulfillment: Curiosity -> Concentration	.123	< .001	200
Desire Fulfillment: Order -> Concentration	.081	.007	82
Desire Fulfillment: Independence -> Concentration	.053	.002	158
Desire Fulfillment: Power -> Concentration	.040	.018	127
Desire Fulfillment: Tranquility -> Concentration	.039	.008	163
Desire Fulfillment: Saving -> Concentration	.029	.043	129
Desire Fulfillment: Idealism -> Sense of Control	.196	.005	39
Desire Fulfillment: Honor -> Sense of Control	.154	< .001	78
Desire Fulfillment: Independence -> Sense of Control	.035	.012	158
Desire Fulfillment: Tranquility -> Sense of Control	.033	.013	163
Desire Fulfillment: Curiosity -> Sense of Control	.031	.008	200

Although these effects are drawn from separate analyses where the desires were analyzed separately, in each of those analyses these effects remained significant even when controlling for the other significant factors in the model (Clear Proximal Goals and Immediate Progress Feedback for Sense of Control and Concentration; Sense of Control and Concentration for Enjoyment). Controlling for here means these factors were also entered into the stepwise multiple linear regression analyses. Comparing these results across desires is useful because it allows us to see how the results differed across the basic human desires that were examined.

While fulfilling many desires had an impact on the Task Engagement factors Concentration and Sense of Control, only the fulfillment of desires for Curiosity and Independence had a significant direct effect on Enjoyment in addition to affecting Concentration and Sense of Control. Experiences that fulfill desires to learn and to make one's own decisions both directly impact Enjoyment. Examining the R^2 Change, learning had a larger direct impact on Enjoyment (R^2 Change = .117) than making one's own decisions (R^2 Change = .018). People experience Task Engagement or flow when they are continuously adjusting performance based on continuous or immediate feedback. So, although these are distinct factors that can be analyzed separately, perhaps Task Engagement inherently involves some amount of learning. So, while feeling that one has made one's own decisions has some direct impact on Enjoyment, learning (or fulfilling a desire for curiosity) has a much greater direct impact on Enjoyment.

Players with a greater desire for order, or a desire to organize things, also tended to experience more Enjoyment. This was the only individual level of desire that significantly predicted Enjoyment in the multiple regression analysis, controlling for other significant factors in the model. This could be because players who want to be more organized tend to seek out and perceive the goals and feedback provided by the system design and then they are more able to

concentrate and have a sense of control, or it could be because they are more likely to seek out the concentration and sense of control that leads to Enjoyment.

Fulfillment of many of the desires had a significant impact on Concentration and Sense of Control, which were the Task Engagement factors that significantly impacted Enjoyment. Despite only 39 of the 315 participants checking the box for Idealism to indicate the desire was relevant or applicable to their gameplay experience, fulfilling a desire for Idealism had the greatest impact on both Concentration (R^2 *Change* = .190; p = .006) and Sense of Control (R^2 Change = .196; p = .005) among all of the desires examined.

Fulfilling a desire for Idealism involves improving society, advancing a social cause, or making things better for humankind. When the desire for Idealism is fulfilled, it may give players a sense of meaning, purpose, or significance. One of the categories of enjoyment sources identified in the card sorting study (see Table 1 in Section 3.1.) was Significance, Meaning, Purpose, & Legacy, which was about knowing why one's actions are important, significant, or meaningful or feeling that your actions are giving your life meaning or helping fulfill the purpose of one's life. So, perhaps fulfilling a desire for Idealism is so effective at increasing Concentration and Sense of Control because when players know that their actions are important, significant, or meaningful, they are more

likely to focus their attention and concentrate. Because they are focused on what is important or gives their life meaning, as opposed to focusing on trivial, non-important tasks, perhaps this makes them feel more like they have everything under control.

Desire Fulfillment: Curiosity, or fulfilling a desire to learn, had a larger impact on Concentration (R^2 Change = .123) then on Sense of Control (R^2 Change = .031). So, when players are learning that makes them more likely to concentrate on the task at hand. Learning also makes players feel they have everything under control, but this effect is weaker than the effect on Concentration.

Fulfilling desires to organize things (Order), make one's own decisions (Independence), influence, lead, or direct others (Power), relax (Tranquility), and collect things (Saving) all also had a significant impact on Concentration, although they had lower R^2 Changes than fulfilling desires for Idealism and Curiosity. Fulfilling each of these basic human desires increases the likelihood that players will concentrate on the task at hand. Fulfilling these desires is interesting or motivating enough to players to increase their concentration.

In addition to fulfilling desires for Idealism and Curiosity, fulfilling desires to follow one's own personal code of conduct (Honor), make one's own decisions (Independence), and relax (Tranquility) all also had significant impacts on players' Sense of Control. When these desires are fulfilled, players feel more in control of the situation. When players are acting in accordance with their personal code of conduct, perhaps they feel more congruent with their ideal self-image. In this way, Desire Fulfillment: Honor could contribute to their Sense of Control. Examining the R^2 Change results in Table 12 above, fulfilling desires for Idealism and Honor had a greater impact on Sense of Control than fulfilling desires for Independence, Tranquility, or Curiosity. Perhaps there is something about fulfilling these two desires, one about helping society and the other about following a personal code of conduct, which reflects a basic human desire to do good deeds (pro-social behavior) or be a good person (maintain a positive self-perception) that has been under-examined in the study of game enjoyment.

Living out a fantasy of saving the world or saving humankind may be a common theme in video games. But as serious games present the possibility that playing games with a purpose beyond enjoyment can actually benefit society, one has to wonder if these benefits to society can themselves contribute to enjoyment if they are presented to players in a way that makes their actions feel more

meaningful and important. Even in the fantasy context of digital games with no purpose beyond enjoyment, the basic human desire of Idealism, to contribute to the wellbeing of society, when fulfilled, showed the greatest impact on Concentration and Sense of Control.

Games that use their story and characters to give players a sense of meaning and purpose – a sense that their actions are important – by making them feel that their actions will serve the public, benefit humankind, or advance a social cause are more likely to get players into Task Engagement or a flow state by getting them to Concentrate on the task at hand and feel a Sense of Control, and this in turn leads to more Enjoyment.

Make users feel that their actions are important, that what they are doing will make the world a better place. This will increase Task Engagement, which leads to more Enjoyment.

6. 3. Desire Impacts Desire Fulfillment

Only players' individual level of desire for Order had a significant direct impact on Enjoyment, and the R^2 Change for that relationship was only .037, so it only predicted 3.7% of the variance in Enjoyment. A much more consistent relationship was found between Desire and Desire Fulfillment, with this

relationship being significant for all desires that could be analyzed except for Idealism. With Idealism, perhaps the small available sample size of 39 did not provide enough statistical power to find this relationship. Or perhaps Idealism is an exception and how much players want to experience fulfillment of this desire does not have a significant impact on how much they experience it.

How much Desire impacts or predicts Desire Fulfillment indicates how much players wanting to have a certain desire fulfilled predicted how much they had that desire fulfilled. Although this relationship was significant across all desires but Idealism, there was a great deal of variation across the desires examined. And although the results were drawn from separate regression results, it is useful to examine how these relationships varied across the desires. These results are presented in Table 13 below.

Table 13. Significant Impacts of Desire on Desire Fulfillment from Separate Linear Regression Results.

Relationship	R^2	Significance for this relationship (*p*-value from Coefficients table *t*-tests)	N
Desire: Romance -> Desire Fulfillment: Romance	.282	.023	18
Desire: Tranquility -> Desire Fulfillment: Tranquility	.259	< .001	163
Desire: Status -> Desire Fulfillment: Status	.134	< .001	102
Desire: Power -> Desire Fulfillment: Power	.125	< .001	127
Desire: Saving -> Desire Fulfillment: Saving	.084	.001	129

Desire: Order -> Desire Fulfillment: Order	.080	.010	82
Desire: Vengeance -> Desire Fulfillment: Vengeance	.067	.004	120
Desire: Honor -> Desire Fulfillment: Honor	.042	.071	78
Desire: Curiosity -> Desire Fulfillment: Curiosity	.035	.008	200
Desire: Independence -> Desire Fulfillment: Independence	.017	.002	158

This relationship between Desire and Desire Fulfillment is basically how much players wanting to have the desire fulfilled leads to having the desire fulfilled. So, the variation across desires in this relationship may be explained by how much the experience of fulfilling this desire must be actively pursued by players in order to be experienced, or at least the experience is more likely to be had if the player wants to have the experience. Thus, Romance and Tranquility had the strongest link between Desire and Desire Fulfillment, examining the relationships with the highest R^2 in Table 13 above, followed by Status, Power, Saving, and Order. The higher the R^2, the more that Desire predicts Desire Fulfillment. So, how much players want to experience relaxation predicted 25.9% of the variance in how much players experienced relaxation, while how much players want to experience learning predicted only 3.5% of the variance in whether or not they experienced learning while playing the game.

Even with Romance or Tranquility, there is still quite a bit of variance unexplained by individual players' level of Desire for that experience. Much of

this remaining variance may be explained by how well the design and content of the game supports fulfilling that desire. In other words, a game with relaxing content is more likely to give players a relaxing experience regardless of whether or not the player wants to experience relaxation. At the same time, players seeking out a relaxing experience may be more likely to choose to play a game with relaxing gameplay content, or may even be able to interpret as relaxing gameplay content that to an outside observer may seem fast-paced, challenging, exciting, scary, or otherwise not at all relaxing.

On the other hand, fulfilling desires for Curiosity, Independence, Honor, or Idealism may depend more on the design or content of the game than on how much players desire these experiences, at least compared to Relaxation or Romance. How much digital gameplay experiences fulfill these desires depends less on players wanting to experience them and seeking out these experiences. This may mean that fulfilling these desires depends more on the design and content of the games being played. But there will also be a part of this variance that is explained by random variation or error as well.

The original model of Desire Fulfillment Theory proposed in Chapter 3 above hypothesized that Desire and Desire Fulfillment were separate independent factors impacting Enjoyment. This was derived from the relationships in

Expectancy Disconfirmation Theory, where Expectations and Disconfirmation of Expectations were two independent factors impacting Satisfaction. Other than a Desire for Order impacting Enjoyment, instead what was found was that Desire impacted Desire Fulfillment, which in turn impacted Task Engagement (Concentration and Sense of Control) and Enjoyment. Because this was the more consistent pattern, this relationship is shown in the Revised Model of Desire Fulfillment Theory (see Figure 33 above).

This may be a difference between desires and expectations. Expecting a thing to happen may not make it more likely to happen, while wanting it to happen may make it more likely because the person wanting it to happen may be more likely to try to make it happen. When a person desires an experience, having a greater level of desire tends to make it more likely they will pursue and have that experience. However, how much digital games provide the desired experience varies across desired experiences and across different digital games. So, there is a lot of potential for desire fulfillment through the design and content of digital games. Desire Fulfillment is not solely determined by the desires of players, but Desire does tend to have an impact on how much their experience fulfills that desire.

6. 4. Implications for the Theory and Practice of Game Design and User Experience Design for Enjoyment

To further make sense of the revised model for Desire Fulfillment Theory (see Figure 33 above), the parts of the model may be mapped to the User-System-Experience Model (Cowley, Charles, Black, & Hickey, 2006, 2008), a model which was based on the Person-Artefact-Task Model (Finneran & Zhang, 2003). Figure 34 below shows this mapping.

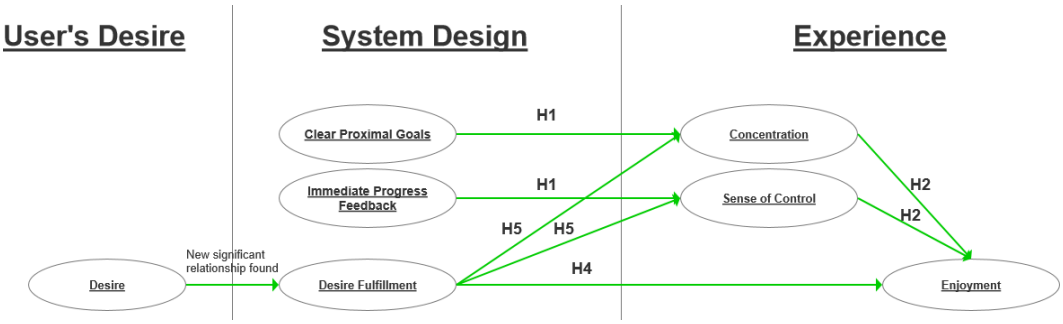

Figure 34. Revised Model of Desire Fulfillment Theory Mapped onto the User-System-Experience Model (Cowley et al., 2006, 2008), which was based on the Person-Artefact-Task Model (Finneran & Zhang, 2003).

The mapping shown in Figure 34 above is useful because it separates the factors into characteristics of the user or player, the system or game design, and

the experience that results from the user using the system or the experience of the player playing the game.

This mapping is useful because game designers and user experience professionals will have the most control over the system design factors. While designers may profile their Users' Desires and try to fulfill those desires, designers cannot directly control what basic human desires are strongest among their users. And while the System Design factors have an impact on the Experience factors, designers do not directly control the Experience factors. Perhaps a design could distract players and decrease their Concentration, or take away control from players such as during a cinematic cut-scene and decrease their Sense of Control, but it is less tangible and useful to tell a designer to design for Concentration or a Sense of Control than to design for the System Design factors.

This means the primary focus for practitioners interested in designing for Enjoyment must be on 1) Clear Proximal Goals: Clearly communicating the goal of the current next step throughout each step of the activity, 2) Immediate Progress Feedback: Clearly communicating how well the user is doing throughout the activity, and 3) Desire Fulfillment: Ensuring the activity fulfills the basic human desires of the user. As a general theory, this is the main practical implication of Desire Fulfillment Theory.

More specifically, practitioners can profile their users or players to identify which basic human needs their game or application needs to fulfill. The multiple regression results from the online survey of 315 digital game players presented above (see Table 12) using the 16 basic human desires from Reiss (2004) suggests that the 8 desires that have a significant impact on Enjoyment or on the Task Engagement sub-dimensions that in turn impact Enjoyment are Curiosity, Idealism, Honor, Order, Independence, Power, Tranquility, and Saving.

Practitioners can use the following guidelines to design games and other interactive systems to fulfill one or more of these eight basic human desires, which in turn will increase enjoyment and intrinsic motivation to use the system.

Desire Fulfillment Theory Guidelines for Practitioners

- Design for Curiosity by giving users opportunities to explore, discover, or learn new knowledge or skills.
- Design for Idealism by giving users the sense that their actions are improving society, serving the public good, or making the world a more just or better place.
- Design for Honor by giving users the sense that they are doing the right thing according to a code of conduct (including ethics, morality, tradition, or integrity).
- Design for Order by giving users opportunities to organize things or make things orderly.
- Design for Independence by giving users opportunities to make their own decisions. Give users control over the decisions they want to

control.

- Design for Power by giving users opportunities to influence, lead, or direct others.
- Design for Tranquility by giving users opportunities to relax.
- Design for Saving by giving users opportunities to collect things.

Figure 35. Desire Fulfillment Theory Guidelines for Practitioners.

Practitioners can identify which of these eight desires their game is designed to fulfill and use the *Desire Fulfillment Questionnaire* used in the present research (see Appendix E) to conduct user research with their target audience to measure how well their game or application fulfills the intended desires throughout the development process. Practitioners can also use the *Enjoyment Questionnaire* used in the present research (see Appendix B) to measure and track user enjoyment, and how well fulfillment of users' basic human desires is leading to greater enjoyment.

Academic researchers can use Desire Fulfillment Theory as a foundation to further explore the sources, process, and benefits of human enjoyment. Desire Fulfillment Theory is a step forward in building a more comprehensive understanding of the sources of Digital Game Enjoyment. If we consider Enjoyment from an input-process-output model perspective, the sources of enjoyment are an Input into Enjoyment, the tasks users do while using an

enjoyable interactive system could be the Process of Enjoyment, and the desirable intended outcomes of the intrinsic motivation provided by enjoyment would be the Output or Benefits of Enjoyment. Basic research at each of these stages can leverage Desire Fulfillment Theory. Fulfilling basic human desires is a source of enjoyment. Studying what user tasks are ideal for fulfilling these desires is at the Process stage. Designs that fulfill these desires and are thereby more enjoyable and intrinsically motivating can be used to study the benefits of enjoyment. Benefits could include learning outcomes for educational games, or behavioral outcomes for games that promote health-related behavior changes.

Future research could explore the most effective ways to design systems to fulfill each of these basic human desires in different specific contexts or domains with different design objectives. To the best of the author's knowledge, previous research on game enjoyment had not identified fulfilling desires for Idealism and Honor as important sources of enjoyment. Academic researchers can use Desire Fulfillment Theory as a theoretical framework for future empirical research to identify the specific design elements that most effectively fulfill these basic human desires and most effectively increase human enjoyment and intrinsic motivation.

6. 5. Additional Analysis: Combining Desires

In the results discussed above, the desires were analyzed separately. To further explore the relationships identified in this research, additional analysis was conducted to attempt to combine desires into a single multiple regression analysis for each dependent variable. The objective of this additional analysis was to explore how different desires worked together, meaning to see if the combined desires would all remain significant or if some would remain significant while others became non-significant. This additional analysis explored these questions.

For the desires that were checked by a large number of participants, many participants checked the same desires, indicating those desires were satisfied or fulfilled by those experiences and therefore relevant to their experiences. The data from those subsets of participants who checked the same desires were tested together to better understand how those desires work together.

6. 5. 1. Combining Curiosity and Independence

114 of the 315 valid participants checked the boxes for both Curiosity and Independence. This pair of desires were checked together more frequently than any other pair of desires. The results of stepwise multiple linear regression analysis of the Desire Fulfillment Model combining the Desire and Desire

Fulfillment items for Curiosity and Independence and using only the subset of 114 participants who checked both of these desires are shown in Table 14 below.

Table 14. Results of Stepwise Multiple Linear Regression Analysis Combining Curiosity and Independence (N = 114).

Relationship	R^2 Change	Significance for this relationship (p-value from Coefficients table t-tests)	Significance for the overall model (p-value from ANOVA table F test)
Desire Fulfillment: Curiosity -> Enjoyment	.118	.000	< .001
Sense Of Control -> Enjoyment	.074	.002	< .001
Desire Fulfillment: Independence -> Enjoyment	.037	.023	< .001
Desire: Independence -> Sense of Control	.059	.009	.009
Immediate Progress Feedback -> Sense of Control	.038	.032	.003
Desire Fulfillment: Independence -> Sense of Control	.026	.072 (n. s.)	.002
Clear Proximal Goals -> Concentration	.117	.000	< .001
Desire Fulfillment: Independence -> Concentration	.070	.003	< .001
Desire: Independence -> Concentration	.024	.069 (n. s.)	< .001
Desire: Curiosity -> Desire Fulfillment: Curiosity	.049	.018	.018
Desire: Independence -> Desire Fulfillment: Independence	.058	.017	0.01

Table 14 above shows the impact of Desire and Desire Fulfillment for Curiosity and Independence among the subset of 114 participants who checked the boxes to indicate that Curiosity and Independence were satisfied or fulfilled by their gameplay experience, and therefore relevant to their experience. Although both effects were statistically significant, Desire Fulfillment: Curiosity predicted 11.8% of the variance in Enjoyment, while Desire Fulfillment:

Independence predicted only 3.7% of the variance in Enjoyment. So, fulfilling a desire to learn had a greater direct impact on Enjoyment than a desire to make one's own decisions for oneself.

Desire: Independence, players' individual level of desire to make their own decisions for themselves, predicted 5.9% of the variance in Sense of Control ($p <$ .01). Players wanting to make their own decisions made it more likely they would experience a sense of control while playing the game. This could be because those players who desired more autonomy and self-determination were more likely to try to take control of the situation and therefore felt more in control of the situation, at least among this subset of 114 players for whom curiosity and independence were desires relevant to their gameplay experience. Desire Fulfillment: Independence predicted 7% of the variance in the Task Engagement factor Concentration. This means that playing a game that makes players feel like they can decide for themselves what they will do tends to lead to players concentrating more on the game, at least among this subset of players.

Stepping back from the details, it appears that Curiosity, a desire to learn, had a greater direct impact on Enjoyment, while Independence, a desire to make one's own decisions, had a greater impact on Task Engagement, which in turn has an impact on Enjoyment. Again, this is among the 114 participants who checked

both Curiosity and Independence. These results are useful to show how these two desires work together to impact Task Engagement and Enjoyment.

6. 5. 2. Combining Curiosity and Tranquility

110 of the 315 valid participants checked the boxes for both Curiosity and Tranquility. This pair of desires were checked together second-most frequently among all pair of desires. The results of stepwise multiple linear regression analysis of the Desire Fulfillment Model combining the Desire and Desire Fulfillment items for Curiosity and Tranquility and using only the subset of 110 participants who checked both of these desires are shown in Table 15 below.

Table 15. Results of Stepwise Multiple Linear Regression Analysis Combining Curiosity and Tranquility.

Relationship	R^2 Change	Significance for this relationship (*p*-value from Coefficients table *t*-tests)	Significance for the overall model (*p*-value from ANOVA table *F* test)
Desire Fulfillment: Curiosity -> Enjoyment	.224	< .001	< .001
Sense Of Control -> Enjoyment	.108	< .001	< .001
Immediate Progress Feedback -> Sense of Control	.128	< .001	< .001
Desire: Tranquility -> Concentration	.288	< .001	< .001
Desire Fulfillment: Curiosity -> Concentration	.050	.006	< .001
Clear Proximal Goals -> Concentration	.030	.027	< .001
Desire: Tranquility -> Desire Fulfillment: Curiosity	.101	.001	0.01
Desire: Tranquility -> Desire Fulfillment: Tranquility	.291	< .001	< .001

Individual participants' level of Desire for Tranquility predicted 28.8% of the variance in player Concentration while playing the game ($p < .001$), at least among this subset of players. Players in this subset who wanted to relax more tended to concentrate more on the game. Players who wanted to relax more also tended to experience more relaxation, with Desire: Tranquility predicting 29.1% of the variance in Desire Fulfillment: Tranquility ($p < .001$). Perhaps players who want to relax are more able to focus on the game because they are less distracted by excited or anxious thoughts, or their trait-like Desire for relaxation makes them more inclined to or able to focus on the task at hand in other ways.

Interestingly, Desire: Tranquility also predicted 10.1% of the variance in Desire Fulfillment: Curiosity, which was a strong enough effect to make the impact of Desire: Curiosity on Desire Fulfillment: Curiosity non-significant in the stepwise multiple regression model. This means that desiring to relax predicted the experience of learning (or the fulfillment of a desire to learn) while playing the game better than a desire to learn among this subset of participants. Being a person who enjoys and seeks relaxation tended to predict greater experiences of concentration, learning, and relaxation while playing the game, at least among this subset of participants.

As with Curiosity and Independence, Desire Fulfillment: Curiosity had a direct impact on Enjoyment, predicted 22.4% of the variance in Enjoyment among this subset of participants. The experience of learning had a direct positive impact on Enjoyment.

Big picture, among this subset of participants, Curiosity had a greater impact on Enjoyment, while Tranquility had a greater impact on Task Engagement, which in turn had an impact on Enjoyment. Other pairs of desires did not appear to have large enough available sample sizes to conduct analyses that would produce useful conclusions or add new information.

6. 5. 3. Combining Curiosity, Independence, and Tranquility

There were 69 out of 315 participants who checked Curiosity, Independence, and Tranquility, indicating all three of these desires were satisfied or fulfilled by their gameplay experience, and therefore relevant to their experience. These three desires were the three desires most frequently checked by players among the 16 desires investigated, and they were the only three desires checked by more than half of the participants (see Table 3 above). Since the two analyses above showed Curiosity impacting Enjoyment directly and showed Independence and Tranquility impacting Task Engagement (which in turn impacted Enjoyment),

analyzing these three desires together would help show how these three desires worked together. Would the Desire and Desire Fulfillment factors for Independence or Tranquility have a greater impact on Task Engagement? The results of stepwise multiple linear regression analysis of the Desire Fulfillment Model combining the Desire and Desire Fulfillment items for Curiosity, Independence, and Tranquility using only the subset of 69 participants who checked all three of these desires are shown in Table 16 below.

Table 16. Results of Stepwise Multiple Linear Regression Analysis Combining Curiosity, Independence, and Tranquility.

Relationship	R^2 Change	Significance for this relationship (*p*-value from Coefficients table *t*-tests)	Significance for the overall model (*p*-value from ANOVA table *F* test)
Sense Of Control -> Enjoyment	.180	.000	< .001
Desire Fulfillment: Curiosity -> Enjoyment	.113	.002	< .001
Loss of Reflective Self-Consciousness -> Enjoyment	.045	.040	< .001
Usability of Controls -> Sense of Control	.136	.002	.002
Desire: Curiosity -> Sense of Control	.058	.033	.001
Desire Fulfillment: Independence -> Sense of Control	.049	.044	< .001
Desire: Tranquility -> Concentration	.328	< .001	< .001
Desire Fulfillment: Curiosity -> Concentration	.033	.067 (n. s.)	< .001
Desire: Tranquility -> Desire Fulfillment: Curiosity	.105	.006	.006
Desire: Tranquility -> Desire Fulfillment: Tranquility	.405	< .001	< .001

As with the previous two analysis, fulfilling a desire to learn (Desire Fulfillment: Curiosity) significantly predicted Enjoyment. Among this subset of

69 participants who indicated that curiosity, independence, and tranquility were satisfied or fulfilled by their experience playing the game, player ratings of the Usability of Controls the game provided, players' individual desire to learn (Desire: Curiosity), and how much the game made players feel like they could decide for themselves what they would do (Desire Fulfillment: Independence) all significantly predicted how much players reported a Sense of Control, one of the Task Engagement factors.

Although Usability of Controls did not have this impact on Sense of Control among other subsets of participants or the full data set of valid participants, these results make sense because when the controls are easy to use it makes sense that players would feel a greater sense of control. It also makes sense that fulfilling a desire for independence, which comes from feeling able to decide for oneself what one will do and having choice, autonomy, and self-determination would lead to a greater Sense of Control. Having a greater desire for curiosity or desire to learn predicted a higher Sense of Control as well. Perhaps players who want to learn are more likely to take control of what they are doing in the game and therefore experience a greater Sense of Control. So, among these 69 participants, usability, a desire to learn, and fulfillment of a desire for independence predicted Sense of Control.

Having a greater desire to relax (Desire: Tranquility) predicted more Concentration. Again, perhaps players who want to relax are more able to focus on the game because they are less distracted by excited or anxious thoughts, or their trait-like Desire for relaxation makes them more inclined to or able to focus on the task at hand in other ways. Just as with the analysis of Curiosity and Tranquility above, players with a greater desire to relax (Desire: Tranquility) significantly predicted greater Concentration, learning (Desire Fulfillment: Curiosity), and relaxation (Desire Fulfillment: Relaxation) while playing the game.

Broadly, experiencing more fulfillment of Curiosity had a direct impact on Enjoyment. The Usability of the Controls of the game, having a greater desire for Curiosity, and fulfilling a desire for Independence predicted greater Sense of Control. Having a greater desire for Tranquility predicted Concentration. So, all three of these desires played some role in game enjoyment when they were relevant to the gameplay experience.

In most previous analyses found above, Desire usually only predicted Desire Fulfillment. But in this analysis Desire had a direct impact on the Task Engagement factors. Players' individual level of desire for Curiosity and Tranquility, the desires to learn and relax, had significant direct impacts on the

Task Engagement factors Sense of Control and Concentration. At least among this subset of participants.

Looking across the results from Tables 14-16, it appears that combining more desires into the model and taking the narrower subset of participants that comes along with that tended to result in a higher overall R^2 for each dependent variable (with the exception of the model in Table 15 predicting Concentration better than the model for Table 16). This increased overall R^2 suggests that the desires being combined appear to be relatively independent and their effects appear to add to each other rather than just overlapping or replacing each other. All three of the combined desires shown in Table 16 above continued to have significant effects rather than some desires pushing other desires out of the model or making them non-significant. At least with these three desires among this subset of participants, the desires are relatively independent and their effects appear to add up to increase player Task Engagement and Enjoyment.

This shows how Desire and Desire Fulfillment of these three desires come together to impact Task Engagement and Enjoyment. Curiosity, Independence, and Tranquility were relatively independent and their effects appeared to add up and work together to increase player Task Engagement and Enjoyment. And

these three desires were the desires most frequently checked by participants to indicate they were relevant to their gameplay experience.

CHAPTER 7. CONCLUSION AND PATHS FORWARD FOR FUTURE RESEARCH

This dissertation proposed and tested a Desire Fulfillment Theory of digital game enjoyment. It moves forward the building of a solid theoretical foundation for research on game enjoyment and what leads to game enjoyment. The research presented above advances our knowledge of what makes games enjoyable and how designers, user experience practitioners, and researchers can design for enjoyment.

Empirical research on what makes digital games enjoyable is critical for practitioners and researchers who want to design for enjoyment. This is true not only for Game Design, but for Gamification of non-game applications, and Serious Games with a purpose beyond enjoyment. But prior theories have been incomplete or lacking in empirical support showing how their impact on enjoyment.

Desire Fulfillment Theory builds on three established Desire Fulfillment Theory builds on three established theories: Expectancy Disconfirmation Theory,

Basic Human Desires Theory, and Flow Theory. While it builds on these theories, Desire Fulfillment Theory was tested by doing research with actual game players. Desire Fulfillment Theory suggests systems that fulfill users' basic human desires will maximize enjoyment.

An online survey of 315 game players was conducted, focusing on the last digital game they played. Multiple linear regression and Structural Equation Modeling (SEM) results support the proposed model with minor revisions. The revised model shows more Clear Proximal Goals, Immediate Progress Feedback, and Desire Fulfillment lead to more Task Engagement (flow not including enjoyment) and more Enjoyment, and that more Task Engagement leads to more Enjoyment (see Figure 34 above).

Fulfillment of the desire for Curiosity had a significant direct impact on Enjoyment. Curiosity was the desire 200 out of 315 digital game players indicated was fulfilled or satisfied by their recent experience playing a digital game. Curiosity is the desire to explore, discover, or learn new knowledge or skills. Having a higher desire for Curiosity tends to lead to players experiencing more fulfillment of that desire, but this only predicted 3.5% of the variance in fulfillment of the desire for Curiosity. Designing systems that give people the ability to learn and get better at the task they are doing, systems that fulfill users'

basic human desire for Curiosity leads both to more Enjoyment and to more Task Engagement.

When the impacts of Desire and Desire Fulfillment on Task Engagement and Enjoyment are examined by analyzing each desire separately (see Table 12 above), Desire Fulfillment: Curiosity has the greatest direct impact on Enjoyment, while Desire Fulfillment: Idealism has the greatest impact on the Task Engagement factors, Concentration (R^2 *Change* = .190; p = .006) and Sense of Control (R^2 *Change* = .196; p = .005). These Task Engagement factors are also flow indicators indicating how much the player was in the psychological state of flow. These factors in turn led to more Enjoyment. Idealism is the desire to improve society (including public service, altruism, and social justice). The basic human desire for Idealism includes making things better for humankind or advancing a social cause. When the desire for Idealism is fulfilled, it may give players a sense of meaning, purpose, or significance. One of the categories of enjoyment sources identified in the card sorting study (see Table 1 in Section 3.1.) was Significance, Meaning, Purpose, & Legacy, which was about knowing why one's actions are important, significant, or meaningful or feeling that your actions are giving your life meaning or helping fulfill the purpose of one's life. So, perhaps fulfilling a desire for Idealism is effective at increasing the Task

Engagement factors Sense of Control and Concentration because when players know that their actions are important, significant, or meaningful, they are more likely to focus their attention and concentrate on those tasks. Because they are focused on what is important or gives their life meaning, as opposed to focusing on trivial, non-important tasks, perhaps this makes them feel more like they have everything under control.

Designing interactive systems to give users a sense that what they are doing is benefiting society or serving the public has not been previously identified as a source of enjoyment, as far as the authors are aware. While enjoyment has been leveraged to benefit society, the idea that making users feel they are benefiting society increases user enjoyment is apparently an original contribution to the study of game enjoyment. For example, the research game FoldIt was an online multiplayer puzzle game that allowed non-scientists to contribute to genetics research to cure diseases (Cooper et al., 2010). FoldIt leveraged enjoyment to improve society. But the idea that improving society or the perception that one is improving society increases enjoyment appears to be a new contribution to the field. Specifically, fulfillment of this desire for Idealism increases users' Sense of Control and Concentration, which in turn increases Enjoyment (see Table 11 above).

Future research may explore the effects of Desire Fulfillment: Idealism in more detail, however among the 39 participants who checked the box to indicate the game they played satisfied or fulfilled a desire for Idealism, none of the games they reported playing were serious games or games with a purpose beyond enjoyment. All of them were playing games for enjoyment which did not appear to have a real-world positive impact on society. This would suggest that the benefit to society may only be a perceived benefit within the fictional world of the game. 17 of those 39 participants (43.6%) reported playing Role-Playing Games (RPG), 6 (15.4%) played Action games, 5 (12.8%) played Simulation games, 3 played Shooter games, 3 played Strategy games, 1 played a Casual game, and 4 played other games. So, there were a mix of game genres that fulfilled this desire for Idealism, but RPGs were the most common genre to fulfill a sense of Idealism. Perhaps this indicates RPGs were more able to get players to feel they were benefiting society or making the world a better place. Perhaps in a fictional game the fantasy of saving humanity or saving the world fulfills this desire of Idealism, this desire to benefit society. While saving humanity is a common theme in games, this empirical research increases our understanding of how fulfilling a desire for Idealism leads to Task Engagement (or more specifically a Sense of Control and Concentration), which in turn leads to Enjoyment (see Table 11

above). It also makes it clearer why themes like saving the world or saving humanity are effective. They make the task at hand feel important, and they fulfill our basic human desire to make the world a better place or contribute to the wellbeing of humankind. This basic human desire Reiss (2004) called Idealism is clearly an adaptive trait human beings evolved to perpetuate our species, and it is a strong enough desire that the human brain rewards the fulfillment of it with a positive experience perceived as enjoyable. The same can be said for Curiosity, the desire to explore, discover, or learn new knowledge or skills.

Additional analysis was conducted to investigate how the three most frequently fulfilled desires, Curiosity, Independence, and Tranquility, work together to impact Task Engagement and Enjoyment (see Table 16 above). Experiencing more fulfillment of a desire for Curiosity had a direct impact on Enjoyment. Usability of Controls, players' individual level of desire for Curiosity, and fulfilling a desire for Independence predicted Sense of Control. Players' individual level of desire for Tranquility predicted Concentration. So, all three of these desires played some role in game enjoyment when they were relevant to the gameplay experience. This additional analysis was conducted with the subset of participants who checked the checkboxes to indicate that all three of these desires were satisfied or fulfilled by the game they played and therefore

relevant to their recent gameplay experience. This showed how Desire and Desire Fulfillment of these three desires come together to impact Task Engagement and Enjoyment. Because the overall R^2 of the model tended to increase as the three desires were combined, Curiosity, Independence, and Tranquility appeared to be relatively independent and their effects appeared to add up and work together to increase player Task Engagement and Enjoyment. And these three desires were the desires most frequently checked by participants to indicate they were relevant to their gameplay experience.

The present research also advances our understanding of how Task Engagement impacts Enjoyment, and the System Design factors that lead to Task Engagement. The results of this study showed that Clear Proximal Goals and Immediate Progress Feedback are the System Design factors that lead to the experience of Concentration and Sense of Control, which are the key Task Engagement factors that lead to Enjoyment (see Figure 34 above).

Designing interactive systems that give users clear proximal goals, immediate progress feedback and desire fulfillment will be more likely to lead to enjoyment. That means ensuring users know what to do next and how well they are doing at each step throughout the activity.

Future research may focus on controlled experiments to test the causal linkages between the identified factors, and identifying other factors that impact enjoyment. Desire Fulfillment Theory can serve as a foundation for applied research as well, including studies of game mechanics, gamification of non-games, and serious games with a purpose beyond enjoyment. However, applied research must be informed by a solid foundation of empirical basic research. Desire Fulfillment Theory is a step forward. There is more research to be done to fully understand what makes games enjoyable, and how this understanding of human enjoyment can be used to make the world a better, more enjoyable place.

REFERENCES

Bangor, A., Kortum, P. T., & Miller, J. T. (2008). An Empirical Evaluation of the System Usability Scale. *International Journal of Human-Computer Interaction*, *24*(6), 574–594. https://doi.org/10.1080/10447310802205776

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173.

Bartle, R. (1996). Hearts, clubs, diamonds, spades: Players who suit MUDs. *Journal of MUD Research*, *1*(1), 19.

Bentler, P. M., & Chou, C.-P. (1987). Practical issues in structural modeling. *Sociological Methods & Research*, *16*(1), 78–117.

Bhattacherjee, A. (2001). Understanding Information Systems Continuance: An Expectation-Confirmation Model. *MIS Quarterly*, *25*(3), 351–370. https://doi.org/10.2307/3250921

Boberg, M., Karapanos, E., Holopainen, J., & Lucero, A. (2015). PLEXQ: Towards a Playful Experiences Questionnaire. *Proceedings of the 2015 Annual Symposium on Computer-Human Interaction in Play*, 381–391. https://doi.org/10.1145/2793107.2793124

Brockmyer, J. H., Fox, C. M., Curtiss, K. A., McBroom, E., Burkhart, K. M., & Pidruzny, J. N. (2009). The development of the Game Engagement Questionnaire: A measure of engagement in video game-playing. *Journal of Experimental Social Psychology*, *45*(4), 624–634. https://doi.org/10.1016/j.jesp.2009.02.016

Brooke, J. (1996). SUS: A "quick and dirty" usability scale. In P. Jordan, B. Thomas, & B. A. Weerdmeester, *Usability evaluation in industry* (pp. 189-- 194). London, UK: Taylor & Francis.

Brown, S., & Vaughan, C. (2010). *Play: How it Shapes the Brain, Opens the Imagination, and Invigorates the Soul* (Reprint edition). New York: Avery.

Caillois, R. (1961). *Man, play, and games*. University of Illinois Press.

Condon, P., Wilson-Mendenhall, C. D., & Barrett, L. F. (2014). What is a positive emotion? The psychological construction of pleasant fear and unpleasant happiness. In *Handbook of Positive Emotions* (pp. 60–81).

Cooper, S., Khatib, F., Treuille, A., Barbero, J., Lee, J., Beenen, M., … Popović, Z. (2010). Predicting protein structures with a multiplayer online game. *Nature*, *466*(7307), 756–760. https://doi.org/10.1038/nature09304

Costello, B., & Edmonds, E. (2007). A study in play, pleasure and interaction design. *Proceedings of the 2007 Conference on Designing Pleasurable Products and Interfaces*, 76–91. ACM.

Costello, B., & Edmonds, E. (2009). A tool for characterizing the experience of play. *Proceedings of the Sixth Australasian Conference on Interactive Entertainment*, 2. ACM.

Cowley, B., Charles, D., Black, M., & Hickey, R. (2006). User-system-experience model for user centered design in computer games. In V. Wade, H. Ashman, & B. Smyth (Eds.), *Adaptive Hypermedia and Adaptive Web-Based Systems, Proceedings* (Vol. 4018, pp. 419–424).

Cowley, B., Charles, D., Black, M., & Hickey, R. (2008). Toward an understanding of flow in video games. *Computers in Entertainment*, *6*(2), 1. https://doi.org/10.1145/1371216.1371223

Csikszentmihalyi, M. (2008). *Flow: The Psychology of Optimal Experience* (1 edition). New York: Harper Perennial Modern Classics.

Csikszentmihalyi, M., & Nakamura, J. (2010). Effortless attention in everyday life: A systematic phenomenology. *Effortless Attention: A New Perspective in the Cognitive Science of Attention and Action*, 179–190.

Deci, E., & Ryan, R. M. (1985). *Intrinsic Motivation and Self-Determination in Human Behavior*. New York: Plenum Press.

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining gamification. *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments*, 9–15. Retrieved from http://dl.acm.org/citation.cfm?id=2181040

Engeser, S., & Rheinberg, F. (2008). Flow, performance and moderators of challenge-skill balance. *Motivation and Emotion*, *32*(3), 158–172.

Entertainment Software Association, & The NPD Group. (2018, January 18). US Video Game Industry Revenue Reaches $36 Billion in 2017. Retrieved May 8, 2018, from http://www.theesa.com/article/us-video-game-industry-revenue-reaches-36-billion-2017/

Fang, X., Chan, S., Brzezinski, J., & Nair, C. (2010). Development of an Instrument to Measure Enjoyment of Computer Game Play. *International Journal of Human-Computer Interaction*, *26*(9), 868–886. https://doi.org/10.1080/10447318.2010.496337

Fang, X., Zhang, J., & Chan, S. S. (2013). Development of an Instrument for Studying Flow in Computer Game Play. *International Journal of Human-*

Computer Interaction, *29*(7), 456–470. https://doi.org/10.1080/10447318.2012.715991

Finneran, C. M., & Zhang, P. (2003). A person–artefact–task (PAT) model of flow antecedents in computer-mediated environments. *International Journal of Human-Computer Studies*, *59*(4), 475–496.

Fredrickson, B. (2009). *Positivity*. Harmony.

Fullerton, T. (2014). *Game Design Workshop: A Playcentric Approach to Creating Innovative Games, Third Edition* (3 edition). Boca Raton: A K Peters/CRC Press.

Havercamp, S. M. (1998). *The Reiss Profile of motivation sensitivity: Reliability, validity, and social desirability* (PhD Thesis). Ohio State University.

Helson, H. (1948). Adaptation-level as a basis for a quantitative theory of frames of reference. *Psychological Review*, *55*(6), 297.

Herzberg, F. (1974). Motivation-hygiene profiles: Pinpointing what ails the organization. *Organizational Dynamics*, *3*(2), 18–29. https://doi.org/10.1016/0090-2616(74)90007-2

Herzberg, F. (2003). One More Time: How Do You Motivate Employees? *Harvard Business Review*, *81*(1), 87–96.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1–55.

Jackson, S. A., & Eklund, R. C. (2004). *The flow scales manual*. Fitness Information Technology.

Jackson, S. A., & Marsh, H. W. (1996). Development and validation of a scale to measure optimal experience: The Flow State Scale. *Journal of Sport and Exercise Psychology*, *18*(1), 17–35.

James, W. (1890). *The Principles of Psychology*. Place of publication not identified: CreateSpace Independent Publishing Platform.

Jenkins, R., Lee, M., Archambault, R., Divnich, J., Zatkin, G., Walker, P., … Short, G. (2010). *The influence of professional critic reviews: EEDAR/SMU behavioral study*. Retrieved from http://mandetech.com/wp-content/uploads/2010/07/EEDAR-SMU-Study-One-Review-Anchoring2.pdf

Jennett, C., Cox, A. L., Cairns, P., Dhoparee, S., Epps, A., Tijs, T., & Walton, A. (2008). Measuring and defining the experience of immersion in games. *International Journal of Human-Computer Studies*, *66*(9), 641–661. https://doi.org/10.1016/j.ijhcs.2008.04.004

Kenny, D. A. (2015, November 24). Measuring Model Fit. Retrieved from http://davidakenny.net/cm/fit.htm

Kenny, D. A., Kaniskan, B., & McCoach, D. B. (2015). The performance of RMSEA in models with small degrees of freedom. *Sociological Methods & Research*, *44*(3), 486–507.

Kline, R. B. (2015). *Principles and practice of structural equation modeling*. Guilford publications.

Korhonen, H., Montola, M., & Arrasvuori, J. (2009). Understanding playful user experience through digital games. *International Conference on Designing Pleasurable Products and Interfaces*, *2009*. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.586.7146&rep=rep1&type=pdf

Koster, R. (2013). *Theory of Fun for Game Design* (2 edition). O'Reilly Media.

Lazzaro, N. (2004). *Why We Play Games: Four Keys to More Emotion Without Story*. Retrieved from http://gamemodworkshop.com/readings/xeodesign_whyweplaygames.pdf

Lazzaro, Nicole. (2009). Why we play: Affect and the fun of games. In A. Sears & J. A. Jacko, *Human-computer interaction: Designing for diverse users and domains* (pp. 155–176). Retrieved from

https://books.google.com/books?hl=en&lr=&id=foE8AnfQmZoC&oi=fnd&pg=PA155&dq=the+four+fun+keys+game+usability&ots=Qvnjmb7lfD&sig=Et2RbeI1TNycztHVs8FPM37b6PQ

Lewis, J. R., & Sauro, J. (2009). The factor structure of the system usability scale. *International Conference on Human Centered Design*, 94–103. Springer.

Livingston, I. J., Nacke, L. E., & Mandryk, R. L. (2011). Influencing Experience: The Effects of Reading Game Reviews on Player Experience. In J. C. Anacleto, S. Fels, N. Graham, B. Kapralos, M. Saif El-Nasr, & K. Stanley (Eds.), *Entertainment Computing – ICEC 2011* (Vol. 6972, pp. 89–100). https://doi.org/10.1007/978-3-642-24500-8_10

Lucero, A., & Arrasvuori, J. (2010). PLEX Cards: A Source of Inspiration when Designing for Playfulness. *Proceedings of the 3rd International Conference on Fun and Games*, 28–37. https://doi.org/10.1145/1823818.1823821

Malone, T. W. (1980). What Makes Things Fun to Learn? Heuristics for Designing Instructional Computer Games. *Proceedings of the 3rd ACM SIGSMALL Symposium and the First SIGPC Symposium on Small Systems*, 162–169. https://doi.org/10.1145/800088.802839

Malone, T. W. (1981). Toward a theory of intrinsically motivating instruction. *Cognitive Science*, *5*(4), 333–369.

Malone, T. W. (1982). Heuristics for designing enjoyable user interfaces: Lessons from computer games. *Proceedings of the 1982 Conference on Human Factors in Computing Systems*, 63–68. Retrieved from http://dl.acm.org/citation.cfm?id=801756

Maslow, A. H. (1943). A theory of human motivation. *Psychological Review*, *50*(4), 370–396. https://doi.org/10.1037/h0054346

McAuley, E., Duncan, T., & Tammen, V. V. (1989). Psychometric properties of the Intrinsic Motivation Inventory in a competitive sport setting: A confirmatory factor analysis. *Research Quarterly for Exercise and Sport*, *60*(1), 48–58.

McDougall, W. (1921). *An Introduction to Social Psychology*. Mineola, N.Y: Dover Publications.

Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, *2*(3), 192–222.

Murray, H. A. (1938). *Explorations in personality: A clinical and experimental study of fifty men of college age*. Oxford, England: Oxford Univ. Press.

Nakamura, J., & Csikszentmihalyi, M. (2014). The concept of flow. In *Flow and the foundations of positive psychology* (pp. 239–263). Springer.

Oliver, R. L. (1977). Effect of expectation and disconfirmation on postexposure product evaluations: An alternative interpretation. *Journal of Applied Psychology*, *62*(4), 480–486. https://doi.org/10.1037/0021-9010.62.4.480

Oliver, R. L. (1980). A Cognitive Model of the Antecedents and Consequences of Satisfaction Decisions. *Journal of Marketing Research*, *17*(4), 460–469. https://doi.org/10.2307/3150499

Oliver, R. L. (1981). Measurement and evaluation of satisfaction processes in retail settings. *Journal of Retailing*.

Park, N., Peterson, C., & Seligman, M. E. (2004). Strengths of character and well-being. *Journal of Social and Clinical Psychology*, *23*(5), 603–619.

Peterson, C., Park, N., & Seligman, M. E. (2005). Orientations to happiness and life satisfaction: The full life versus the empty life. *Journal of Happiness Studies*, *6*(1), 25–41.

Peterson, C., & Seligman, M. E. (2004). *Character strengths and virtues: A handbook and classification* (Vol. 1). Oxford University Press.

Quick, J. M., Atkinson, R. K., & Lin, L. (2012). Empirical Taxonomies of Gameplay Enjoyment: Personality and Video Game Preference.

International Journal of Game-Based Learning, *2*(3), 11–31. (IGI Global. 701 East Chocolate Avenue, Hershey, PA 17033. Tel: 866-342-6657; Tel: 717-533-8845; Fax: 717-533-8661; Fax: 717-533-7115; e-mail: journals@igi-global.com; Web site: http://www.igi-global.com/journals).

Randolph, J. J. (2005). *Free-marginal multirater kappa: An alternative to Fleiss´ fixed-marginal multirater kappa*. Presented at the Joensuu University Learning and Instruction Symposium 2005, Joensuu, Finland. Retrieved from https://eric.ed.gov/?id=ED490661

Reiss, S. (2002). *Who Am I? The 16 Basic Desires That Motivate Our Actions and Define Our Personalities* (35050th edition). New York, NY: Berkley.

Reiss, S. (2004). Multifaceted Nature of Intrinsic Motivation: The Theory of 16 Basic Desires. *Review of General Psychology*, *8*(3), 179–193. https://doi.org/10.1037/1089-2680.8.3.179

Reiss, S., & Havercamp, S. M. (1998). Toward a comprehensive assessment of fundamental motivation: Factor structure of the Reiss Profiles. *Psychological Assessment, 10*(2), 97–106. https://doi.org/10.1037/1040-3590.10.2.97

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68–78. https://doi.org/10.1037//0003-066X.55.1.68

Ryan, R. M., Rigby, S. C., & Przybylski, A. (2006). The Motivational Pull of Video Games: A Self-Determination Theory Approach. *Motivation and Emotion*, *30*(4), 344–360. https://doi.org/10.1007/s11031-006-9051-8

Schaffer, O., & Fang, X. (2015). *Finding Flow with Games: Does Immediate Progress Feedback Cause Flow?* Presented at the Americas Conference on Information Systems (AMCIS), Puerto Rico. https://doi.org/10.13140/RG.2.1.4236.8725

Schaffer, O., & Fang, X. (2016). *Impact of Task and Interface Design on Flow*. Presented at the HCI Research in MIS Workshop (SIGHCI) at the International Conference on Information Systems (ICIS), Dublin, Ireland. Retrieved from http://aisel.aisnet.org/sighci2016/7/

Schaffer, O., & Fang, X. (2017). Sources of Computer Game Enjoyment: Card Sorting to Develop a New Model. In M. Kurosu (Ed.), *Human-Computer Interaction. Interaction Contexts* (Vol. 10272, pp. 99–108). https://doi.org/10.1007/978-3-319-58077-7_9

Schaffer, O., & Fang, X. (2018). *What Makes Games Fun? Card Sort Reveals 34 Sources of Computer Game Enjoyment*. Presented at the Americas Conference on Information Systems (AMCIS) 2018, New Orleans. Retrieved from http://aisel.aisnet.org/amcis2018/HCI/Presentations/2/

Seligman, M. E. P., & Csikszentmihalyi, M. (2000). Positive psychology: An introduction. *American Psychologist*, *55*(1), 5–14. https://doi.org/10.1037/0003-066X.55.1.5

Sherrick, B., & Schmierbach, M. (2016). The Effects of Evaluative Reviews on Market Success in the Video Game Industry. *The Computer Games Journal*, *5*(3–4), 185–194. https://doi.org/10.1007/s40869-016-0027-y

Shiota, M. N. (2014). The evolutionary perspective in positive emotion research. *Handbook of Positive Emotions*, 44–59.

Shiota, M. N., Neufeld, S. L., Danvers, A. F., Osborne, E. A., Sng, O., & Yee, C. I. (2014). Positive emotion differentiation: A functional approach. *Social and Personality Psychology Compass*, *8*(3), 104–117.

Siegrist, M., & Cousin, M.-E. (2009). Expectations influence sensory experience in a wine tasting. *Appetite*, *52*(3), 762–765. https://doi.org/10.1016/j.appet.2009.02.002

Sutton-Smith, B. (2009). *The ambiguity of play*. Harvard University Press.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, *46*(2), 186–204.

Yee, N. (2006). Motivations for play in online games. *CyberPsychology & Behavior*, *9*(6), 772–775.

Yee, N., Ducheneaut, N., & Nelson, L. (2012). Online gaming motivations scale: Development and validation. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 2803–2806. Retrieved from http://dl.acm.org/citation.cfm?id=2208681

APPENDICES

Appendix A: Initial Questions and Screening

A digital game is any game that you play on a computerized device, like a video game console, Personal Computer (PC), smartphone, or on the Internet.

What was the name of the last digital game you played for longer than 30 minutes?

[Note: The answer to this question will be piped into or inserted into questions in the questionnaires below to replace the words “this game” or “the game” to ensure participants recall which game the questions are asking about.]

What kind of game was it?

Multiple Choice: Action, Fighting, Racing, Shooter, Simulation, Strategy, Role-Playing Game (RPG), Puzzle Game, Educational Game, Sports, Casual, Other: (text field)

How long ago was the last time you played this game for longer than 30 minutes?

Multiple Choice: More than 1 year ago, Between 6 months and 1 year ago, Between 3 months ago and 6 months ago, Between 1 month ago and 3 months ago, Between 2 weeks ago and 1 month ago, Between 1 week ago and 2 weeks ago, Within the last week

[Respondents who answer “More than 1 year ago” or “Between 6 months and 1 year ago” will be redirected to a page where they will be thanked and dismissed as not eligible to participate. Others may continue. This participant screening is done so that participants who have played a digital game for longer than 30 minutes within the last 6 months can be recruited.]

The last time you played this game for longer than 30 minutes, how long did you play the game?

Hours:

Minutes:

Please indicate **how much do you agree** with each of the following statements about **your experience the last time you played this game** for longer than 30 minutes.

Appendix B: Enjoyment Questionnaire

ID	Item (While playing this game…)	Source
ENJOY01	I loved the feeling of what I was doing and want to capture it again.	Schaffer & Fang (2016); Jackson & Marsh (1996)
ENJOY02	I enjoyed the experience.	Schaffer & Fang (2016)
ENJOY03	I found this game interesting.	Schaffer & Fang (2016)
ENJOY04	Playing this game was interesting.	Schaffer & Fang (2016)
ENJOY05	Playing this game was rewarding in itself.	Schaffer & Fang (2016)
ENJOY06	I wished I was doing something else. [R]	Schaffer & Fang (2016)
ENJOY07	I enjoyed this game very much.	Schaffer & Fang (2016), adapted from McAuley et al.

		(1989)
ENJOY08	Playing this game was fun.	Schaffer & Fang (2016), adapted from McAuley, et al. (1986)
ENJOY09	I would describe this game as very interesting.	Schaffer & Fang (2016), adapted from McAuley, et al. (1986)
ENJOY10	This game did not hold my attention. [R]	Schaffer & Fang (2016), adapted from McAuley, et al. (1986)
ENJOY11	While playing this game, I was thinking about how much I enjoyed it.	Adapted from McAuley, et al. (1986)

Appendix C: Task Engagement Questionnaire

Effortless Concentration

ID	Item (While playing this game…)	Source
EC01	My attention was focused entirely on the game that I was playing.	Schaffer & Fang (2016)
EC02	I was totally concentrated on what I was doing.	Schaffer & Fang (2016)
EC03	It was hard to concentrate. [R]	Schaffer & Fang (2016)
EC04	I had no difficulty concentrating.	Schaffer & Fang (2016); Engeser & Rheinberg (2008)
EC05	Playing the game took up all of my attention.	Original
EC06	I had to force myself to concentrate on what I was doing. [R]	Original

Altered Perception of Time

ID	Item (While playing this game…)	Source
TIME01	I tended to lose track of time.	Schaffer & Fang (2016)

TIME02	It felt like time went by quickly.	Schaffer & Fang (2016)
TIME03	I lost my normal awareness of time.	Schaffer & Fang (2016)
TIME04	I did not notice time passing.	Schaffer & Fang (2016); Engeser & Rheinberg (2008)
TIME05	The way time passed seemed to be different from normal	Jackson & Marsh (1996)
TIME06	Time seemed to alter (either slowed down or speeded up).	Jackson & Marsh (1996)

Loss of Self-Consciousness

ID	Item (While playing this game…)	Source
LSC01	I was not concerned with what others may have been thinking of me.	Schaffer & Fang (2016), Jackson & Marsh (1996)

LSC02	I was not concerned with how I was presenting myself.	Schaffer & Fang (2016), Jackson & Marsh (1996)
LSC03	I was not thinking about my everyday concerns.	Original
LSC04	I was not thinking about my real-world problems.	Original
LSC05	I was not consciously aware of my body in the real world.	Original
LSC06	I was not aware of my surroundings in the real world.	Original
LSC07	I was not thinking about anything outside of what I was doing in the game.	Original

Merging of Action & Awareness

ID	Item (While playing this game…)	Source
MAA01	I played the game without thinking about trying to do so.	Adapted from Schaffer & Fang (2016)
MAA02	I took action in the game without having to think about all the details of how to take action.	Original
MAA03	I did not see myself as separate from what I was doing in	Original

	the game.	
MAA04	My actions in the game were spontaneous, as if they were happening on their own.	Original
MAA05	I took action in the game automatically, as if the actions I took happened on their own.	Original
MAA06	I felt like I was acting on auto-pilot, as if my actions were happening on their own.	Original
MAA07	My thoughts and actions ran fluidly and smoothly.	Adapted from Engeser & Rheinberg (2008)
MAA08	I was so involved in what I was doing that I was not aware I was even using controls.	Adapted from Jennett et al. (2008)

Sense of Control

ID	Item (While playing this game…)	Source
CTRL01	I felt that I had everything under control.	Schaffer & Fang (2016)
CTRL02	I felt like I could control what I was doing.	Jackson &

		Marsh (1996)
CTRL03	I felt in total control of what I was doing.	Jackson & Marsh (1996)
CTRL04	I felt in control of my own actions.	Original
CTRL05	I felt in control enough that I could handle whatever would happen next.	Original
CTRL06	I felt in control of the situation.	Original

Appendix D: Usability Questionnaire

System Usability Scale

ID	Item (While playing this game…)	Source
SUS01	I think that I would like to play this game frequently.	Adapted from Brooke (1996)
SUS02	I found the controls of this game unnecessarily complex. [R]	Adapted from Brooke (1996)
SUS03	I thought the controls of the game were easy to use.	Adapted from Brooke (1996)
SUS04	I think that I would need to read a Frequently Asked Questions (FAQ) guide or watch a walkthrough video	Adapted from

	to be able to play this game. [R]	Brooke (1996)
SUS05	I found the various things I could do in this game were well integrated into the controls of the game.	Adapted from Brooke (1996)
SUS06	I thought there was too much inconsistency in the controls of this game. [R]	Adapted from Brooke (1996)
SUS07	I would imagine that most people would learn to use the controls of this game very quickly.	Adapted from Brooke (1996)
SUS08	I found the controls of this game very cumbersome to use. [R]	Adapted from Brooke (1996)
SUS09	I felt very confident using the controls of this game.	Adapted from Brooke (1996)
SUS10	I needed to learn a lot of things before I could get going with this system. [R]	Adapted from Brooke (1996)

Perceived Ease of Use

ID	Item (While playing this game…)	Source
EASE01	My interaction with the game was clear and understandable.	Adapted from Venkatesh & Davis (2000)

EASE02	Interacting with the game did not require a lot of my mental effort.	Adapted from Venkatesh & Davis (2000)
EASE03	I found the controls of the game easy to use.	Adapted from Venkatesh & Davis (2000)
EASE04	I found it easy to get the game to do what I wanted it to do using the controls of the game.	Adapted from Venkatesh & Davis (2000)

Intuitive Controls

ID	Item (While playing this game…)	Source
IC01	Learning the controls of the game was easy.	Adapted from Ryan et al. (2006)
IC02	The controls of the game were intuitive.	Adapted from Ryan et al. (2006)
IC03	When I wanted to do something in the game, it was easy to remember the control I needed to use.	Adapted from Ryan et al. (2006)

Clear Proximal Goals

ID	Item (While playing this game…)	Source
CG01	I knew clearly what I wanted to do next throughout this game.	Schaffer & Fang (2016)
CG02	I knew what I wanted to achieve through each step of the game.	Schaffer & Fang (2016)
CG03	My next steps were clearly defined.	Schaffer & Fang (2016)
CG04	I knew what I had to do each step of the way.	Schaffer & Fang (2016)

Immediate Progress Feedback

ID	Item (While playing this game…)	Source
IPF01	I had a good idea about how well I was doing.	Schaffer & Fang (2016)
IPF02	I was aware of how well I was playing this game.	Schaffer & Fang (2016)
IPF03	It was really clear to me how I was doing in the game.	Schaffer &

		Fang (2016)
IPF04	I always knew how well I was playing the game.	Original

Appendix E: Desire Fulfillment Questionnaire

Desire Relevance

Which of the following desires were satisfied or fulfilled while playing this game? (Check all that apply)

- ❑ Power: Desire to influence, lead, or direct others
- ❑ Curiosity: Desire to explore, discover, or learn new knowledge or skills
- ❑ Independence: Desire to make your own decisions
- ❑ Status: Desire for prestige, social standing, and positive attention
- ❑ Social contact: Desire for peer companionship (including desire to spend time with friends)
- ❑ Vengeance: Desire to get even (including desire to compete, to win)
- ❑ Honor: Desire to do the right thing according to a code of conduct (including ethics, morality, tradition, or integrity)
- ❑ Idealism: Desire to improve society (including public service, altruism, and social justice)
- ❑ Physical exercise: Desire for body movement that increases your heart rate or exercises your muscles
- ❑ Romance: Desire for sexual behavior, sexual arousal, or sexual fantasies (including flirting, courting, or being turned on)
- ❑ Family: Desire to spend time with your own family
- ❑ Order: Desire to organize or make things orderly
- ❑ Eating: Desire to eat (including seeing food you want to eat)
- ❑ Acceptance: Desire to be accepted or liked by others
- ❑ Tranquility: Desire for relaxation
- ❑ Saving: Desire to collect things

[Only the Desire Fulfillment and Desire questions for the desires the participant has checked will be asked about. This is done to reduce participant fatigue by minimizing the number of questions asked about, and to ensure each participant only has to answer questions that are relevant to their experience playing the game. The subset of participants who checked a given desire will be used to analyze participants' experience of desire fulfillment with that desire.]

Desire Fulfillment: Social Contact

ID	Item (Playing this game more than fulfilled my desire…)	Source
DFSC01	...to do things in groups.	Original
DFSC02	…to spend time with others.	Original
DFSC03	…to initiate conversations with others.	Original
DFSC04	…for it to be like going to a party.	Original
DFSC05	…to meet new people.	Original
DFSC06	…to spend time in the company of others.	Original
DFSC07	…to have frequent contact with other people.	Original
DFSC08	…to spend more time with people I like.	Original

Desire Fulfillment: Curiosity

ID	Item (Playing this game more than fulfilled my desire…)	Source
DFCUR01	…to learn new skills.	Original
DFCUR02	…to learn about something in depth.	Original
DFCUR03	Playing this game more than fulfilled my "thirst for knowledge".	Original
DFCUR04	…to have an intellectually stimulating experience.	Original
DFCUR05	…to feel like I was having an intellectual conversation.	Original
DFCUR06	…to think about each decision I made in the game.	Original
DFCUR07	…to think about great ideas.	Original
DFCUR08	…to experience a great deal of curiosity.	Original

Desire Fulfillment: Honor

ID	Item (Playing this game more than fulfilled my desire…)	Source
DFHON01	…to make promises and keep those promises.	Original
DFHON02	…to act in accordance with my Code of Conduct.	Original
DFHON03	…for my personal honor to guide my behavior.	Original

DFHON04	…to avoid losing my honor.	Original
DFHON05	…to uphold my reputation for character.	Original
DFHON06	…to live my life in accordance with the highest moral standards.	Original
DFHON07	…for ethics/morality to guide my actions.	Original
DFHON08	…to behave morally.	Original
DFHON09	…to do the right thing according to my personal code of honor.	Original
DFHON10	…to present my real, genuine, and authentic self to others.	Original

Desire Fulfillment: Family

ID	Item (Playing this game more than fulfilled my desire…)	Source
DFFAM01	…to feel needed by my family.	Original
DFFAM02	…to make any personal sacrifices necessary to meet my family's needs.	Original
DFFAM03	…to put my family first.	Original
DFFAM04	…to spend time with my family.	Original

DFFAM05	…to take care of my family.	Original
DFFAM06	…to meet my family's needs.	Original
DFFAM07	…to make my family my highest priority.	Original
DFFAM08	…to feel very close to my family.	Original

Desire Fulfillment: Independence

ID	Item (Playing this game more than fulfilled my desire…)	Source
DFIND01	…to feel self-reliant.	Original
DFIND02	…to do what I freely chose to do.	Original
DFIND03	…to feel in control.	Original
DFIND04	…to decide for myself what I was going to do.	Original
DFIND05	…to do what I wanted to do rather than what others told me to do.	Original
DFIND06	…to feel that I had freely chosen to do what I did.	Original
DFIND07	…to choose for myself what I was going to do.	Original
DFIND08	…to make my own decisions.	Original
DFIND09	…to decide for myself what path I would take.	Original

DFIND10	…to decide for myself how I would take action.	Original

Desire Fulfillment: Power

ID	Item (Playing this game more than fulfilled my desire…)	Source
DFPOW01	…to be the boss of the group.	Original
DFPOW02	…to persuade others of my opinions.	Original
DFPOW03	…to take more of a leadership role.	Original
DFPOW04	…to direct group activities.	Original
DFPOW05	…to have a dominant role.	Original
DFPOW06	…to feel a sense of power from being in charge of others.	Original
DFPOW07	…to get others do my bidding.	Original
DFPOW08	…to make decisions that affected other people.	Original

Desire Fulfillment: Order

ID	Item (Playing this game more than fulfilled my desire…)	Source
DFORD01	…to feel like I was going through a daily routine.	Original

DFORD02	…to make things more neat and well-organized.	Original
DFORD03	…to do things in a precise manner.	Original
DFORD04	…to make sure everything was in its place.	Original
DFORD05	…to organize things.	Original
DFORD06	…to be organized.	Original
DFORD07	…to put things in their proper place.	Original
DFORD08	…to organize things so they were less sloppy.	Original

Desire Fulfillment: Idealism or Citizenship

ID	Item (Playing this game more than fulfilled my desire…)	Source
DFIDL01	…to make the world a better place.	Original
DFIDL02	…to act on my sense of social responsibility.	Original
DFIDL03	…to serve my community.	Original
DFIDL04	…to feel like I was serving the public.	Original
DFIDL05	…to feel like I was advancing a social cause.	Original
DFIDL06	…to feel like I was improving the well-being of society.	Original

DFIDL07	…to feel like I was making things better for humankind.	Original
DFIDL08	…to help people less fortunate than me.	Original

Desire Fulfillment: Status or Social Prestige

ID	Item (Playing this game more than fulfilled my desire…)	Source
DFSTAT01	…for social status.	Original
DFSTAT02	…to become rich.	Original
DFSTAT03	…for prestige.	Original
DFSTAT04	…to boast about my success.	Original
DFSTAT05	…to have the best things in the game.	Original
DFSTAT06	…to show others my high score or rank.	Original
DFSTAT07	…to have a high position in the social hierarchy of my group.	Original
DFSTAT08	…to play a role in the game with a lot of social prestige.	Original

Desire Fulfillment: Vengeance

ID	Item (Playing this game more than fulfilled my desire…)	Source
DFVEN01	…to get even with people who offended me.	Original
DFVEN02	…to get sweet revenge.	Original
DFVEN03	…to insult back anybody who insulted me.	Original
DFVEN04	…to retaliate when I was attacked.	Original
DFVEN05	…to not take any crap from others.	Original
DFVEN06	…to strike back when I got angry.	Original
DFVEN07	…to make people pay for any trouble they caused me.	Original
DFVEN08	…to get even with others.	Original

Desire Fulfillment: Eating or Food

ID	Item (Playing this game more than fulfilled my desire…)	Source
DFEAT01	…to eat food in the game.	Original
DFEAT02	…to have a big appetite.	Original
DFEAT03	…to think (or fantasize) about food.	Original
DFEAT04	…to smell the aroma of food.	Original

DFEAT05	…for eating to be one of the activities I did in the game.	Original
DFEAT06	…to eat desserts in the game.	Original
DFEAT07	…to go to a restaurant in the game.	Original
DFEAT08	…to eat food late at night in the game.	Original

Desire Fulfillment: Romance or Sex

ID	Item (Playing this game more than fulfilled my desire…)	Source
DFROM01	…to have sex in the game.	Original
DFROM02	…to satisfy my need for frequent sex in the game.	Original
DFROM03	…to fantasize a lot about sex.	Original
DFROM04	…to have all the sex I could get in the game.	Original
DFROM05	…to make use of my sexual prowess.	Original
DFROM06	…to be sexually uninhibited in the game.	Original
DFROM07	…to have sex often in the game.	Original
DFROM08	…to have frequent sex in the game.	Original

Desire Fulfillment: Physical Exercise

ID	Item (Playing this game more than fulfilled my desire…)	Source
DFPE01	…to feel like I was participating in sports.	Original
DFPE02	…to make myself more physically fit.	Original
DFPE03	…to have frequent physical activity.	Original
DFPE04	…to be physically active.	Original
DFPE05	…to make use of my athletic abilities.	Original
DFPE06	…to have physical exercise.	Original
DFPE07	…to do activities that challenged my strength.	Original
DFPE08	…to exercise at least one hour every day.	Original

Desire Fulfillment: Acceptance

ID	Item (Playing this game more than fulfilled my desire…)	Source
DFACPT01	…to get other people to like me.	Original
DFACPT02	…to gain acceptance from others.	Original
DFACPT03	…to please other people.	Original

DFACPT04	…for other people to like me.	Original
DFACPT05	…to feel accepted by the people around me.	Original
DFACPT06	…to please other people.	Original
DFACPT07	…to be accepted by others.	Original
DFACPT08	…to feel accepted by other people.	Original

Desire Fulfillment: Tranquility

ID	Item (Playing this game more than fulfilled my desire…)	Source
DFTQL01	…to have calming experiences.	Original
DFTQL02	…to rest and recover from feeling stressed.	Original
DFTQL03	…to be calm and relaxed.	Original
DFTQL04	…to be free from tension or concern.	Original
DFTQL05	…to regenerate my energy by relaxing.	Original
DFTQL06	…to have a peaceful feeling of satisfaction with the way things were in that moment.	Original
DFTQL07	…to let go of worries and unpleasant thoughts.	Original
DFTQL08	…to feel relaxed.	Original

Desire Fulfillment: Saving

ID	Item (Playing this game more than fulfilled my desire…)	Source
DFSAV01	…to keep things that I collected in the game.	Original
DFSAV02	…to save up things in the game.	Original
DFSAV03	…to collect things in the game.	Original
DFSAV04	…to own things in the game that I valued.	Original
DFSAV05	…to avoid giving up anything I owned in the game.	Original
DFSAV06	…to not have to throw away the things I collected in the game.	Original
DFSAV07	…to not waste my things in the game.	Original
DFSAV08	…to avoid running out of things in the game.	Original

Appendix F: Desire Questionnaire

Please rate how much you agree with the following statements about yourself.

Desire: Social Contact

ID	Item	Source

DSC01	I prefer to do things in groups.	Havercamp (1998)
DSC02	I am happiest when I am with others.	Havercamp (1998)
DSC03	I like to initiate conversations.	Havercamp (1998)
DSC04	I love parties.	Havercamp (1998)
DSC05	I enjoy meeting new people.	Havercamp (1998)
DSC06	I often seek the company of others.	Havercamp (1998)
DSC07	I need frequent contact with other people.	Havercamp (1998)
DSC08	I definitely like people.	Havercamp (1998)

Desire: Curiosity

ID	Item	Source
DCUR01	I love learning new skills.	Havercamp (1998)
DCUR02	I enjoy learning about something in depth.	Havercamp (1998)
DCUR03	I have a "thirst for knowledge".	Havercamp (1998)

DCUR04	My intellectual life is essential to my well-being.	Havercamp (1998)
DCUR05	I enjoy intellectual conversations.	Havercamp (1998)
DCUR06	I especially like games that make me think (e.g., bridge, chess).	Havercamp (1998)
DCUR07	Thinking about great ideas is an important part of my life.	Havercamp (1998)
DCUR08	I have a great deal of curiosity.	Havercamp (1998)

Desire: Honor

ID	Item	Source
DHON01	My word is my bond.	Havercamp (1998)
DHON02	I try to behave in accordance with a Code of Conduct.	Havercamp (1998)
DHON03	My personal honor is foremost in guiding my behavior.	Havercamp (1998)

DHON04	I would rather lose my life than lose my honor.	Havercamp (1998)
DHON05	I am proud of my reputation for character.	Havercamp (1998)
DHON06	I want to live my life in accordance with the highest moral standards.	Havercamp (1998)
DHON07	Ethics/morality is very important to me.	Havercamp (1998)
DHON08	Behaving morally is essential to my happiness.	Havercamp (1998)
DHON09	I want to do the right thing according to my personal code of honor.	Original
DHON10	I like presenting my real, genuine, and authentic self to others.	Original

Desire: Family

ID	Item	Source
DFAM01	I love being needed by my family.	Havercamp (1998)
DFAM02	I will make any personal sacrifice necessary to meet	Havercamp (1998)

	my family's needs.	
DFAM03	My family is the most important part of my life.	Havercamp (1998)
DFAM04	I am happiest when spending time with my family.	Havercamp (1998)
DFAM05	I enjoy taking care of my family.	Havercamp (1998)
DFAM06	I am always thinking about my family's needs.	Havercamp (1998)
DFAM07	My family comes first (my highest priority).	Havercamp (1998)
DFAM08	I feel very close to my family.	Havercamp (1998)

Desire: Independence

ID	Item	Source
DIND01	Self-reliance is one of my most important goals.	Havercamp (1998)
DIND02	I enjoy doing what I have freely chosen to do.	Original
DIND03	I am happiest when I feel in control.	Original
DIND04	I like to decide for myself what I will do.	Original

DIND05	I am happiest when I am doing what I want to do rather than what others tell me to do.	Original
DIND06	I want to feel that I have freely chosen to do what I am doing.	Original
DIND07	Choosing for myself what I will do is very important to me.	Original
DIND08	Making my own decisions is essential to my happiness.	Original
DIND09	I enjoy deciding for myself what path I will take.	Original
DIND10	I like to decide for myself how I am going to take action.	Original

Desire: Power

ID	Item	Source
DPOW01	I like being the boss.	Havercamp (1998)

DPOW02	I try hard to persuade others of my opinions.	Havercamp (1998)
DPOW03	I am trying to assume more of a leadership role.	Havercamp (1998)
DPOW04	I enjoy directing group activities.	Havercamp (1998)
DPOW05	I seek dominant roles.	Havercamp (1998)
DPOW06	I enjoy the sense of power when in charge of others.	Havercamp (1998)
DPOW07	I try to get others do my bidding.	Havercamp (1998)
DPOW08	I enjoy making decisions that affect other people.	Havercamp (1998)

Desire: Order

ID	Item	Source
DORD01	Daily routines are very important to me.	Havercamp (1998)
DORD02	Neatness is essential to me.	Havercamp (1998)
DORD03	I must do things in a precise manner.	Havercamp (1998)
DORD04	Everything must be in its place for me to be	Havercamp (1998)

	comfortable.	
DORD05	I enjoy organizing things.	Havercamp (1998)
DORD06	I pride myself in being organized.	Havercamp (1998)
DORD07	When things are out of place, I want to put them in their proper place.	Original
DORD08	When I see sloppiness, I try to organize things so they are less sloppy.	Original

Desire: Idealism or Citizenship

ID	Item	Source
DIDL01	Making the world a better place is one of my most important life goals.	Havercamp (1998)
DIDL02	I have a strong sense of social responsibility.	Havercamp (1998)
DIDL03	I am proud of my community service.	Havercamp (1998)
DIDL04	I place considerable value on public service.	Havercamp (1998)

DIDL05	Social causes are an essential part of my life.	Havercamp (1998)
DIDL06	I often worry about the well-being of society.	Havercamp (1998)
DIDL07	I should devote my life to the betterment of humankind.	Havercamp (1998)
DIDL08	I worry about people less fortunate than me.	Havercamp (1998)

Desire: Status or Social Prestige

ID	Item	Source
DSTAT01	Social status is very important to me.	Havercamp (1998)
DSTAT02	Becoming rich is one of my most important life goals.	Havercamp (1998)
DSTAT03	Prestige is very important to me.	Havercamp (1998)
DSTAT04	I like to boast about my success.	Havercamp (1998)
DSTAT05	I love having the best things in games.	Original

DSTAT06	I enjoy showing others my high scores in games.	Original
DSTAT07	I want to have a high position in the social hierarchy of my group.	Original
DSTAT08	The social prestige of my role in the games I play is important to me.	Original

Desire: Vengeance

ID	Item	Source
DVEN01	I enjoy getting even with people who offend me.	Havercamp (1998)
DVEN02	I believe that "revenge is sweet".	Havercamp (1998)
DVEN03	I will insult back anybody who insults me.	Havercamp (1998)
DVEN04	I try to retaliate when attacked.	Havercamp (1998)
DVEN05	I will not take any crap from others.	Havercamp (1998)
DVEN06	When I get angry, I strike back.	Havercamp (1998)

DVEN07	I make people pay for any trouble they cause me.	Havercamp (1998)
DVEN08	I must get even with others.	Havercamp (1998)

Desire: Eating or Food

ID	Item	Source
DEAT01	I love to eat.	Havercamp (1998)
DEAT02	I have a big appetite.	Havercamp (1998)
DEAT03	I often think (or fantasize) about food.	Havercamp (1998)
DEAT04	I love the aroma of food.	Havercamp (1998)
DEAT05	Eating is one of the most enjoyable activities of my day.	Havercamp (1998)
DEAT06	I love desserts.	Havercamp (1998)
DEAT07	I love to go to restaurants.	Havercamp (1998)
DEAT08	I like to eat late at night.	Havercamp (1998)

Desire: Romance or Sex

ID	Item	Source
DROM01	Sex is very important to me.	Havercamp (1998)
DROM02	I have a strong need for frequent sex.	Havercamp (1998)
DROM03	I fantasize a lot about sex.	Havercamp (1998)
DROM04	I want all the sex I can get.	Havercamp (1998)
DROM05	I am proud of my sexual prowess.	Havercamp (1998)
DROM06	I am sexually uninhibited.	Havercamp (1998)
DROM07	I am trying to have sex more often.	Havercamp (1998)
DROM08	I must have frequent sex.	Havercamp (1998)

Desire: Physical Exercise

ID	Item	Source
DPE01	Participating in sports is an essential part of my life.	Havercamp (1998)

DPE02	Fitness is very important to me.	Havercamp (1998)
DPE03	I must have frequent physical activity to be happy.	Havercamp (1998)
DPE04	I am happiest when I am physically active.	Havercamp (1998)
DPE05	I am proud of my athletic abilities.	Havercamp (1998)
DPE06	I enjoy physical exercise.	Havercamp (1998)
DPE07	I like activities that challenge my strength.	Havercamp (1998)
DPE08	I try to exercise at least one hour every day.	Havercamp (1998)

Desire: Acceptance

ID	Item	Source
DACPT01	I very much want other people to like me.	Havercamp (1998)
DACPT02	Gaining acceptance from others is one of my most important goals.	Havercamp (1998)
DACPT03	I try hard to please other people.	Havercamp (1998)

DACPT04	I enjoy it when other people like me.	Original
DACPT05	I like feeling accepted by the people around me.	Original
DACPT06	I enjoy pleasing other people.	Original
DACPT07	I seek acceptance from others.	Original
DACPT08	I enjoy feeling accepted by other people.	Original

Desire: Tranquility

ID	Item	Source
DTQL01	I enjoy calming experiences.	Original
DTQL02	I like to rest and recover from feeling stressed.	Original
DTQL03	I want to be calm and relaxed.	Original
DTQL04	I try to be free from tension or concern.	Original
DTQL05	I like to regenerate my energy by relaxing.	Original
DTQL06	I seek a peaceful feeling of satisfaction with the way things are now.	Original

DTQL07	I want to let go of worries and unpleasant thoughts.	Original
DTQL08	Feeling relaxed is one of my most important goals.	Original

Desire: Saving

ID	Item	Source
DSAV01	My desire to keep things is very strong.	Havercamp (1998)
DSAV02	I enjoy saving up things.	Adapted from Havercamp (1998)
DSAV03	I enjoy collecting things.	Havercamp (1998)
DSAV04	I place a very high value on the things I own.	Havercamp (1998)
DSAV05	I hate giving up anything I own.	Havercamp (1998)
DSAV06	I hate throwing things away.	Havercamp (1998)
DSAV07	I hate it when my things are wasted.	Havercamp (1998)
DSAV08	I hate it when I run out of something.	Havercamp (1998)

Appendix G: Demographics and Background Questionnaire

A digital game is any game that you play on a computerized device, like a video game console, Personal Computer (PC), smartphone, or on the Internet.

How many years have you been playing digital games?

Which of following best characterizes how often you play digital games?

Multiple choice options: Not at all, Rarely, Once per year, Once per season, Once per month, Once per week, Three times per week, Every day, Four hours per day, Eight hours per day, or More than eight hours per day.

What kind of digital games do you typically play? (Check all that apply)

Checkboxes: Action, Fighting, Racing, Shooters, Simulations, Strategy, Role-Playing Games (RPGs), Puzzle Games, Educational Games, Sports, Casual, Other: (text field)

What was the first language you learned, or your native language?

How old are you?

What is your gender?

Email Address

If you would like a chance to win a prize for participating in this survey, please enter your email address below.

Your email address will only be used to email you if you are randomly selected to win a prize for participating in this survey. Your email address will not be used for any other purpose.

What is your email address?

Appendix H: Items Retained after Instrument Validation, Factor Loadings, and Cronbach's Alpha Internal Consistency Reliability Levels

Factor	Items Retained	Factor Loading (Note: desires were analyzed separately)	Reliability if item deleted
Enjoyment	ENJOY07	.849	.877
Cronbach's Alpha = .901	ENJOY09	.829	.886
	ENJOY04	.800	.889
	ENJOY02	.742	.885
	ENJOY08	.724	.887
	ENJOY01	.717	.889
	ENJOY05	.691	.895
Usability of Controls	EASE03	.929	.883
Cronbach's Alpha = .905	SUS03	.867	.885
	IC02	.729	.896
	IC01	.725	.893
	EASE04	.718	.893
	IC03	.668	.896
	SUS09	.638	.894
	SUS02	.636	.901
	SUS08	.605	.907

Learnability	SUS10	.842	-
Cronbach's Alpha = .609	SUS04	.487	-
Immediate Progress Feedback	IPF03	.857	.837
Cronbach's Alpha = .881	IPF02	.805	.848
	IPF04	.797	.857
	IPF01	.723	.845
Clear Proximal Goals	CG01	.853	.766
Cronbach's Alpha = .847	CG02	.669	.778
	CG04	.658	.815
Control	CTRL01	.779	.815
Cronbach's Alpha = .847	CTRL06	.737	.814
	CTRL05	.719	.824
	CTRL03	.689	.821
	CTRL02	.649	.825
	CTRL04	.629	.830
Altered Perception of Time	TIME03	.830	.792
Cronbach's Alpha = .858	TIME01	.822	.812
	TIME05	.700	.829
	TIME04	.698	.839
Concentration	EC01	.819	.736
Cronbach's Alpha = .836	EC05	.804	.766
	EC02	.695	.806
Merging of Action and Awareness	MAA05	.884	-
Cronbach's Alpha = .737	MAA04	.593	-
Loss of Reflective Self-Consciousness	LSC02	.627	-
Cronbach's Alpha = .649	LSC01	.572	-
Desire Fulfillment: Curiosity	DFCUR03	.893	.851
Cronbach's Alpha = .882	DFCUR05	.731	.863
	DFCUR07	.706	.863
	DFCUR02	.685	.867
	DFCUR04	.671	.864
	DFCUR01	.638	.875
	DFCUR08	.612	.875
Desire: Curiosity	DCUR03	.774	.784
Cronbach's Alpha = .823	DCUR05	.736	.786

	DCUR07	.631	.800
	DCUR04	.621	.806
	DCUR08	.603	.803
	DCUR01	.575	.809
	DCUR02	.574	.809
Desire Fulfillment: Tranquility	DFTQL03	.963	.898
Cronbach's Alpha = .920	DFTQL01	.908	.900
	DFTQL08	.899	.909
	DFTQL05	.725	.907
	DFTQL06	.639	.911
	DFTQL02	.568	.916
	DFTQL04	.565	.911
Desire: Tranquility	DTQL01	.892	.823
Cronbach's Alpha = .857	DTQL03	.751	.839
	DTQL08	.690	.837
	DTQL05	.687	.835
	DTQL04	.678	.840
	DTQL07	.586	.837
	DTQL06	.527	.851
Desire Fulfillment: Independence	DFIND07	.936	.957
Cronbach's Alpha = .963	DFIND04	.916	.958
	DFIND09	.900	.958
	DFIND01	.885	.960
	DFIND06	.874	.959
	DFIND05	.856	.962
	DFIND02	.828	.959
	DFIND08	.815	.957
	DFIND03	.774	.961
	DFIND10	.766	.960
Desire: Independence	DIND07	.897	.863
Cronbach's Alpha = .886	DIND04	.804	.866
	DIND06	.739	.873
	DIND10	.705	.872
	DIND09	.694	.873
	DIND08	.690	.873

	DIND05	.672	.876
	DIND03	.577	.878
	DIND02	.545	.880
	DIND01	.480	.890
Desire Fulfillment: Social Contact	DFSC06	.858	.881
Cronbach's Alpha = .906	DFSC02	.843	.884
	DFSC08	.831	.893
	DFSC07	.777	.887
	DFSC03	.713	.896
	DFSC01	.701	.896
Desire: Social Contact	DSC01	.739	.729
Cronbach's Alpha = .782	DSC02	.727	.723
	DSC04	.687	.759
	DSC08	.636	.734
	DSC03	.543	.761
Desire Fulfillment: Saving	DFSAV03	.760	.677
Cronbach's Alpha = .741	DFSAV02	.716	.682
	DFSAV01	.599	.670
	DFSAV04	.563	.707
	DFSAV05	.438	.747
Desire: Saving	DSAV01	.885	.772
Cronbach's Alpha = .834	DSAV06	.758	.795
	DSAV05	.713	.796
	DSAV04	.626	.812
	DSAV03	.555	.824
	DSAV07	.467	.835
Desire Fulfillment: Power	DFPOW04	.816	.855
Cronbach's Alpha = .878	DFPOW03	.765	.854
	DFPOW08	.759	.859
	DFPOW05	.722	.863
	DFPOW01	.644	.858
	DFPOW02	.638	.871
	DFPOW06	.607	.865
Desire: Power	DPOW01	.818	.794
Cronbach's Alpha = .832	DPOW08	.710	.801
	DPOW03	.695	.806

	DPOW04	.668	.803
	DPOW05	.615	.804
	DPOW02	.581	.816
	DPOW07	.517	.842
Desire Fulfillment: Vengeance	DFVEN07	.907	.911
Cronbach's Alpha = .928	DFVEN01	.829	.914
	DFVEN06	.816	.915
	DFVEN08	.803	.916
	DFVEN04	.784	.923
	DFVEN05	.743	.920
	DFVEN03	.692	.921
	DFVEN02	.666	.923
Desire: Vengeance	DVEN06	.839	.884
Cronbach's Alpha = .900	DVEN04	.800	.886
	DVEN07	.790	.878
	DVEN08	.773	.880
	DVEN02	.754	.880
	DVEN01	.742	.884
Desire Fulfillment: Status	DFSTAT08	.810	.749
Cronbach's Alpha = .800	DFSTAT03	.787	.746
	DFSTAT07	.656	.740
	DFSTAT05	.630	.777
	DFSTAT06	.510	.797
Desire: Status	DSTAT03	.792	.688
Cronbach's Alpha = .772	DSTAT07	.695	.718
	DSTAT01	.694	.692
	DSTAT08	.495	.771
Desire Fulfillment: Order	DFORD05	.968	.884
Cronbach's Alpha = .907	DFORD08	.899	.886
	DFORD06	.863	.885
	DFORD02	.818	.886
	DFORD04	.735	.894
	DFORD07	.613	.903
	DFORD03	.540	.905
	DFORD01	.509	.918
Desire: Order	DORD06	.935	.844

Cronbach's Alpha = .884	DORD02	.808	.852
	DORD05	.703	.869
	DORD04	.702	.858
	DORD08	.680	.864
	DORD01	.626	.892
Desire Fulfillment: Honor	DFHON03	.937	.958
Cronbach's Alpha = .963	DFHON05	.911	.958
	DFHON02	.900	.957
	DFHON09	.882	.959
	DFHON07	.855	.959
	DFHON08	.855	.960
	DFHON01	.853	.959
	DFHON06	.806	.958
	DFHON10	.750	.963
	DFHON04	.743	.961
Desire: Honor	DHON06	.892	.854
Cronbach's Alpha = .894	DHON08	.874	.867
	DHON02	.862	.863
	DHON09	.737	.891
	DHON03	.689	.879
	DHON07	.678	.889
Desire Fulfillment: Acceptance	DFACPT07	.998	.959
Cronbach's Alpha = .968	DFACPT08	.952	.962
	DFACPT01	.926	.961
	DFACPT04	.922	.960
	DFACPT02	.891	.961
	DFACPT03	.834	.968
	DFACPT05	.802	.966
Desire: Acceptance	DACPT01	.924	.763
Cronbach's Alpha = .857	DACPT07	.857	.784
	DACPT03	.699	.830
	DACPT05	.611	.874
Desire Fulfillment: Idealism	DFIDL02	.965	.943
Cronbach's Alpha = .949	DFIDL04	.940	.924
	DFIDL03	.913	.929
	DFIDL05	.879	.936

Desire: Idealism Cronbach's Alpha = .886	DIDL04	.955	.821
	DIDL02	.890	.839
	DIDL05	.829	.890
	DIDL07	.760	.868
Desire Fulfillment: Physical Exercise Cronbach's Alpha = .939	DFPE06	.957	.928
	DFPE03	.946	.927
	DFPE04	.939	.940
	DFPE08	.878	.943
Desire: Physical Exercise Cronbach's Alpha = .928	DPE03	.990	.906
	DPE06	.953	.930
	DPE02	.913	.909
	DPE04	.833	.932
Desire Fulfillment: Family Cronbach's Alpha = .947	DFFAM03	.955	.910
	DFFAM07	.937	.932
	DFFAM01	.799	.926
Desire: Family Cronbach's Alpha = .912	DFAM02	.972	.801
	DFAM07	.943	.894
	DFAM05	.853	.906
Desire Fulfillment: Eating Cronbach's Alpha = .903	DFEAT03	1.008	.904
	DFEAT05	1.004	.805
	DFEAT07	.923	.869
Desire: Eating Cronbach's Alpha = .887	DEAT05	.899	.829
	DEAT02	.845	.860
	DEAT04	.826	.856
	DEAT03	.781	.876
Desire Fulfillment: Romance Cronbach's Alpha = .986	DFROM04	.949	.983
	DFROM02	.906	.981
	DFROM08	.902	.979
	DFROM01	.884	.981
	DFROM07	.705	.991
Desire: Romance Cronbach's Alpha = .911	DROM03	.878	.896
	DROM01	.870	.876
	DROM08	.828	.908
	DROM02	.793	.883
	DROM05	.783	.892