Modeling Gameplay Enjoyment through Feature Preferences,

Goal Orientations, Usage, and Gender

by

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ABSTRACT

The gameplay experience can be understood as an interaction between player and game design characteristics. A greater understanding of these characteristics can be gained through empirical means. Subsequently, an enhanced knowledge of these characteristics should enable the creation of games that effectively generate desirable experiences for players.

The purpose of this study was to investigate the relationships between gameplay enjoyment and the individual characteristics of gaming goal orientations, game usage, and gender. A total of 301 participants were surveyed and the data were analyzed using Structural Equation Modeling (SEM). This led to an expanded Gameplay Enjoyment Model (GEM) with 41 game features, an overarching Enjoyment factor, and 9 specific components, including Challenge, Companionship, Discovery, Fantasy, Fidelity, Identity, Multiplayer, Recognition, and Strategy. Furthermore, the 3x2 educational goal orientation framework was successfully applied to a gaming context. The resulting 3x2 Gaming Goal Orientations (GGO) model consists of 18 statements that describe players' motivations for gaming, which are distributed across the six dimensions of Task-Approach, Task-Avoidance, Self-Approach, Self-Avoidance, Other-Approach, and Other-Avoidance. Lastly, players' individual characteristics were used to predict gameplay enjoyment, which resulted in the formation of the GEM-Individual Characteristics (GEM-IC) model. In GEM-IC, the six GGO dimensions were the strongest predictors. Meanwhile, game usage variables like multiplayer, genre, and platform preferences, were minimal to moderate predictors. Although commonly

appearing in games research, gender and hours played per week failed to predict enjoyment.

The results of this study enable important work to be conducted involving game experiences and player characteristics. After several empirical iterations, GEM is considered suitable to employ as a research and design tool. In addition, GGO should be useful to researchers interested in how player motivations relate to gameplay experiences. Moreover, GEM-IC points to several variables that may prove useful in future research. Accordingly, it is posited that researchers will derive more meaningful insights on games and players by investigating detailed, context-specific characteristics as compared to general, demographic ones. Ultimately, it is believed that GEM, GGO, and GEM-IC will be useful tools for researchers and designers who seek to create effective gameplay experiences that meet the needs of players.

DEDICATION

To my wife, Zarraz, whose intellect, humor, and kindness have breathed life into this work. I am excited for the love and adventures that we will share.

To my parents, Susan and Paul, Rod and Sue, whose encouragement, discipline, and persistence have ensured this work was carried out with the utmost integrity from beginning to end. I am grateful for all of your love and support.

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John

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I am pleased with the addition of Dr. Danielle McNamara to my committee and the ASU community. She has helped to broaden my knowledge of learning science research, particularly in regards to the integration of video games and intelligent tutoring systems. Her lab includes a number of outstanding students and young researchers, whose work I have become familiar with. Dr. McNamara has also inspired me to consider how my research models can be conveyed to others in approachable, easy to understand ways.

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Dr. Wilhelmina Savenye holds a special place among my committee members. She was my mentor during the early portions of my PhD journey. Dr. Savenye introduced me to valuable research, collaboration, and professional opportunities. In challenging times, she showed resolve and compassion when difficult decisions had to be made. Dr. Savenye's ability to support and nurture me as a young researcher has made a vital impact on my professional development. I am grateful to have worked with her over these past years.

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INTRODUCTION

The gameplay experience can be understood as an interaction that is partially generated by a game and partially generated by a player. In a corresponding perspective, Ermi and Mayra (2005, p. 16) defined the gameplay experience as a "unique interaction process between the game and the player." Similarly, Winn (2008, p. 1013) explained that "Play is greatly influenced by not only the design, but also the player, including his or her cognitive, social, cultural, and experiential background that he or she brings to the given play experience." Furthermore, Juul (2010, p. 53) explained that video game researchers tend towards either a "player-centric" or "game-centric" perspective. A player-centric perspective concentrates on how users play games, while a game-centric perspective concentrates on game design. Juul advises that these viewpoints cannot fully describe games in isolation. Taken together, these perspectives suggest that design and player characteristics, as well as their combined effects, are critical to understanding the gameplay experience.

Research Approach

Repeated calls for empirical research that considers the combined effects of game design and player characteristics can be found in the literature. As a result of the past treatment of gaming as a singular, simplified entity, Hartmann and Klimmt (2006b) emphasized the importance of distinguishing between complex and diverse game types. In addition, Ryan, Rigby, and Przybylski (2006, p. 362) urged for "more research on individual differences in the appeal of games that differ in theme, content, and styles of play." Further, an online survey of 314 gamers conducted by researchers at the University of Southern California revealed that competition and challenge were most important to the enjoyment of games (Vorderer, Bryant, Pieper, & Weber, 2006). Yet, the authors pointed out that researchers "have yet to clearly delineate what 'challenge' and 'competition' mean for video game players and why they are so appealing" (Vorderer, et al., 2006, p. 2). Ke (2008) explained that although games are widely considered engaging activities, players react differently to games due to individual differences. Meanwhile, Weber and Shaw (2009, p. 68) described that "video game players mostly talk about game features and the game experience when explaining (or justifying) why they play a certain game." Wilson et al. (2009) noted that there was a lack of understanding in regards to how learning outcomes are impacted by game attributes. Moreover, Magerko, Heeter, and Medler (2010) identified gaming literacy, motivation, mindsets, and goal orientation-game design equivalence as four key challenges for game-based learning. They went on to call for a "set of design principles that can help designers better target a varied student population" and suggested that the first step would be to "map the most important individual differences among students… to possible game design features" (Magerko, et al., 2010, p. 4). Similarly, McNamara, Jackson, and Graesser (2010) expressed a need to identify the relationships between specific game features and the motivational aspects of games. After collecting a variety of students' in-game behaviors in and post-play reports of four games, Heeter, Lee, Magerko, and Medler (2011, p. 50) made several key concluding remarks, including citing the "need for more future work on understanding the relevant individual differences between game players," and cautioning that "Serious game designers should consider how their game will be received by non-gamers as well as avid gamers and females as well as males." Likewise, a review by

Vandercruysse, Vanderwaetere, and Clarebout (2012) recommends focusing on game characteristics and individual differences among learners.

In these literature perspectives, many calls are found for research that empirically identifies important game features while simultaneously considering individual differences. Thus, the present research adopts a multifaceted approach that considers how design features and player characteristics combine to yield enjoyable video game experiences. This research also proposes a detailed, empirical approach to examining game design features, individual characteristics, and gameplay enjoyment. In taking this perspective, it is anticipated that a more complete and purposeful understanding of video games and players can be achieved.

Aims

Through exploring the enjoyment of gameplay, this research aims to provide empirical findings that are applicable to many kinds of games and players. Rather than focusing only on avid gamers or expert players of a specific game or genre, all players were embraced, including infrequent and non-gamers. When considering the design of games for learning, it is important to focus on the full range of anticipated players, rather than solely those with extensive prior experience. It is believed that doing so will increase the capability of a game design to meet the needs of its audience and yield an effective experience. In this study, players' feature preferences, goal orientations, usage of games, and genders were investigated as components of enjoyable gameplay experiences.

Literature Review

To begin, the existing literature in game design and player taxonomies are reviewed. Subsequently, examinations into personality and other individual characteristics are discussed. Next, the prior studies and proposed study in this line of research are described.

Game Design and Player Taxonomies

Many conceptual game design and player type taxonomies have been proposed in the literature and a few have been examined through empirical means. Although some of these taxonomies have focused on different types of games and players, many valuable games and players have been neglected. The game design taxonomies break the gameplay experience (often called fun, enjoyment, or flow) into distinct components. Meanwhile, the player type taxonomies describe different patterns of player behaviors. By reviewing prior game design and player type taxonomies, insights into the historical characteristics of interest can be gained and areas for improvement in future research can be identified.

Game Design Taxonomies

The Mechanics, Dynamics, and Aesthetics (MDA) framework attempts to describe video game design in a formal, comprehensive fashion (Hunicke, LeBlanc, & Zubek, 2004). Mechanics are the underlying coded mechanisms of a game, Dynamics are the interactions between the Mechanics and the player over time, and Aesthetics are the player's affective states while interacting with the game. Aesthetics are the player-facing dimension of the MDA model and of interest when examining the role of enjoyment in gameplay. Within Aesthetics, MDA offers a glossary of eight words to formalize how fun can be experienced in games: Fantasy, Narrative, Expression, Submission, Sensation, Challenge, Fellowship, and Discovery (Hunicke, et al., 2004; Schell, 2008). Table 1 contains descriptions of the elements found in each reviewed game design taxonomy.

In considering the design of serious games, Winn (2008) developed the Design, Play, and Experience (DPE) framework. Unlike most commercial games, serious games are created primarily for purposes other than entertainment. For example, serious games are commonly used in education, military training, and healthcare interventions. DPE expands upon MDA by further specifying the interactions between designers, games, and players in the context of serious games. As a result, four major design layers are presented (Winn, 2008). In the Learning layer, content and instruction are combined to yield learning outcomes. In the Storytelling layer, a player experiences narrative both as designed and as emergent from his own interactions with the game. In the User Experience layer, a player interacts with a physical interface and its associated sensory stimuli. Lastly, the Gameplay layer is closely related to MDA (Hunicke, et al., 2004), with the renaming of Aesthetics to Affect in order to focus attention towards psychological states rather than artistic beauty (Winn, 2008). Here, the Gameplay layer is of primary interest, since it entails players' psychological responses to gameplay. Incorporating prior work on the ways in which fun can be experienced (Garneau, 2001; Heeter et al., 2004), DPE offers 16 ways that fun can be achieved in games (Table 1).

The GameFlow model (Sweetser & Wyeth, 2005) describes enjoyment in games based on Flow theory (Csikszentmihalyi, 1990). GameFlow is composed of eight elements, including Concentration, Challenge, Player Skills, Control, Clear Goals, Feedback, Immersion, and Social Interaction, which were applied by its authors to the evaluation of two real-time strategy computer games (Sweetser & Wyeth, 2005). Later, Fu, Su, and Yu (2009) adapted the GameFlow model to learning games to form the 42-item, eight dimension, EGameFlow questionnaire. The questionnaire was validated using a sample of 166 introductory software applications students in Taiwan, who played one of four browser-based learning games prior to completing the instrument. It is worth noting that the EGameFlow questionnaire is designed as a post assessment that immediately follows the play of a specific game. Due to their inherent similarities, GameFlow and EGameFlow are presented as a combined taxonomy in Table 1 with slight differences noted.

Yee (2006) surveyed 3,200 players (2,769 males, 431 females) of the MMORPGs *EverQuest*, *Dark Age of Camelot*, *Ultima Online*, and *Star Wars Galaxies*. The online questionnaire was composed of 40 items derived from Bartle's (1996) player taxonomy and was advertised on gaming community websites. An initial Principle Component Analysis (PCA) yielded 10 factors, which were subjected to a second PCA that yielded three factors. Subsequently, Yee (2006) concluded that the primary components of Achievement, Social, and Immersion, each containing three to four subcomponents, represent MMORPG players' underlying motivations for play. Several years later, a follow-up study examined a model that consisted of only the three primary components of Achievement, Social, and Immersion. In that study (Yee, Ducheneaut, & Nelson, 2012), 2,071 *World of Warcraft* players (1,358 males, 709 females) were again recruited through announcements on online gaming websites. Participants completed a 12-item online questionnaire that contained revised items from the preceding study (Yee, 2006). An Exploratory Factor Analysis (EFA) arranged the 12 items into the Achievement, Social, and Immersion factors with four items loading on each factor. Thus, Yee et al. (2012) concluded that the three-factor model (Table 1) of online MMORPG player motivations was supported by the data.

Ryan et al. (2006) reported a series of four studies on players' motivation for gaming in the context of Self-Determination Theory (SDT). In the first three studies, participants were undergraduate students at a private northeastern U.S. university who completed online questionnaires before and after a series of 20-40 minute play sessions. These students were exposed to different types of *Nintendo 64* console games in each study, including *Super Mario 64* (study 1, n = 89), top (*Legend of Zelda: Ocarina of Time*) and bottom rated (*A Bug's Life*) 3D adventure games (study 2, n = 50), and *Super Mario 64*, *Super Smash Brothers*, *Star Fox 64*, and *San Francisco Rush* (study 3, n = 58). In the fourth study, Massively Multiplayer Online (MMO) gamers were surveyed from an online community (study 4, n = 730) based on their prior play experience. Very few males participated in the first three studies, while the fourth study included males almost exclusively. A battery of existing SDT instruments were used to measure participants' Autonomy, Competence, Presence, Intuitive Controls, and Relatedness (Table 1), as well as their intrinsic motivation to play, preference for future play, continued play behavior, mood, and self-esteem. The fourth study added Yee's (2006) dimensions of Achievement, Social, and Immersion to the preceding measures. Regression, ANOVA, and Hierarchical Linear Modeling (HLM) analyses were used to evaluate the data. Based on these studies, Ryan et al. (2006) concluded that the SDT components of Autonomy and Competence were present in solo games, while Relatedness was additionally present in multiplayer games. Moreover, Autonomy, Competence, and Relatedness significantly accounted for intrinsic motivation to play and preference for future play, while Intuitive Controls related to higher intrinsic motivation to play.

Wilson et al. (2009) reviewed the literature in games and learning. The authors categorized and summarized several types of historical learning outcomes, such as cognitive learning, declarative knowledge, skill-based knowledge, and affective learning. They also examined prior work in games to compile a list of attributes that were being studied. The authors included their own theories to expand this list to 18 game features (Table 1). Next, Wilson et al. (2009) indicated which combinations of learning outcomes and game attributes had already been studied. Finally, the authors made 14 propositions for future research in games and learning. A subsequent attempt was made to further distill the 18 game features provided by Wilson et al. (2009) into the nine categories of Action/Language, Assessment, Conflict/Challenge, Control, Environment, Game Fiction, Human Interaction, Immersion, and Rules/Goals (Bedwell, Pavlas, Heyne, Lazzara, & Salas, 2012). However, a combination of small sample size, ambiguous analysis procedures, and questionable post hoc modifications to the results led to findings that cannot be accepted with confidence. Therefore, the nine categories by Bedwell et al. (2012) are not included in Table 1.

Hong et al. (2009) conducted a design-based, action research study of the development of a drill and practice arithmetic game with competitive team features. The study included three phases. In the first phase, game rules and features were designed collaboratively with teachers who supervised their students playing the game prototype. In the second phase, the positive and negative reinforcement of playfulness in the game was examined via teacher focus groups. In the third phase, eight teachers evaluated the importance of factors that influence playfulness using checklists and focus groups. From this pursuit, Hong et al. (2009) concluded upon six elements that promote playfulness, including Degree of Uncertainty, Equal Conditions for Fair Play, Opportunities for Competition and Cooperation, Level of Challenge, Flexibility in Decision Making, and Level of Interactivity (Table 1). Note that these elements were derived from mathematical game theory, which does not perfectly relate to the situations encountered in modern video games.

Wood, Griffiths, Chappell, and Davies (2004) and Griffiths, Davies, and Chappell (2004) sought to identify the structural characteristics of games that attract players and motivate them to play. Wood et al. (2004) surveyed 382 (242 male, 140 female) mostly undergraduate and graduate students, though the study was open to other acquaintances of these students. Nearly all of the participants played games at least once per week (96%). Participants rated how important an array of features, such as sound, graphics, background and setting, and multiplayer features, among others, were to their enjoyment of a game. The authors reported that realistic or high quality graphics, sounds, and settings were the most important finding and that sound effects were one of the only gender-neutral characteristics. Meanwhile, Griffiths et al. (2004) surveyed the demographics and favorite/least favorite play aspects of 540 (431 male, 99 female) *EverQuest* MMORPG players. In addition to providing general demographics for the sample, they found social aspects (social game, grouping with others, guild membership) to be most appealing to players, while roleplaying and player versus player (PVP; a form of intense competition in MMORPGs) were among the least appealing play aspects. In both studies, the researchers reported their results on a feature-by-feature basis, rather than forming a taxonomy. However, King, Delfabbro, and Griffiths (2010) later expanded upon the concept of structural characteristics and provided a five-element taxonomy of video game design features, which included Social, Manipulation and Control, Narrative and Identity, Reward and Punishment, and Presentation features (Table 1). Three or more subfeatures were also associated with each primary feature.

In Intelligent Tutors and Games (ITaG), McNamara et al. (2010) proposed that the strengths of games and intelligent tutoring systems (ITS) could be leveraged in tandem to improve learning. The authors described five overarching categories of game features, including Feedback, Incentives, Task Difficulty, Control, and Environment (Table 1). Within each category, specific example game features were offered. For instance, the Feedback category recommended features like points and verbal information. The ITaG taxonomy also contained two unique elements. The first was a function associated with each feature. The function describes the purpose or goal behind incorporating a feature into a game and/or ITS. For example, in the Feedback category, the function associated with the Competition feature is to provide information on "performance relative to others" McNamara et al. (2010, p.50). The second distinct element in ITaG is that each feature and function is tied to one or more motivational constructs, including self-regulation, self-efficacy, interest, and/or engagement. ITaG's combination of categories, features, functions, and motivational constructs supports the development of educational research questions surrounding the use of games and ITS.

Player Type Taxonomies

Perhaps the most well-known classification of players comes from designer Richard Bartle (1996). His taxonomy describes the players of multi-user dungeons (MUDs), which were early, text-based predecessors to MMORPGs. Bartle described MUD players as being Achievers preoccupied with gaining points and levels, Explorers seeking to understand the mechanisms that operate the game world, Socializers interested in person-to-person interaction, or Killers imposing their ill will upon others.

Similarly, after observing the in-game behaviors and online communication habits of Star Wars Galaxies MMORPG players, Squire and Steinkuehler (2006) suggested that players could be categorized as either Power Levelers or Role Players. Power Levelers are obsessed with gaining levels through efficient, mechanical gameplay, known as *grinding*. Alternatively, Role Players are interested in maintaining the fiction of the virtual world by assuming an alternative identity, rather than acting as they would in everyday life.

Furthermore, Klug and Schell (2006) offered a grouping of theoretical player types, which included the Competitor, Explorer, Collector, Achiever, Joker, Director, Storyteller, Performer, and Craftsman. Each player type is explained to have different motivations for play. For example, a Craftsman enjoys building in-game items and having a structural impact on the game world, whereas a Joker enjoys lighthearted socialization with peers.

After crossing the works of Bartle (1996), Squire and Steinkuehler (2006), and Klug and Schell (2006) with several learning and motivation theories, Heeter (2008) presented an integrated model of play styles, learning styles (abstract, reflective, auditory, concrete, kinesthetic, active, visual), achievement orientations (intrinsic vs. extrinsic), social orientations (anti-social vs. pro-social), and mindsets (helpless vs. mastery). This model featured an expanded taxonomy of 13 player types (Collector, Achiever, Power Leveler, Competitor, Director, Performer, Socializer, Storyteller, Role Player, Explorer, Craftsman, Joker, and Killer). Heeter (2008) suggested that a game's design may or may not match a player's motivations, with associated implications for learning effectiveness. In addition, Heeter (2008) suggested that certain player types (Killers and Jokers) and motivations (anti-social orientations and helpless mindsets) may not be conducive to learning.

The taxonomies offered by Bartle (1996), Squire and Steinkuehler (2006), Klug and Schell (2006), and Heeter (2008), all contain similar player types. Once these taxonomies are synthesized, 9 distinct player types remain. Table 2 contains descriptions of the synthesized player types, as well as those found in subsequently reviewed taxonomies.

In another conceptual merging of player type theories, Mena (2012) described several versions of a framework known as the Entertainment Grid (EG). Originally, the EG crossed Bartle's (1996) four player types with Caillois' (2001) four play styles to form a 4x4 taxonomy. Next, the grid was expanded to 8x8 by including additional player types and play styles. Ultimately, the author concluded that the EG could be simplified and restructured in a number of ways. The resulting updated EG crossed four player types (Socializer, Dominater, Explorer, Achiever) with five play styles (Competition, Cooperation, Chance, Mimicry, Vertigo) with two degrees of play complexity (Order, Chaos). Due to the absence of descriptions for each grid square, the EG is not presented in Table 2.

Weber and Shaw (2009) conducted two studies to investigate gamers' perceptions of the gameplay experience from a Social Cognitive Theory (SCT) perspective. In the first study, interviews were conducted with 15 (6 males, 11 females) individuals. The 15 participants were categorized as experienced (3 males, 3 females) or inexperienced/casual

(3 males, 6 females) gamers. Focused interview questions were formed based on a review of the terminology used in popular gaming magazines and websites. Participants were initially asked open-ended questions about their gameplay experiences, followed by additional questions based on the magazine and website terminology, in sessions that lasted 1.5 to 2.5 hours. In the second study, 422 undergraduate communications students (approximately two-thirds were female), who averaged playing games three hours per week, were surveyed. Anyone who played games once per month or less was excluded from the final analysis. The questionnaire included sections for demographics, play habits, gameplay experience, and genre preferences. In addition, participants rated the game quality perceptions derived from the first study. They also responded to a series of SCT psychological constructs, including incentives for human behavior, self-regulation tendencies, and temperaments. A hierarchical agglomerative cluster analysis was conducted on the psychological constructs and yielded six player type clusters, including the Hedonist, Competitor, Organizer, Rebel, Team Player, and Socializer (Table 2).

The Validator player type (Table 2) has emerged as a player type in certain discussions (Heeter, Magerko, Melder, & Fitzgerald, 2009; Heeter, Winn, Winn, & Bozoki, 2008; Magerko et al., 2010). This type of player is averse to failure, concerned with his public image, and tends to repeatedly choose easy-to-win tasks, rather than those that challenge and expand his skills. Heeter, Winn et al. (2008) initially encountered this player type in a study of 27 60-80 year old senior citizens who played a word memory brain game. Some participants consistently opted for easy challenges and subsequently improved their skills less than those who sought more difficult challenges. Heeter, Magerko et al. (2009) reviewed five commercial games and three serious games in estimation of how well they served three player types (Achievers, Explorers, and Validators). They concluded that Validators were not well served by most of the games and cautioned that compulsory serious games are more likely to encounter this player type than self-selected entertainment games. Magerko et al. (2010) further described the Validator player type and warned that such players may not learn well from educational games due to their aversion to failure.

Westwood and Griffiths (2010) employed a five-element taxonomy of game design (King et al., 2010) in a study of 40 avid gamers (38 males, 2 females, 90% between 18 and 30 years of age) who averaged 11.5 hours of play per week. A Q-methodology approach was employed, in which participants sorted a series of 56 statements into a normal distribution. Subsequently, the data were analyzed through inverted factor analysis (where people are taken as variables, rather than statements). Six factors (player types) were able to account for 31 of the 40 participants. These player types included Story-Driven Solo Gamers, Social Gamers, Solo Limited Gamers, Hardcore Online Gamers, Control/Identity Solo Gamers, and Casual Gamers (Table 2).

Ventura, Shute, and Kim (2012) surveyed 319 (161 male, 155 female) undergraduate students with an average age of 23. They divided students into three groups (Table 2) based on their hours played per week (Habitual players), hours spent playing favorite games (Selective players), and games played per year (Diverse players). Within these categories, percentiles were used to split the groups into three equal portions. The authors investigated how Openness and Conscientiousness, using a questionnaire from John (1990), relate to undergraduate students' self-reported GPAs (only 252 responses) and amounts of gameplay. The correlations between the personality traits and GPA were low, as were those between students' personality traits, GPAs, and genre preferences. In a series of one-way ANOVAs, the authors reported significant differences between high over low Habitual players on Conscientiousness, medium over high Selective players on GPA, and high over low Diverse players on Openness.

Following Demographic Game Design (DGD; Bateman & Boon, 2006) as a guiding theoretical framework, Cowley, Charles, Black, and Hickey (2012) explored the use of a real-time machine learning techniques for classifying players. The authors created a modified version of Pac-Man that logged players' actions and also adapted Bateman and Boon's (2005) DGD questionnaire. In the first phase, 100 players completed the questionnaire and played the modified Pac-Man game. From these data, a machine-learning model was developed and used to classify a second wave of 37 participants with approximately 70% accuracy. However, the authors only examined a binary player type that considered players as being either Conquerors or Not Conquerors. Hence, this study is currently of little practical value in understanding or designing for different player types. Nevertheless, Cowley et al. (2012) demonstrated a machine learning approach based on game features and players' in-game behaviors, which may be a promising methodology for future research on player types.

Areas for Improvement

While the presented taxonomies offer insights into game design, player types, and the elements that support certain gameplay experiences, there is much room for improvement. Many of the taxonomies were derived conceptually or through personal experience and rely primarily on anecdotal evidence. Even the few empirically derived taxonomies have their limitations. For instance, most are from solitary, exploratory studies in which follow-up validation and refinement work has not been conducted. Hence, the study of games and players would be improved through iterative research that provides accumulated empirical evidence in support of any proposed taxonomy.

Another challenge to much of the existing literature is the overemphasis of certain players and games alongside a neglect of others. Thus far, most research has focused on avid gamers, especially those who participate in MMORPGs. Not only is this a general problem of underrepresentation and overgeneralization in games research, but it is deeply concerning when serious games are considered. Serious games are employed in a variety of non-entertainment contexts, such as education, military training, and healthcare. There can be almost no similarities found between the wide array of serious games that have been created and the commercial MMORPGs that have been researched to date. Serious games tend to be solitary time-limited experiences (usually minutes) that focus on a narrow content area, whereas MMORPGs are repeating ongoing experiences (months to years) that provide more content than any one player could ever take in. Furthermore, MMORPG players tend to be experienced gamers who play several hours per week. In contrast, serious game players may come with any degree of gaming interest, expertise, and experience, including people who have played little to no digital games in their lifetime. With so many differences, it seems unlikely that results based on MMORPG games and avid gamers will be strongly representative of serious games and their audiences. There is a clear need to incorporate a broader range of potential players and games in future research.

Individual Characteristics

This study addresses the need for a detailed examination of individual characteristics in gaming in three ways. First, it examines how the motivational concept of goal orientations applies to the gaming context. Second, it investigates how game usage variables influence player enjoyment. Third, it asks whether gender is an influential individual difference in games. Finally, the literature surrounding these variables and the motivation behind selecting them as key inclusions in this study is discussed.

Goal Orientations

Educational researchers in the 1970s and 1980s started to conceptualize learning motivations in terms of goal-oriented activity (Dweck, 1986; Elliot, 2005; Payne, Youngcourt, & Beaubien, 2007). In synthesizing prior work, Dweck (1986) explained two salient types of motivational patterns. *Learning goals* manifest when students "seek to increase their competence, to understand or master something new," while *performance goals* occur when students "seek to gain favorable judgements of their competence or avoid negative judgements of their competence" (Dweck, 1986, p. 1). She further suggested that learning and performance goals were associated with adaptive and maladaptive behavioral patterns related to challenge seeking and persistence. By applying this framework in two pilot studies, Elliot and Dweck (1988) demonstrated relationships between goal orientation, perceived ability, task difficulty choice, and performance among 101 fifth grade students. In the studies, students completed challenging memory pattern recognition tests. Meanwhile, a proctor manipulated students' goal orientations using different instruction and feedback conditions. When learning goals were emphasized, students chose challenging problems and sought to increase competence despite their perceived ability. When performance goals were emphasized, students with high perceived ability similarly exhibited mastery-oriented behavior. However, students with low perceived ability exhibited helpless behavior in which they attributed poor performance to a lack of ability and did not persist in the face of challenging tasks. Hence, the authors concluded that a learning goal oriented environment could support positive achievement behaviors regardless of students' perception of their own abilities. Simultaneously, Ames and Archer (1988) evaluated a nearly identical framework whereby learning goals were referred to as *mastery goals*. They surveyed 176 eighth through eleventh grade students on their goal orientations and related attitudes. Most notably, the authors reported that, regardless of perceived ability, when students regarded their classroom environment as having a mastery goal orientation, they also cited more use of effective learning strategies, higher preference for challenging tasks, greater enjoyment of class, and a stronger belief in the relationship between success and effort. Similar to Elliot and Dweck (1988), Ames and Archer (1988) also suggested that learning environments, in tandem with interventions, may influence students' goal orientations. Research on learning/mastery goals and performance goals continued throughout the 1990s (Ames, 1992; Bouffard, Boisevert, Vezeau, & LaRouche, 1995; Elliot & Harackiewicz, 1994; Midgley et al., 1998; Wolters, Yu, & Pintrich, 1996) as these constructs were further refined and solidified across different contexts and populations.

However, the new millennium ushered in new perspectives and major developments in achievement goal orientations (Elliot & McGregor, 2001; Payne et al., 2007; Pintrich, 2000). Elliot and McGregor (2001) described achievement goals as relating to competence, which can be evaluated in absolute (according to task requirements), intrapersonal (according to one's own past performance), or normative (according to the performance of others) terms. Hence, absolute competence is concerned with mastery goals, whereas intrapersonal and normative competence is concerned with performance goals. In addition, Elliot and McGregor (2001) described competence as valenced by approach (seeking positive outcomes) or avoidance (evading negative outcomes). To examine these views, Elliot and McGregor (2001) conducted a series of three studies in which the goal orientations of undergraduate psychology students were surveyed. Exploratory and confirmatory factor analyses supported the identification of a 2x2 goal orientation framework that crossed the mastery-performance and approach-avoidance constructs. This resulted in four types of goals: mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance.

A decade later, two studies by Elliot, Murayama, and Pekrun (2011) supported further expansion to a 3x2 goal orientation framework. Here, a more detailed division of the goal orientation constructs was made. Absolute competence would remain represented by task-specific requirements, while intrapersonal and interpersonal competence would be recognized separately according to one's self (relative to the past) and normative (relative to others) performance. Again, the studies involved surveying the goal orientations of undergraduate psychology students and the use of Confirmatory Factor Analysis (CFA) to test the proposed model structure. In both studies, the hypothesized 3x2 goal orientation framework achieved sufficient fit to be considered a worthwhile representation of the theoretical constructs. Thus, the 3x2 goal orientation framework, which consists of the task-approach, task-avoidance, self-approach, self-avoidance, other-approach, and other-avoidance constructs, is the most developed model of educational goal orientations at the present time.

Initial investigations into the application of goal orientation constructs to video game contexts have already taken place. In a chapter that called for deeper investigations into individual characteristics and serious gaming, Magerko et al. (2010) described several motivational dichotomies as promising areas for continued research. Of the discussed motivational concepts, the goal orientation constructs of performance, mastery, approach, and avoidance were all included. In a subsequent study, Heeter, Lee, Medler et al. (2011) surveyed over 400 undergraduate students for the purpose of examining whether educational goal orientation constructs apply to gaming. To do so, they used the established 2x2 framework questionnaire (Elliot & McGregor, 2001) as well as an adapted version to fit the gaming context. All four constructs of the 2x2 educational goal orientation framework were significantly correlated with their game-adapted counterparts, with r values ranging from .20 to .93 and all $p < .001$ (Heeter, Lee, Medler, et al., 2011). As such, the authors concluded that students' motivations for classroom performance were correlated with their motivations for video gameplay performance. However, it is important to note that mastery approach/avoidance goals were significantly lower for gaming compared to the classroom, whereas performance approach/avoidance goals were significantly higher for gaming compared to the classroom. Accordingly, the authors interpreted that performance goals play a stronger role in gaming than mastery goals, while the opposite is true for education. In a follow-up EFA, the researchers were not able to reproduce the anticipated 2x2 gaming goal orientation structure, instead encountering a two-factor solution that featured mastery and performance goals that did not distinguish between approach and avoidance (Heeter, Lee, Medler, et al., 2011). In sum, this study established a preliminary connection between educational and gaming goal orientation frameworks that could be examined in greater detail through further research.

To date, no known examination of the 3x2 goal orientation framework (Elliot et al., 2011) alongside gameplay enjoyment and individual characteristics exists. Considering the promising preliminary investigations of gaming goal orientations (Heeter, Lee, Magerko, et al., 2011; Magerko et al., 2010), it is worthwhile to consider what contributions the 3x2 framework may hold for understanding goal orientations in the gaming context.

Game Usage

Game usage variables typically refer to the observable, quantifiable behaviors that gamers exhibit. They also include generalized gaming preferences to some degree. Nearly all gaming studies incorporate game usage variables to some extent. Sometimes these variables are used to describe differences among players (for example, Nah, Zhou, Boey, & Li, 2012; Poels, de Kort, & IJsselsteijn, 2012). At other times, game usage variables are analyzed statistically to explain differences between players (for instance, Hartmann, Jung, & Vorderer, 2012; Jin, 2012; Peever, Johnson, & Gardner, 2012; Ventura et al., 2012).

Data on game usage has been collected in prior studies from the GEM line of research. However, this information has been handled purely in a descriptive nature. After statistically clustering players based on their feature preferences and personality traits, Quick, Atkinson, and Lin (2012a) used play habits variables like hours played per week, minutes played per session, gaming skill, multiplayer preference, genre preference, platform ownership, and platform usage to supplement their descriptions of the clusters. Meanwhile, these same data were collected in the study reported by Quick, Atkinson, and Lin (2012b), but were not incorporated into any analyses nor did they serve a descriptive function. A goal of this study is to reverse these trends and incorporate game usage variables directly into statistical analyses as potential predictors of gameplay enjoyment. The specific game usage variables of interest to this study are briefly introduced.

Multiple game usage variables represent players' dedication to gaming. Hours played per week gives a broad indication of time spent gaming, while session duration indicates how long individuals spend gaming in a single sitting. Depending on the player, these variables can range from mere minutes to several hours. Overall gaming frequency (e.g. monthly, weekly, daily), number of games owned, and quantity of games played per month and year, are additional indicators of dedication to gaming. Similarly, if different gaming platforms appeal to different players, then the usage frequency of different platforms (e.g. home consoles, computers, mobile devices) might provide insights into one's enjoyment of games.

Other game usage variables deal with generalized player preferences. Self-reported skill level and difficulty preference may suggest the degree of experience that players have and their desire for challenging games. Experience may also be indicated by the age at which one began playing games. Citing one's multiplayer preference (e.g. solo, one partner, two partners) may also improve motivational understanding. Lastly, if different genres appeal to different players, then the enjoyment of various genres (e.g. puzzle, racing, MMORPG) may explain differences in players' enjoyment of games.

In total, 41 game usage variables were selected for this study. It is intended that this extensive examination will provide insights into the viability of these variables to distinguish between players' enjoyment of video games.

Gender

An abundance of theoretical and empirical game-related works have included gender as a prime variable of interest (Heeter & Winn, 2009; Kafai, 2008). Some discuss gender gaps in the game industry and technology-related disciplines (Gee & Hayes, 2010). Several authors focus on avatars, roleplaying, and identity, as related to gender issues within MMORPGs (Hussain & Griffiths, 2008; Isbister, 2006; Williams, Consalvo, Caplan & Yee, 2009; Yee, 2008). Still others consider gender differences between learners who are exposed to gaming in educational contexts (Annetta, Mangrum, Holmes, Collazo, & Cheng, 2009; Carr, 2005; Hayes, 2005; Heeter, Egidio, Mishra, Winn, & Winn, 2008; Wei & Hendrix, 2009), while some assess gender differences in the player experience (Bourgonjon, Valcke, Soetaert, and Schellens, 2010; Chumbley & Griffiths, 2006; Greenberg, Sherry, Lachlan, Lucas, & Holmstrom, 2010; Hartmann & Klimmt, 2006a; Hoffman & Nadleson, 2010; Klimmt, Schmidt, & Orthmann, 2009; Winn & Heeter, 2009; Wood et al., 2004). The latter two categories - how gender relates to educational gaming and player experience - are of high relevance to the present study and therefore will be discussed in greater detail.

Numerous games studies have reported finding gender differences among players. In their study of video game structural characteristics, Wood et al. (2004) surveyed the feature preferences and demographics of 382 undergraduate gamers (37% female, 63% male). The authors noted significant gender differences across almost all of the major categories in the survey, which included graphics, background and setting, duration of game, rate of play, advancement rate, use of humor, control options, game dynamics, winning and losing features, character development, and multiplayer features (note that several specific game features were included in each category). Only the sound and brand assurance categories did not demonstrate gender differences. The authors concluded that major differences existed in the study and that further research into gender preference differences was warranted.

Hartmann and Klimmt (2006a) conducted a study to understand women's perceptions of violence, sexualization, and social interactions in games. In the study, German females aged 18 to 26 were presented with fictional game descriptions. Then they were asked to rank the games in order desirability, as well as how enjoyable they anticipated they would be on a 6-point scale. The game descriptions were manipulated on three areas of interest, including the degrees of violence, sexualized characters, and social interactions. A conjoint analysis on the game description rankings (n = 223) confirmed that participants preferred (in descending order of importance) high amounts of social interactions, non-sexualized female protagonists, and low levels of violence. However, the authors did note that 44% of respondents differed in direction on at least one variable, most often in regards to level of violence. A second conjoint analysis (n = 177) was conducted on the participants' anticipated enjoyment ratings. Similar results were found, with high social interaction being the most important factor and low violence making a small contribution. Surprisingly, a sexualized protagonist was associated with higher enjoyment ratings, unlike in the ranking analysis. Again, the authors noted that several participants exhibited preferences that ran counter to the hypothesized directions.

Ultimately, Hartmann and Klimmt (2006a) suggested that this study cautiously revealed female preferences on the average, but that subgroups within the female population with divergent preferences likely exist.

Two related studies reported by Heeter, Egidio et al. (2008) involved having small single-gender teams of fifth and eighth grade students (22 boys, 20 girls, 8 teams) design game concepts. The authors described similarities between the male and female game designs, such as embracing the adventure genre, fantasy settings, and grandiose world-saving themes. Notable gender differences were cited in that girls included more diverse protagonists, more humorous elements, more social elements, and less violence in their designs than boys. Subsequently, a sample of 521 fifth to eight grade students (50% female, 50% male) rated the game design concepts on perceived fun and gender appropriateness. Boys tended to prefer the boy-designed games and girls tended to prefer the girl-designed games. Boy-designed games were considered for boys by both genders, whereas girl-designed games were viewed as applicable to both genders. The authors concluded that a link between the gender of the designer and player emerged and that different design preferences were present by gender, although they cautioned that gender is clearly not the only variable that influences design preferences.

In math education, Wei and Hendrix (2009) qualitatively investigated gender differences in 4-7 year old students' (27 females, 22 males) recall of competitive and noncompetitive games. Participants played both a competitive (number line race versus AI opponents) and noncompetitive (object sorting and addition) math learning game for approximately 10 minutes each. After each game, a researcher interviewed the child. Qualitative analyses on the recorded and transcribed interviews were used to examine themes among the students' recall of the games and their gender differences. Little to no gender differences were noted for the noncompetitive game. On the other hand, for the competitive game, 6-7 year old males were more focused on winning/losing and rewards, whereas females paid attention to their feelings towards game characters instead of competitive outcomes. The authors described males as distracted by winning and rewards in the competitive game, while males and females similarly recalled learning aspects of the noncompetitive game. Thus, in this sample, the authors suggested that noncompetitive games may be preferred to focus males more towards learning content than competition and rewards (Wei & Hendrix, 2009). Similarly, a gender difference was found in a survey of 8,203 German browser-based strategy game players (33% female, 77% male) whereby males rated competition significantly more important than females (Klimmt et al., 2009). No gender differences were found on the other dimensions, such as socializing, cost, or coping (Klimmt et al., 2009).

A survey of 276 undergraduate psychology and communications students (69% female, 31% male) asked how students spend their free time in relation to gaming (Winn & Heeter, 2009). Over 60% of males had played games in the past week compared to 25% for females. Correspondingly, males dedicated an average of 5.30 hours per week to gaming compared to 0.98 for females. When playing games, 76% of males typically held sessions longer than one hour, while 68% of females tended to play for less than 30 minutes per session (Winn & Heeter, 2009). Likewise, a survey of 189 students (75% female, 25% male) from undergraduate and master's level education courses revealed that "males were almost twice as likely to be engaged in gaming as females," with males dedicating an average of 13.39 hours per week to gaming compared to 8.35 for females (Hoffman & Nadleson, 2010, p. 257).

Adhering to uses and gratifications theory, Greenberg et al. (2010) surveyed 686 high school (364 females, 322 males) and 550 university (321 females, 229 males) students on their time spent gaming, gratifications, and genre preferences. Participants rated their enjoyment of 14 game genres on a 7-point scale. They also reported their time spent playing games across various daily and hourly time slots, which were later summed into generalized daily and weekly totals. Then participants rated nine gratifications on a 7-point scale. On average, males spent significantly more time playing games per week than females (18.6 vs. 8.2 hours, $p < .001$). Males rated all nine gratifications significantly higher than females on average (all $p < .001$). Males and females both showed the highest preference for the competition and challenge gratifications. For the genre data, an EFA yielded three factors, which were named imagination (combination of the strategy, adventure, and fantasy genres), traditional (arcade, card, trivia, board, and puzzle genres), and physical (sports, fighting, shooting, and racing genres). Across all age groups (except for fifth graders on the imagination factor), males preferred the physical and imagination genres more than females, while females preferred the traditional genres more than males (all $p < .001$). The authors cited competition as the most important motive for play and gender as the primary indicator of how much time someone spends playing games, why they are motivated to play, and what genre preferences they have (Greenberg et al., 2010).

Together, these studies appear to indicate stark gender differences when it comes to game preferences and the amount of time that males and females dedicate to gaming.

However, not all studies have found substantial links between gender and the investigated phenomena. Having spent time qualitatively analyzing an all-girls gaming club in the UK, Carr (2005) came to question the commonplace representations of gender and games in the literature. Carr (2005, p. 479) explained that "It is not difficult to generate data that will indicate that gendered tastes exist, but...To attribute gaming tastes...to an individual subjects' gender is to risk underestimating the complexities of both identity and preference." She supplementarily posited that gaming competence, experience, and access influence player preferences, regardless of gender. Hayes (2005, p. 28) expressed similar views and suggested that "designing games that appeal to women - and are good for learning - is a lot like designing good games in general." Furthermore, Chumbley and Griffiths (2006) examined gender alongside numerous personality and affective variables. In their study, 33 undergraduates (16 female, 17 male) played a commercial video game and completed post-play questionnaires. Several ANOVA analyses were conducted, but none found statistically significant gender effects.

In science education, a study was conducted to understand game engagement and learning outcomes among 74 fifth grade students, of which 43 were female and 31 were male (Annetta et al., 2009). Participants were pretested on their computer usage and knowledge of simple machines, then exposed to a 5-hour educational gaming intervention spread out over several days. At the conclusion of the intervention, participants were again tested on their knowledge of simple machines. An ANCOVA analysis was conducted on the gain scores between the pretest and post-test. Female students used computers for more hours per day than their male counterparts (2.1 to 1.3), whereas the opposite was true for hours spent playing games per day (1.3 to 2.1). Overall, students performed significantly better on the post-test than the pretest ($p < .001$). However, no gender difference was found in the knowledge scores ($p = .133$). Hence, the authors concluded that the game was effective in helping students to learn about simple machines, regardless of gender (Annetta et al., 2009).

Moreover, Bourgonjon et al. (2010) sought to model video game preference as a function of gender, experience, ease of use, usefulness, and learning opportunities after surveying 858 Flemish students (48% female, 52% male) aged 12 to 20. Interestingly, the authors found large differences by gender in the descriptive statistics, but the path model demonstrated that gender had a minimal direct effect on video game preference. Instead, gender was reported to be mediated by ease of use and experience, thereby having an indirect effect on video game preference (Bourgonjon et al., 2010). These studies, particularly those that included multiple predictors, call into question the influence of gender when it is assessed with multiple, detailed, topic-specific variables.

While gender has been a preeminent theoretical topic in game studies and an often influential variable in games research, some studies have demonstrated null or mediated gender effects. Although gender is a popular topic in video game theory, empirical research has not proven as decisive and some theorists have questioned the prevailing perspectives on gender, game design, and game preferences. As calls for detailed individual characteristics become stronger, the broad, general characteristic of gender is worth scrutinizing in new light. This study will examine gender amidst a host of detailed individual characteristics that include gaming goal orientations and game usage variables. Accordingly, gender can be evaluated as a potentially useful variable for understanding gameplay enjoyment, not in isolation, but along with several other promising predictors.

Prior GEM Research

Two major studies in the GEM line of research preceded the present work. The first study was exploratory in nature and sought to investigate the relationships among gameplay preferences and personality traits. The second study was confirmatory in nature and sought to refine and expand GEM. Each study will be summarized to highlight the development of GEM and how the present study design was guided.

In an exploratory study, Quick et al. (2012a) called for a more holistic understanding of game design and player characteristics. Their study surveyed the video game feature preferences and personality traits of 293 undergraduate learners (64% female, 36% male) from a variety of majors. Participants rated the importance of 18 features, such as fantasy worlds and online play, to their enjoyment of video games on a 5-point scale. Responses from the 18 game features were analyzed through EFA. This yielded six factors, which were named Challenge, Companionship, Competition, Exploration, Fantasy, and Fidelity. The factors contained between two and four items each with loadings that ranged from 0.43 to 0.95. The overall solution accounted for 58% of the total variance in gameplay enjoyment (Quick et al., 2012a). The result of this EFA became the first iteration of GEM.

For personality, participants rated the accuracy of 60 statements from the IPIP-NEO (Johnson, 2001) to them on a 5-point scale. From these responses, scores were generated across 15 associated personality traits. In addition, scores across the six GEM components were generated according to the prior factor analysis. To explore the relationships among game feature preferences and personality traits, a hierarchical agglomerative cluster analysis was conducted. This resulted in the identification of six different player types, named the Dutiful Companion, Extraverted Fidelitist Companion, Introverted Fidelitist Explorer, Conscientious Companion, Introverted Challenge-Seeking Fidelitist, and Calm Challenge-Seeking Companion (Quick et al., 2012a). These player types represented detailed groupings of different players based on a combination of game feature preferences and personality traits. Game usage and demographic variables, such as hours played per week, genre preferences, and gender, were used to further describe these clusters.

Although robust player descriptions were achieved, the authors noted that the game preference-personality trait cluster analysis was exploratory in nature and could not determine whether predictive relationships were present (Quick et al., 2012a). Unpublished data from a follow-up study demonstrated a lack of substantial predictive relationships between game preferences and personality traits (Quick, Atkinson, & Lin, 2012c). Accordingly, the decision was made to focus on alternative individual characteristics of interest in the present study.

Following the exploratory study, a confirmatory approach was taken to establishing GEM and refining its features (Quick et al., 2012b). A survey of 326 undergraduate learners (59% female, 41% male) from a variety of majors and diverse gaming experience was conducted. The gameplay enjoyment questionnaire again asked participants to rate the importance of certain design features to their enjoyment of video games on a 5-point scale. The questionnaire contained 28 total items, which were either adapted from the exploratory study or written with the intent to enhance the existing model. A comparative models approach to Structural Equation Modeling (SEM) was employed to analyze four feasible representations of the data. Ultimately, a bifactor model was deemed the optimal structure with $X^2_{(332)} = 557.823$, CFI = .956, RMSEA = .046 with 90% CI [.039, .052], and SRMR = .041 (Quick et al., 2012b). This model became the second iteration of GEM. It introduced the general Enjoyment factor, which captures a players' enjoyment across all 28 game features. In addition, the six factors of Challenge, Companionship, Competition, Exploration, Fantasy, and Fidelity were increased in size to include four to six features each. This study greatly expanded GEM. In similar fashion, the present study seeks to further refine GEM through the inclusion of additional features.

Overview of Present Study

As discussed, several past taxonomies have attempted to describe game design and players. Many are qualitative in nature and were born out of professional experience, observation, or theory. Most often, these taxonomies severely lack empirical support. Other taxonomies have risen out of more empirical approaches. Often these taxonomies are steeped deeply within a sociological theory and/or fail to pay regard or due understanding to games as a distinct field of research and practice. Though valuable within their specific contexts, nearly all past taxonomies tend to focus on specialized gamer populations or game types, which probably limits their generalizability across entertainment and serious gaming contexts. Moreover, prior research in game design and player types demonstrates a lack of consideration for moderate, infrequent, and non-gamers, which likely constitute a majority of the learners exposed to serious games. Furthermore, many of the past taxonomies are insufficiently supported or completely unsupported by empirical research, which makes their validity questionable. It is therefore proposed that the empirical, iterative approach taken by the GEM line of research is well suited for understanding the relationships between gameplay enjoyment and associated individual characteristics. Therefore, one goal of this study was to continue to refine and expand GEM en route to improving the models' usefulness and evaluating its validity.

Regarding individual characteristics, it appears that goal orientations will be useful in differentiating players' enjoyment of games (Heeter, Lee, Medler, et al., 2011; Magerko et al., 2010). Furthermore, in several studies (Greenberg et al., 2010; Hartmann & Klimmt, 2006a; Heeter, Egidio et al., 2008; Hoffman & Nadleson, 2010; Klimmt et al., 2009; Wei & Hendrix, 2009; Winn & Heeter, 2009; Wood et al., 2004), gender was found to influence the relationships between the investigated phenomena. Similarly, game usage variables, such as hours played per week, make an appearance in multiple studies (for example, Hartmann et al., 2012; Jin, 2012; Peever et al., 2012; Nah et al., 2012; Poels et al., 2012; Ventura et al., 2012). While gender and game usage information has been collected throughout the GEM line of research, these variables have only been used in a descriptive nature to date. In this study, game usage and gender data were incorporated directly into statistical analyses as potential predictors of gameplay enjoyment. Meanwhile, goal orientation has not been measured in this line of research to date. However, the literature suggests that goal orientations may be of value in understanding the motivational differences between players (Heeter, Lee, Medler, et al., 2011; Magerko et al., 2010). Based on prior GEM studies and others' examinations of player differences in gaming, the individual characteristics of gaming goal orientations, game usage variables, and gender were selected for inclusion in this study. The investigation of these individual characteristics should offer valuable insights into how future research on gameplay enjoyment can be focused.

Research Questions

A review of the literature and prior results in this line of research have led to the development of the following research questions.

1. How can the enjoyment of gameplay be modeled through players' individual preferences for game design features?

The first question extends an existing line of research on gameplay enjoyment and feature preferences. The purpose of this pursuit was to build from prior results and identify areas for the expansion and refinement of GEM.

2. To what extent are prior models of gameplay enjoyment similar to the model found in this study?

Following, the purpose of the second question was to compare the model found in this study to those from prior studies in the GEM line of research. This assisted in determining the reproducibility of results and explaining the historical development of the model.

3. To what extent does the 3x2 goal orientation framework apply to the gameplay context?

A prior games study (Heeter, Lee, Medler, et al., 2011) has employed the 2x2 achievement goal framework (Elliot & McGregor, 2001) to effectively distinguish between players. Recently, Elliot et al. (2011) validated a 3x2 goal orientation framework. This new framework has yet to be examined from a gameplay standpoint.

The purpose of the third research question was to examine the extent to which the 3x2 goal orientation framework is applicable to the context of gaming.

4. To what extent are the individual characteristics of goal orientations, game usage, and gender related to GEM?

The existing GEM portrays players' enjoyment of games through game design feature preferences. This fourth question was intended to determine how the individual characteristics of goal orientations, game usage, and gender are related to GEM. The purpose was to explore whether additional individual characteristics can further explain players' enjoyment of video games and identify beneficial avenues for future research.

METHOD

Participants

The participants in this study came from a large southwestern university in the United States. These 301 respondents yielded a 100% completion rate with no removals necessary for blank, duplicate, or straight-line responses. Participants ranged in age from 18 to 49 (M = 21.95, Mdn = 21), with 84% between 18 and 24 years old. By gender, 29% (88) were female and 70% (210) were male, with 1% (3) opting not to share this information. Undergraduate students composed 80% of the sample, with 19% (57) freshmen, 19% (58) sophomores, 24% (72) juniors, and 18% (53) seniors. The remaining 20% (61) were graduate or continuing education students who had already completed a bachelor's degree (36, 12%), master's degree (14, 5%), PhD (3, 1%), or other qualification (8, 2%). A diverse array of disciplines was represented, including engineering (99, 33%), science (44, 15%), psychology (42, 14%), humanities (38, 13%), arts (32, 11%), business (20, 7%), communications (12, 4%), and others (14, 5%).

Materials

The survey instrument was composed of four major sections (*demographics*, *game preferences*, *game goals*, and *game usage*). The instrument is presented in its entirety in Appendix A. To clarify the meaning of the term *video game* used throughout the questionnaire, participants were presented with the following statement at the beginning of each game-related section: *For the purposes of this survey, "video game" describes any type of digital game that you might play, including those on computers, home consoles, handhelds, mobile phones, or any other device. For example, Angry Birds, Words With Friends, FarmVille, Pac-Man, Tetris, Super Mario, Zelda, Pokemon,* *Halo, Portal, Gran Turismo, Madden NFL, and World of Warcraft are all considered video games*.

For the *demographics* section, participants provided a gender, age, and a yes-no undergraduate student status. Undergraduate students then reported a class standing and field of study. Meanwhile, non-undergraduates indicated their highest degree completed and field of work.

In the *game preferences* section, participants shared their preferences for different video game features. The instruction text read: *Indicate how important each feature is to your enjoyment of a video game*. Following, a table of 60 different game features was provided. Features included items such as *Explore unfamiliar places*, *Fantasy world setting*, and *Realistic graphics*. Of the game features, 28 were adapted from a prior study in this line of research (Quick et al., 2012b). These items have already been modeled and associated with the seven components of the GEM (Enjoyment, Challenge, Companionship, Competition, Exploration, Fantasy, and Fidelity). In addition, 32 new items were included to examine the potential for expanding and refining these components.

Participants rated each game feature on a 5-point scale with labels for *Not important*, *Slightly important*, *Moderately important*, *Very important*, and *Extremely important*. Compared to 7-point scales, 5-point scales have proven more effective for unipolar constructs such as this one (Krosnick & Tahk, 2012). The 5-point scale also maintains consistency with previous GEM survey studies. All response choices were labeled with words only, which is preferred to alleviate interpretation problems associated with scales that contain numbers or partial labels (Krosnick, 1999). To assist participants with remembering their response options and to divide the table into easily manageable sections, the response choice headers were repeated every five items.

Subsequently, the *game goals* section allowed participants to describe their motivations for playing games. The instruction text read: *The following statements represent types of goals that you may or may not have when playing video games. Indicate how true each statement is of you when playing video games*. Following, a table of 30 statements was provided. Example statements include *To beat the game*, *To play better than I typically do*, and *Avoid doing worse than other players*.

Of the 30 items in this section, 18 were adapted from the 3x2 goal orientation model (Elliot et al., 2011). The 3x2 model was produced in the performance context of undergraduate psychology students taking exams and the authors explicitly call for its adaptation to other contexts (Elliot et al., 2011). Upon examination of the 18 items adapted from the 3x2 model, it was clear that the GEM dimensions of Challenge and Competition were present. To better represent the context of gameplay and capture the motivations of more participants, an additional 12 items were designed to address the Exploration and Companionship GEM dimensions. These items maintained the same style and form as the adapted items, but further expanded the scope of the instrument to include information relevant to the gameplay context that was not found in the classroom context in which the instrument was originally developed.

Although additional items were included to better represent the gaming context, the GEM dimensions of Fantasy and Fidelity were still not present. Goal orientations are concerned with competence, while Fantasy and Fidelity deal with preferences like imaginary creatures and realistic graphics. Since Fantasy and Fidelity are primarily aesthetic domains, the competence-focused concept of goal orientations does not apply. Thus, no new items were designed to reflect goal orientations related to Fantasy and Fidelity. Nevertheless, the goal orientation concept is considered applicable to the included gameplay motivations of Challenge, Companionship, Competition, and Exploration.

Note that the original 3x2 goal orientation questionnaire used a 7-point scale in which numbers were shown and only five of the response choices were labeled. Having found no empirical evidence to justify such a design, the scale was modified for this study. Consistent with the design and justification of the *game preferences* section, a 5-point scale was used. Response choices included *Not true*, *Slightly true*, *Moderately true*, *Very true*, and *Extremely true*. Again, all response choices were labeled using words only and the headers were repeated every five items.

Lastly, in the *game usage* section, participants self reported information about their usage of video games. The items in this section asked respondents to report on a variety of gaming activities, such as time spent gaming, frequency of play, gaming skill, difficulty preference, reasons for play, and multiplayer preference. Scales and response choices were developed for each specific item. Participants also noted their usage frequency of 12 gaming platforms, including the *Nintendo Wii*, *Playstation 3*, *Xbox 360*, *Xbox Kinect*, *Nintendo DS/3DS*, *Sony PSP/Vita*, *desktop computer*, *laptop computer*, *tablet*, *iOS handheld*, *smartphone*, and *mobile phone*. Example devices were offered to clarify the meanings of the *tablet*, *iOS handheld*, *smartphone*, and *mobile phone* categories. Subsequently, participants indicated their enjoyment of 19 game genres, which consisted of *board game*, *puzzle*, *health/fitness*, *roleplaying*, *online roleplaying*, *card*, *sports*, *racing*, *dance*, *action/adventure*, *platform*, *shooting*, *fighting*, *strategy*, *music*, *arcade*, *mobile*, *social network*, and *simulation*. To clarify the meanings of the genres, two well-known game examples were provided for each.

Procedure

All data were collected in a university lab that contained nine computers. The computers were preconfigured to access an online questionnaire hosted through the *surveygizmo.com* website. Open lab hours were held between 10:00 A.M. and 4:00 P.M., Monday through Friday, for a period of seven business days in late October and early November 2012. During this period, one additional night session was held between 7:00 and 9:00 P.M. Potential participants were allowed to visit the lab at any time during these hours to complete the questionnaire in a single continuous session.

As potential participants entered the lab, the researcher guided them to open computers. The computers were arranged into private cubicles that prevented participants from seeing each others' screens. Whenever space allowed, participants were positioned at the computer farthest away from other participants. The researcher was present in the lab at all times and positioned such that participants' computer screens were not visible to him.

Prior to beginning the study, potential participants were presented with a letter of consent that described the purpose, procedures, participation requirements, benefits, and risks associated with the study. Eligible and willing participants consented prior to completing the questionnaire and were allowed to withdraw from the study at any time without penalty.

After completing the questionnaire, participants' names and signatures were collected on a separate list for university accounting purposes. Subsequently, the researcher provided each participant with one United States ten dollar bill. Most participants completed the questionnaire in approximately 15-20 minutes. All results report the data in anonymous, aggregate form without any identifiable personal information.

RESULTS

Research Question 1

The first research question asked, "How can the enjoyment of gameplay be modeled through players' individual preferences for game design features?" This question sought to build from the preceding version of GEM (Quick et al., 2012b) and examine opportunities to refine and expand the model through the inclusion of new features.

To begin, the 28 features included in the previous formulation of GEM (Quick et al., 2012b) were used as a starting point for this analysis. Next, 32 new features introduced in this study were examined for potential inclusion in GEM. Each new feature was hypothesized to belong to one or more existing GEM components. Subsequently, the features were examined within the model. Lastly, a decision to retain or eliminate each feature was made. The following goals guided this analysis.

1. The model should include the 28 features previously demonstrated by Quick et al. (2012b).

2. Any new feature should have the following characteristics in order to be included in the model: a) a statistically significant loading on a single factor of at least three features, and b) no greater than a marginal negative impact on the fit of the overall model.

Through this process, 19 features were eliminated from consideration. Of these, seven were solitary features that showed no strong relationship with any factor or loaded across multiple factors. Meanwhile, 12 features were pairs that related strongly to one another, but not to any of the GEM components. Since a factor of fewer than three features would not be acceptable for inclusion in the model, these pairs were eliminated from consideration. However, the presence of highly related pairs suggests that future expansion of GEM could take place. If additional features related to these pairs were included, there could be the potential to generate new factors of three or more features. Conversely, 13 features met the criteria for inclusion in the model. Each of these showed a statistically significant loading on a single factor of at least three features and had minimal adverse impacts on the overall model fit. Table 3 presents information on the 32 features that were evaluated for inclusion in the model. In total, 41 features were retained for further analysis. Twenty-eight features came from the preceding version of GEM, while 13 were introduced in this study.

An SEM approach was used to model gameplay enjoyment using 41 game features. A series of probable structures were compared following a nested models approach (Anderson & Gerbing, 1988). The purpose of the nested models approach is to provide evidence for selecting an optimal model structure. The *lavaan* package (Rosseel, 2012a, 2012b) in the *R* (R Development Core Team, 2012) statistical software suite was used to conduct this analysis.

Four models were compared using the nested models approach. These included the unidimensional, correlated traits, second order, and bifactor models. A unidimensional model indicates that a single latent variable predicts all of the measured variables. Meanwhile, a correlated traits model suggests that multiple latent variables are associated with the measured variables. Furthermore, a second-order model portrays hierarchical levels of latent variables as predicting the measured variables. For instance, a single overarching latent variable might connect to three subordinate latent variables, which in turn connect to the measured variables. Last, the bifactor model demonstrates that a single overarching latent variable, as well as multiple specific latent variables, simultaneously account for the measured variables.

The same 41 game features were assessed in all four model structures. The scale was set for all latent variables by fixing the first loading to one. An overarching latent variable of Enjoyment, which represents one's general enjoyment of all 41 game features, was used as required by the unidimensional, second order, and bifactor models. A collection of nine specific latent variables, including Challenge, Companionship, Discovery, Fantasy, Fidelity, Identity, Multiplayer, Recognition, and Strategy, were used as required by the correlated traits, second order, and bifactor models.

Multiple criteria were used to evaluate the four models. Model acceptability was gauged using the root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR), and comparative fit index (CFI). According to Hu and Bentler (1999), Type I and Type II errors can be minimized when identifying misspecified models by requiring a RMSEA < .06, SRMR < .08, and CFI > .95. In addition, Hair, Black, Babin, and Anderson (2010) provide criteria to assess the fit of models containing the sample size (> 250) and quantity of observed variables (≥ 30) found in the present analysis. These authors suggest that a CFI > .90 with RMSEA < .07 or a CFI ≥ .92 with SRMR ≤ .08 indicates good fit. The fit statistics for each model are presented in Table 4. However, note that these values are not to be taken as strict decision cutoffs (Marsh, 2004). Thus, the interpretability and theoretical merit of each model was also taken into consideration.

While the discussed fit statistics provide an indication of acceptability for individual models, Anderson and Gerbing (1988) describe the use of chi-square values to make relative comparisons between nested models. When two models are compared relatively, the model with the lower chi-square value is generally considered better. Thus, given the chi-square values and degrees of freedom for a number of models, pairwise tests can be conducted to determine any significant differences between the models. Such a procedure was performed to relatively compare the four models examined in this analysis. The results of the chi-square comparisons are presented in Table 5.

A multifaceted examination of fit statistics, chi-square comparisons, interpretability, and theoretical value was undertaken to determine the optimal model of gameplay enjoyment. This evaluation resulted in the selection of the bifactor model. While all of the models were interpretable, only the bifactor model exceeded the recommended goodness of fit criteria (Hair et al., 2010; Hu & Bentler, 1999) with $X^2_{(740)} = 1028.020$, RMSEA = .036 with 90% CI [.031, .041] at $p = 1.000$, SRMR = .046, and CFI = .955. Pairwise chi-square tests also indicated that the bifactor model was significantly better than the other models. Individually, neither the unidimensional nor second-order models approached the recommended goodness of fit criteria. The correlated traits model met the criteria set forth by Hair et al. (2010), but had a lower CFI (.928) than suggested by Hu and Bentler (1999). While a case could be made for the acceptability of the correlated traits model, it can be considered of less theoretical value than the bifactor model. The substantial structural difference between the two models is the inclusion of the general overarching factor of Enjoyment in the bifactor model that is absent in the correlated traits model. The general Enjoyment factor is of theoretical relevance because it provides a way to gauge players' overall enjoyment of games in addition to the specific facets of enjoyment included in the model. When joined with superior goodness of fit and chi-square, the bifactor model's theoretical value makes it the optimal representation of gameplay enjoyment. Table 6 contains the loadings, standard errors, and descriptions for the bifactor model features. Figure 1 portrays the bifactor model graphically.

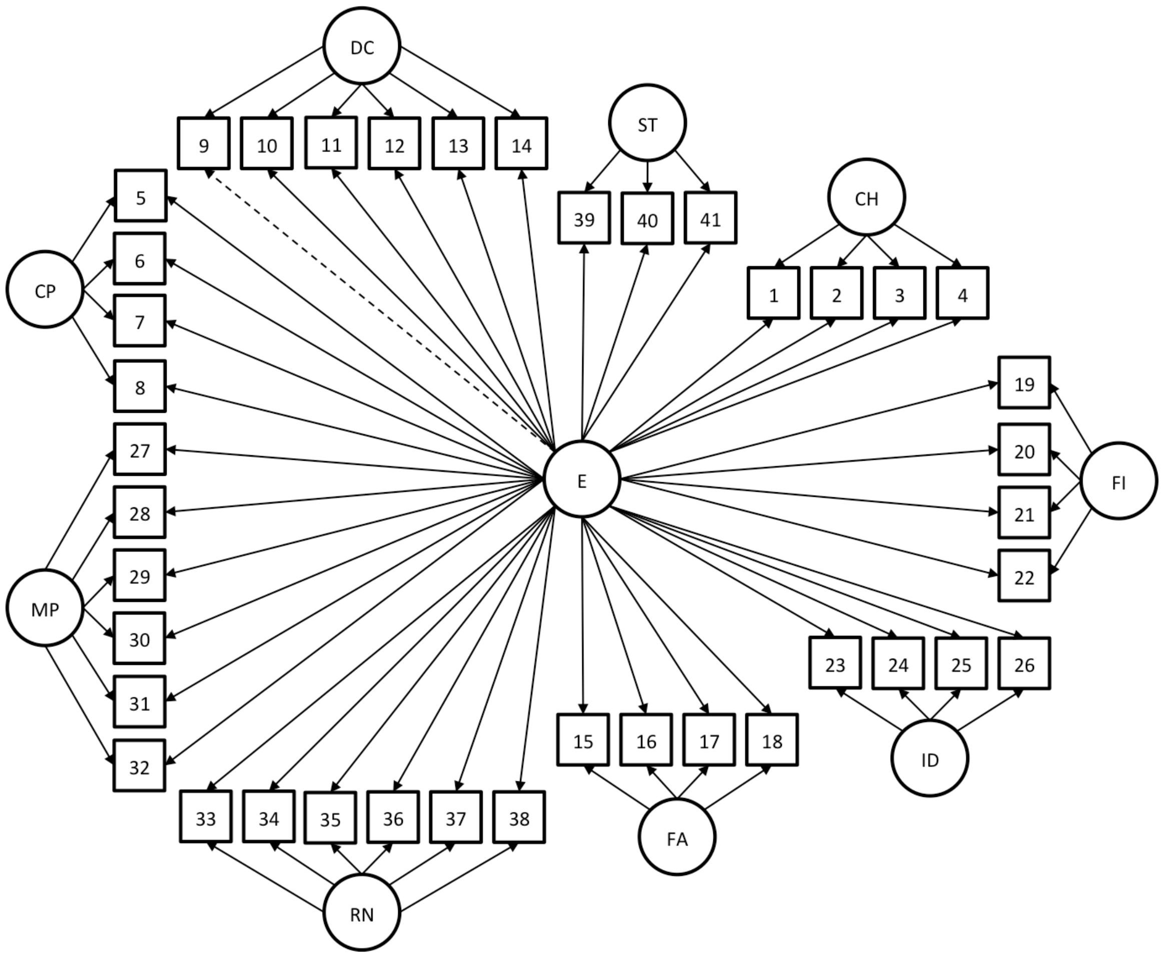

Figure 1. Bifactor representation of the Gameplay Enjoyment Model. CH = Challenge; CP = Companionship; DC = Discovery; E = Enjoyment; FA = Fantasy; FI = Fidelity; ID = Identity; MP = Multiplayer; RN = Recognition; ST = Strategy. Solid lines indicate statistically significant paths. A dashed line indicates a statistically nonsignificant path between factor E and feature 9. Correlational paths between the nine subfactors and feature pairs 10-14, 31-32, and 39-40 are suppressed to improve readability. Measured variable numbers correspond to those in Table 6.

Modification indices were examined and used sparingly to allow three residual pairs to correlate in the bifactor model. The correlated residual pairs occur between the features *Online multiplayer* and *Compete with other players online*, *Discover unexpected things* and *Surprising things*, and *High level of skill required* and *Experiment with different play strategies*. Each of these pairs share a specific model component (Multiplayer, Discovery, and Strategy, respectively), which suggests that cross loading is not a cause. Instead, it seems that these features are strongly related to one another beyond even the common component that they share. Therefore, some additional variance can be found in these feature pairs that is not fully represented by the model.

A single statistically nonsignificant path appears in the model. The feature *Explore unfamiliar places* is strongly related to its specific factor of Discovery, but failed to achieve statistical significance at the $p = .05$ level on the general Enjoyment factor ($p = .078$). Since the bifactor structure is such that both specific and general factors are simultaneously associated with individual features, statistical nonsignificance can occur when a very strong relationship exists on one side or the other. In this case, the feature appears to relate very strongly to its specific factor and less strongly to the general factor. This path was retained because it contributes to maintaining a clear, complete, and theoretically valuable model, it does not stray far from the $p = .05$ significance level ($p = .078$), and removing it would not substantially alter the model's fit statistics (no change to RMSEA or CFI, +.003 to SRMR).

Research Question 2

The second research question asked, "To what extent are prior models of gameplay enjoyment similar to the model found in this study?" This question seeks to examine the historical development of the model and the reproducibility of the model across multiple studies.

The original, exploratory GEM was built on 18 features that were distributed across the six components of Challenge, Companionship, Competition, Exploration, Fantasy, and Fidelity. Each component contained two to four features with loadings that ranged in absolute value from .43 to .95. This EFA model accounted for 58% of the variance in gameplay enjoyment (Quick et al., 2012a).

A major transition took place in the establishment of the second, confirmatory GEM. The analysis involved a nested models comparison of feasible structural equation models. In addition, the accepted model contained 28 features, which marked an increase of 10 over the exploratory version. However, of the 28 features, only 11 out of 18 were retained from the exploratory model, whereas 17 were new entrants. Nevertheless, the same six components of Challenge, Companionship, Competition, Exploration, Fantasy, and Fidelity remained and were now represented by four to six features each. Notably, the model also contained a seventh component of Enjoyment, which represents one's overall enjoyment of games based on all 28 model features. This model was accepted with the goodness of fit indices of $X^2_{(332)} = 557.823$, CFI = .956, RMSEA = .046 with 90% CI [.039, .052], and SRMR = .041 (Quick et al., 2012b).

In the present analysis (see research question 1), a host of new items were analyzed under the same nested models procedure used for the confirmatory model. All 28 features from the confirmatory model were retained in the present model. Furthermore, 13 new features were introduced. At a total of 41 features, the Exploration, Competition, and Fantasy components fractured into Discovery and Strategy, Multiplayer and Recognition, and Fantasy and Identity, respectively. This led to a model with nine specific components, including Challenge, Companionship, Discovery, Fantasy, Fidelity, Identity, Multiplayer, Recognition, and Strategy. The overarching Enjoyment component was retained in this iteration of the model, although it was represented by 41 items versus 28 in the confirmatory version. The present model was accepted with goodness of fit indices of $X^2_{(740)}$ = 1028.020, CFI = .955, RMSEA = .036 with 90% CI [.031, .041], and SRMR = .046.

To summarize, based on feature similarity, the confirmatory GEM had a 61% (11/18) correspondence with the exploratory GEM and expanded the overall size of the model by 56% (10/18). Following, the present GEM contained 100% (28/28) of the features included in the confirmatory GEM, while also expanding the model by 46% (13/28). The original six components of Challenge, Companionship, Competition, Exploration, Fantasy, and Fidelity were maintained through the exploratory and confirmatory versions, although they were associated with more features in the confirmatory GEM. With the expansion of the present model to 41 features, the Exploration, Competition, and Fantasy components fractured into more specific entities. Thus, the present model contains the nine components of Challenge, Companionship, Discovery, Fantasy, Fidelity, Identity, Multiplayer, Recognition, and Strategy, each of which is represented by three to six features. Lastly, the confirmatory model introduced the overarching Enjoyment component, which was maintained in the present model, but again associated with additional features.

Research Question 3

The third research question asked, "To what extent does the 3x2 goal orientation framework apply to the gameplay context?" While the goal orientations concept is traditionally applied in the context of school exam performance, the purpose of this research question is to discover whether goal orientations apply to the context of video games.

A CFA approach to SEM was used to test whether the hypothesized 3x2 goal orientation framework could be adapted successfully to a gameplay context. The 18 gaming goal orientation statements were structured identically to their Elliot et al. (2011) counterparts. This structure contained six dimensions (Task-Approach, Task-Avoidance, Self-Approach, Self-Avoidance, Other-Approach, Other-Avoidance) with three statements each. The model achieved a $X^2_{(138)}$ = 188.350, RMSEA = .035 with 90% CI [.021, .047] at p = 0.982, SRMR = .034, and CFI = .982. All paths were significant at the $p < .001$ level with completely standardized loadings ranging between .498 and .859. No correlated residual paths were freed. This model exceeded all criteria presented by Hair et al. (2010) and Hu and Bentler (1999) and was deemed an acceptable representation of gaming goal orientations. Table 7 contains the loadings, standard errors, and descriptions for the Gaming Goal Orientations (GGO) model. A visual depiction of the 3x2 GGO model is represented in Figure 2.

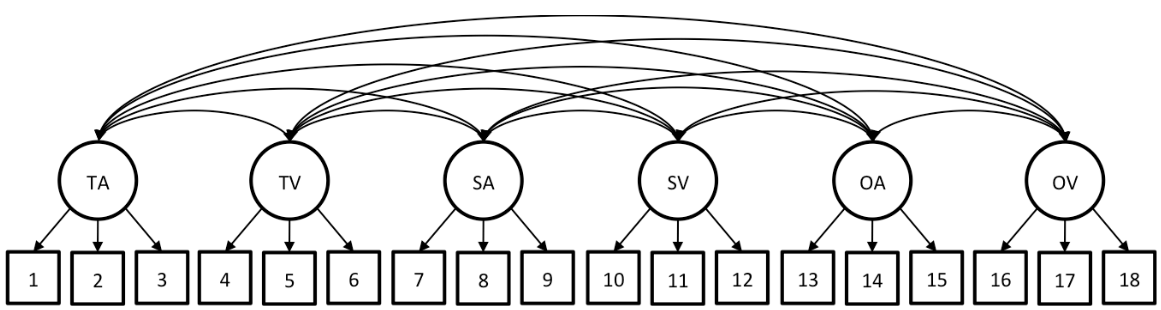

Figure 2. Confirmatory representation of the Gaming Goal Orientations model. TA = Task-Approach; TV = Task-Avoidance; SA = Self-Approach; SV = Self-Avoidance; OA = Other-Approach; OV = Other-Avoidance. Solid lines indicate statistically significant paths. Measured variable numbers correspond to those in Table 7.

Upon examination of the 18 goal orientation statements from Elliot et al. (2011) and their gameplay-adapted counterparts, it looked as though certain aspects of GEM (Quick et al., 2012b) were well represented, whereas other aspects were poorly represented. Specifically, the Task-Approach/Task-Avoidance goal orientation dimensions appear related to the GEM Challenge component, while the Other-Approach/Other-Avoidance dimensions appear related to the GEM Competition component. Meanwhile, the GEM components of Exploration, Companionship, Fantasy, and Fidelity felt less represented. Both Exploration and Companionship clearly relate to competence contexts and could potentially be represented through additional items. In contrast, Fantasy and Fidelity are associated with narrative and aesthetic aspects of games that do not relate to competence. Hence, the goal orientation concept was not considered applicable to the GEM components of Fantasy and Fidelity.

Subsequently, an attempt was made to incorporate a broader gaming context through the inclusion of 12 additional items related to GEM's Exploration and Competition components. To reflect the GEM Exploration component, three Task-Approach and three Task-Avoidance statements were written. Similarly, to reflect the GEM Companionship component, three Other-Approach and three Other-Avoidance statements were written. These statements were crafted in the style of the original goal orientation items, but tailored to reflect the specific GEM components. The 12 additional items are presented in Table 8.

Again, a CFA approach was used to test the hypothesized model. The hypothesized model featured the 18-statement, six-dimension structure from the preceding 3x2 framework, along with 12 additional statements divided across four new dimensions (Exploration Task-Approach, Exploration Task-Avoidance, Companionship Other-Approach, Companionship Other-Avoidance). This model achieved a $X^2_{(390)}$ = 828.864, RMSEA = .062 with 90% CI [.056, .067] at p = 0.001, SRMR = .065, and CFI = .902 with all paths significant at the $p < .001$ level. Although the model narrowly met the most lenient criteria provided by Hair et al. (2010), it fell short of the guidelines offered by Hu & Bentler (1999). In addition, the expanded model fit was substantially worse than that of the directly adapted 3x2 model. Thus, a strong case could not be made for accepting the expanded model. Ultimately, it was determined that the adapted 3x2 goal orientation model was superior to the expanded version. Therefore, the additional 12 items were removed and subsequent analyses made use of the 18-statement 3x2 GGO model.

Research Question 4

The fourth research question asked, "To what extent are the individual characteristics of goal orientations, game usage, and gender related to GEM?" This question considers how the individual characteristics of goal orientations, game usage, and gender are related to the feature preferences contained in GEM. These individual characteristics could lead to an enhanced understanding of players' enjoyment of games.

Scores for the GEM general Enjoyment component and the nine specific components were calculated by multiplying the completely standardized loadings from the accepted model in Research Question 1 by participants' raw survey responses. Similarly, scores for the six GGO dimensions were computed using the standardized loadings from the model confirmed in research question 3. Gender took the form of a categorical variable with zero representing female and one representing male. Each of the game usage variables were coded with five levels that matched the collected data, such as Likert scales for the frequency of gaming platform use or relevant data ranges for hours spent gaming per week. Throughout this analysis, players' GEM scores were portrayed as the dependent variables that were being predicted by the independent goal orientations, game usage, and gender variables.

A combination of stepwise regression modeling, path analysis, and nested model comparisons was used to examine the relationships between GEM, goal orientations, game usage, and gender. Due to the large quantity of variables in this analysis, bidirectional stepwise regression was utilized as a prescreening measure. The bidirectional stepwise regression process was implemented using the *stepAIC* function from the *MASS* package in *R* (Venables & Ripley, 2002). Using standardized values, a model for each GEM variable was evaluated with all possible goal orientation, game usage, and gender variables included. This process allowed a number of variables to be eliminated from consideration and identified a subset of promising variables to examine further.

Subsequently, the variables suggested by the stepwise regression analysis were further scrutinized via path analysis. The distinguishing characteristic between SEM and path analysis is that SEM includes latent variables whereas path analysis does not. A path analysis was conducted here because the dependent GEM variables and the independent individual characteristic variables were all known and measured. Otherwise, the path analysis was implemented in the same fashion as SEM in research question 1.

Following, nested model comparisons were implemented as in research question 1. Once again, fit statistics and chi-square tests were used to evaluate the unidimensional, correlated traits, second order, and bifactor structures. The bifactor model failed to meet the goodness of fit criteria suggested by Hair et al. (2010) and Hu and Bentler (1999). On the other hand, the second order model, with $X^2_{(333)} = 562.106$, RMSEA = .048 with 90% CI [.041, .055] at $p = .695$, SRMR = .016, and CFI = .949, nearly met the criteria. However, the second order model had poorer fit statistics than the other potentially acceptable models. Chi-square tests also suggested that the second order model was not superior to the unidimensional or correlated traits model. Since the model does not have substantially higher conceptual value than the others, a strong case could not be made for its acceptance. Meanwhile, the unidimensional model, with $X^2_{(1)} = 1.152$, RMSEA = .041 with 90% CI [.000, .166] at $p = .377$, SRMR = .007, and CFI = .999, and correlated traits model, with $X^2_{(253)} = 154.837$, RMSEA = .000 with 90% CI [.000, .000] at $p = 1.000$, SRMR = .012, and CFI = 1.000, met all of the criteria. However, the unidimensional model had an RMSEA 90% confidence interval whose upper bound of .166 fell well above the acceptable level. A chi-square test also indicated that, despite its lower chi-square value, the unidimensional model was not superior to the correlated traits model ($p = 1.000$). In addition, the unidimensional model explains only the general Enjoyment component (no specific components), whereas the correlated traits model describes all nine specific GEM components (no general component). Since more specific information is contained in the correlated traits model, it can be considered theoretically superior to the unidimensional model. Thus, this evaluation resulted in the selection of the correlated traits model, which exceeded the goodness of fit criteria, passed pairwise chi-square comparisons, and provided the most theoretical value of the potentially acceptable structures. Therefore, the correlated traits model is considered the best representation of players' GEM scores based on a combination of goal orientation, game usage, and gender variables.

To further reduce the complexity of the accepted model, additional statistically nonsignificant paths were eliminated. Each time the correlated traits model was evaluated, the statistically nonsignificant path with the highest p-value was removed and the model was reevaluated. This iterative process continued until no statistically nonsignificant paths remained and resulted in the removal of 61 total paths. The final version of the correlated traits model had $X^2_{(215)} = 188.736$, RMSEA = .000 with 90% CI [.000, .011] at $p = 1.000$, SRMR = .018, and CFI = 1.000. Table 9 contains the loadings, standard errors, and descriptions for the correlated traits model, hereafter referred to as the GEM-Individual Characteristics (GEM-IC) model. Figure 3 depicts the model graphically.

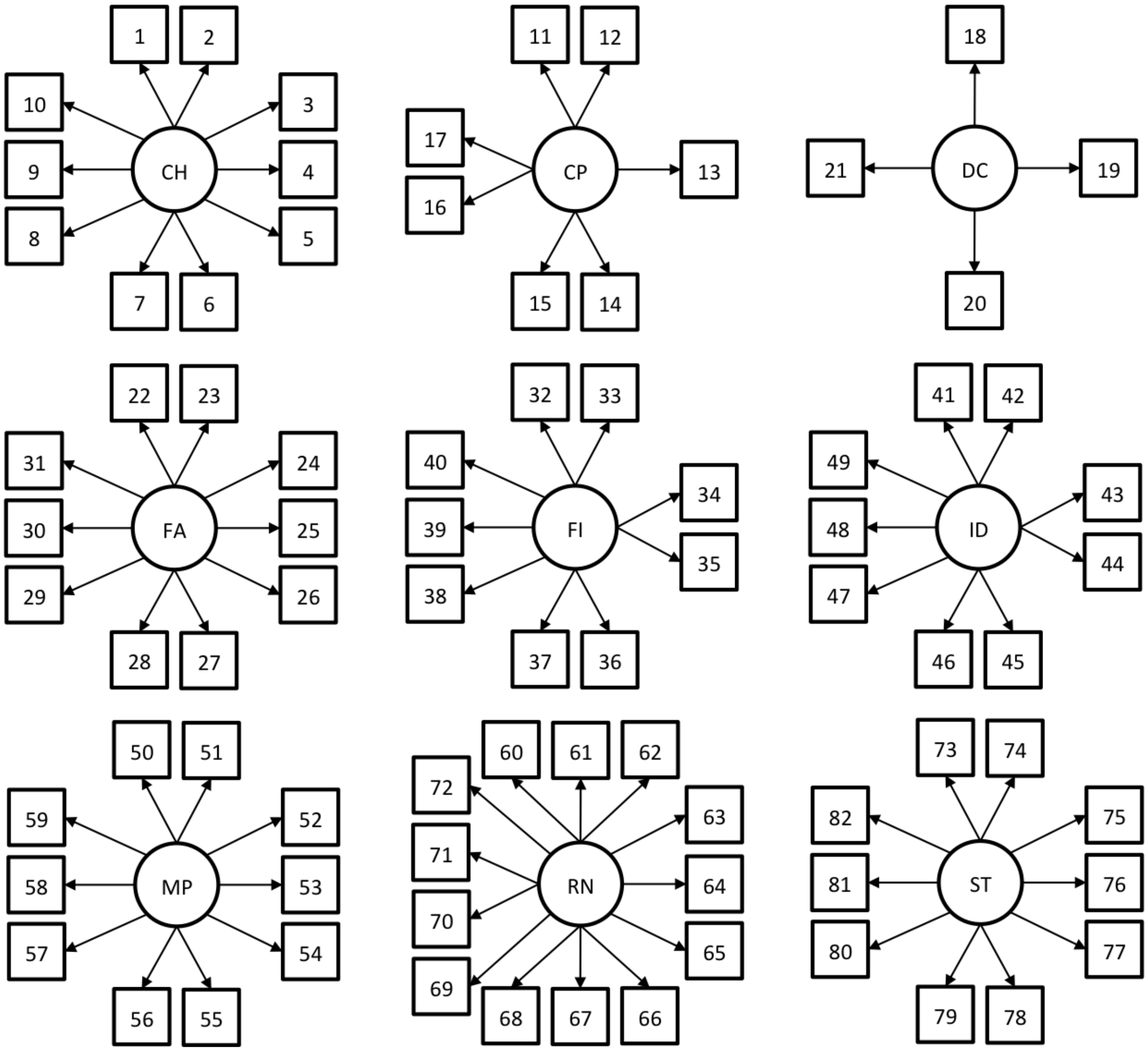

Figure 3. Correlated traits representation of the GEM-Individual Characteristics model. CH = Challenge; CP = Companionship; DC = Discovery; FA = Fantasy; FI = Fidelity; ID = Identity; MP = Multiplayer; RN = Recognition; ST = Strategy. Solid lines indicate statistically significant paths. Correlational paths between the nine components are suppressed to improve readability. Variable numbers correspond to those in Table 9.

DISCUSSION

From the research questions asked in this study and their associated analyses, three models were formulated: the Gameplay Enjoyment Model (GEM), Gaming Goal Orientations (GGO) model, and GEM-Individual Characteristics (GEM-IC) model. A discussion of these models and their implications is presented.

The Gameplay Enjoyment Model (GEM)

Following an extensive review of game design and player type taxonomies, certain areas of improvement were offered. Multiple taxonomies were challenged for lacking an empirical base, having been either conceptually or casually derived (Bartle, 1996; Garneau, 2001; Heeter, 2008; Heeter et al., 2004; Hunicke, et al., 2004; Mena, 2012; Schell, 2008; Sweetser & Wyeth, 2005; Wilson et al., 2009; Winn, 2008). Of the empirical taxonomies, many were criticized as one-offs that lacked a coherent, iterative line of inquiry in the field of games research or being overly reliant on specific types of games or players (Bedwell et al., 2012; Cowley et al., 2012; Fu et al., 2009; Griffiths et al., 2004; Hong et al., 2009; Ryan et al., 2006; Squire & Steinkuehler, 2006; Weber & Shaw, 2009; Yee, 2006; Yee et al., 2012). Moreover, taxonomies of both kinds were cited as narrowly focusing on only a small subset of games and players, while simultaneously tending to overgeneralize their results.

It is believed that the GEM line of research addresses the limitations found in prior game and player taxonomies. GEM has empirical foundations and has always been an empirical pursuit. Throughout, GEM research has relied upon players' enjoyment ratings of large feature sets without a preconceived plan for what outcomes might be achieved. Instead, the feature sets were reduced and structured through statistical analyses, then interpreted in the context of stated research questions.

To date, three major studies (including this one) have composed the GEM line of research and 920 players have shared their feature preferences. Through each iteration, the model has been empirically refined and expanded. Thus, GEM has addressed the one-off critique by adopting a thoughtful, iterative approach to expansion, refinement, and validation.

The appraisal of prior taxonomies as narrowly focused and often overreaching was noted as particularly disconcerting when one considers the role of serious games in society. Prior works have tended to involve highly specialized gamers and games, such as avid players of MMORPGs. Whether implemented in educational contexts, healthcare interventions, social argumentations, or elsewhere, it seems unlikely that the individuals exposed to serious games will fit this type of mold. Rather, it is anticipated that people from all walks of life, varied gaming experience, and personalized preferences will experience serious games. GEM has accommodated diversity to a greater extent than prior pursuits by including players of all experience levels, varied preferences, and many different fields of work and study. Furthermore, GEM's foundation on game features that can be implemented broadly across games of all types will likely lead to greater generalizability across contexts.

That said, a greatly refined and expanded GEM has been derived from addressing the first research question, "How can the enjoyment of gameplay be modeled through players' individual preferences for game design features?" GEM now contains 41 game design features, which are associated with a general Enjoyment component, as well as distributed across the nine specific components of Challenge, Companionship, Discovery, Fantasy, Fidelity, Identity, Multiplayer, Recognition, and Strategy. To simultaneously address the second research question, which asked, "To what extent are prior models of gameplay enjoyment similar to the model found in this study?", it can be noted that all 28 game features from the preceding version of GEM were retained in the present model. Additionally, the model was expanded by 13 features (a 46% increase). The general Enjoyment factor remained tied to all of the game features, as it had in the previous version. Meanwhile, the new specific components of Discovery and Strategy, Multiplayer and Recognition, and Fantasy and Identity, entered the model when their preceding parent components of Exploration, Competition, and Fantasy fractured into more specific entities. Hence, it can be concluded that the present GEM demonstrates a degree of stability and reproducibility in retaining the bifactor structure, 28 features, and overarching Enjoyment component from the previous model. Yet, the present GEM also produced substantial gains in specificity by introducing 13 more features and three more components than the previous model. The following paragraph defines each of the GEM components.

The general Enjoyment component indicates a player's overall enjoyment of games, as measured by the 41 GEM features. Challenge is the enjoyment of games that are difficult to beat and master, and have a challenging difficulty level and challenging obstacles to overcome. Companionship is the enjoyment of games that involve socializing with others, playing with friends, spending time with friends, and playing with many people at parties. Discovery is the enjoyment of games that involve exploring unfamiliar places, discovering unexpected things, searching for hidden things, surprising things, chance events, and exploring the inner workings of the game. Fantasy is the enjoyment of games that feature imaginary creatures, fictional characters, a fantasy world setting, and characters whose abilities do not exist in the real world. Fidelity is the enjoyment of games that feature realistic graphics, 3D graphics, lifelike animations, and realistic sound effects. Identity is the enjoyment of games that include characters of a different species, race, gender, and identity than the player's own. Multiplayer is the enjoyment of games that involve more than one player, multiplayer, online multiplayer, cooperating with other players, competing against other players, and competing with other players online. Recognition is the enjoyment of games that involve high scores, leaderboards, player rankings, public recognition of the best players, displaying one's skills in public, and comparing one's skills with others. Strategy is the enjoyment of games that involve a high level of strategy, a high level of skill, and experimenting with different play strategies.

With GEM now containing a total of 10 components (one general, nine specific), it may be of use to draw simplifying conceptual links between them. The nine specific GEM components can be thought of as belonging to three different categories that lie within the overarching theme of Enjoyment. Since they deal primarily with social interactions between players, Companionship, Multiplayer, and Recognition can be thought of as belonging to the designed Context of a game. In contrast, Challenge, Discovery, and Strategy, which detail gameplay actions and mechanics, can be said to belong to the Architecture of a game. Lastly, Fantasy, Fidelity, and Identity concern the aesthetic or thematic elements of a game and therefore belong to the designed Representation. Together, these conceptual links form the acronym CAR (Context, Architecture, Representation). The CAR conceptualization of GEM's components is visually portrayed in Figure 4.

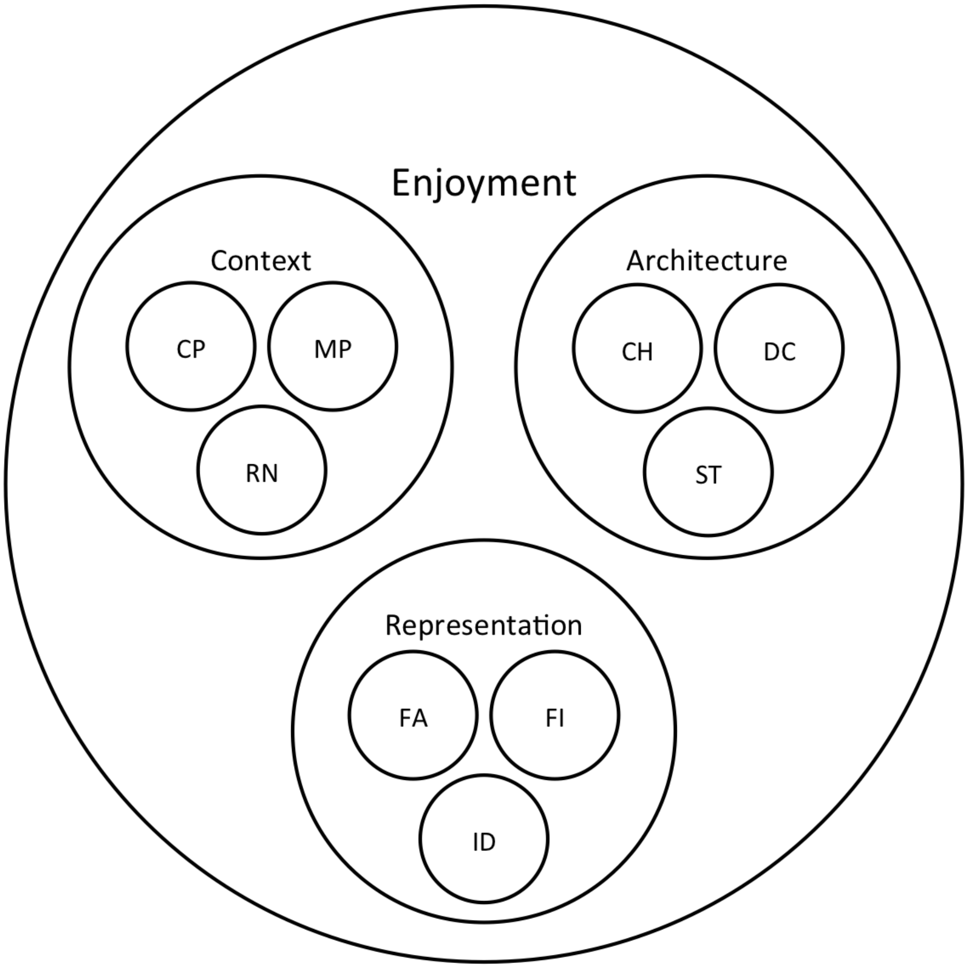

Figure 4. CAR (Context, Architecture, Representation) conceptual arrangement of GEM components. CH = Challenge; CP = Companionship; DC = Discovery; FA = Fantasy; FI = Fidelity; ID = Identity; MP = Multiplayer; RN = Recognition; ST = Strategy.

Consider the following analogy between the CAR gameplay enjoyment conceptualization and a real-world automobile, or car. The Architecture of a game is much like the various operational components of a car, such as the pistons and axels. The Representation elements a game are similar to the aesthetic features of a car, like its body design and paint. The Context of a game involves social interactions, like a car contains a driver and accompanying passengers who encounter other drivers on the road. The gameplay experience, like the driving experience, is whole when its Context, Architecture, and Representation are unified.

At this level of abstraction, the CAR conceptualization of GEM resembles the MDA (Hunicke et al., 2004), DPE (Winn, 2008), and several other game design taxonomies. Indeed, Quick and Atkinson (2011) analyzed the similarities between the first iteration of GEM and 10 preceding game taxonomies. The authors reported a high correspondence between the models, despite the fact that they were developed in different ways, for different purposes, and at different times. Hence, it was suggested that a degree of convergence was found among research and practice in identifying the salient aspects of game design (Quick & Atkinson, 2011). However, GEM simultaneously differs greatly from its predecessors by providing defined components based on quantifiable features. Therefore, while GEM may share similar spirits with previous conceptualizations, it offers a level of detail and empiricism that is not found in prior efforts.

GEM is a model of gameplay enjoyment that represents a substantial departure from the previous literature. Its empirical basis and iterative refinement mark a stark contrast in development compared to prior taxonomies of games and players. Its inclusiveness of diverse players and foundation upon broadly generalizable game features should lead to greater applicability across contexts. Its coverage of features and different dimensions of enjoyment cannot be found in existing models. The GEM derived from this study is offered to researchers and designers alike. It is believed that GEM can be useful in both contexts. Researchers can use GEM to further examine gameplay enjoyment, player motivations, and individual characteristics in entertainment and serious gaming. Designers can apply GEM to intelligently design games that will delight and meet the needs of specific audiences. In research or practice, it is not expected that all of the features and components of GEM will be applied in all instances. Alternatively, it would be reasonable to select key components of GEM that relate to the specific topic at hand.

The Gaming Goal Orientations (GGO) Model

While goal orientations is a longstanding motivational concept in educational research, it has only recently begun to be explored in a gaming context. Magerko et al. (2010) proposed the use of mastery-performance, approach-avoidance, and other dichotomies to better understand player motivations. Heeter, Lee, Medler, et al. (2011) reported high correlations between players' educational and gaming goal orientations using the 2x2 goal orientation framework (Elliot & McGregor, 2001). Heeter, Lee, Medler, et al. (2011) also noted that players rated performance goals higher, and mastery goals lower, in gaming as compared to education. This suggests different motivational emphases between the contexts. However, via EFA, the authors were not able to reproduce the expected 2x2 framework structure, instead finding a two-factor mastery-performance dichotomy that did not distinguish between approach and avoidance. While Heeter, Lee, Medler, et al. (2011) demonstrated a promising link between gaming and educational goal orientations, much was left to be explored. In addition, Elliot et al. (2011) published an updated 3x2 educational goal orientations framework. Prior to this study, no known examination of the 3x2 framework in a gaming context had taken place. Thus, this study aimed to further examine the relationships between gaming and educational goal orientations introduced by Heeter, Lee, Medler et al. (2011) within the unexplored 3x2 framework (Elliot et al., 2011).

Accordingly, the third research question asked, "To what extent does the 3x2 goal orientation framework apply to the gameplay context?" Based on the results of the CFA in this study, the answer can be reported as extremely well. The 3x2 Gaming Goal Orientations (GGO) model reflected the same structure as the 3x2 educational goal orientations framework, showed exceptional fit and universally strong loadings (.498 to .859). The model is composed of six motivational dimensions, each associated with three statements. In this study, an attempt was made to expand the 3x2 GGO with additional dimensions and items related to the gaming context. However, the results did not support such an expansion and the original 3x2 structure was retained. The following paragraph describes each of the six 3x2 GGO dimensions.

The 3x2 GGO is composed of six dimensions: Task-Approach, Task-Avoidance, Self-Approach, Self-Avoidance, Other-Approach, and Other-Avoidance. Task-Approach goals involve the pursuit of absolute competence, such as beating a game or achieving a high score. Task-Avoidance goals involve an aversion to demonstrating absolute incompetence, such as failing challenges or achieving a low score. Self-Approach goals involve the pursuit of competence relative to one's own past performance, like completing more levels in a game today compared to a previous play session. Self-Avoidance goals involve an aversion to demonstrating relative incompetence compared to one's own past performance, like completing fewer levels in a game today compared to a previous play session. Other-Approach goals involve the pursuit of competence relative to the performance of others, for example, outperforming others in a multiplayer game.

Other-Avoidance goals involve an aversion to demonstrating relative incompetence compared to the performance of others, for example, underperforming in contrast to others in a multiplayer game. Figure 5 offers a visual map to assist with understanding the six GGO dimensions and their relationships to one another.

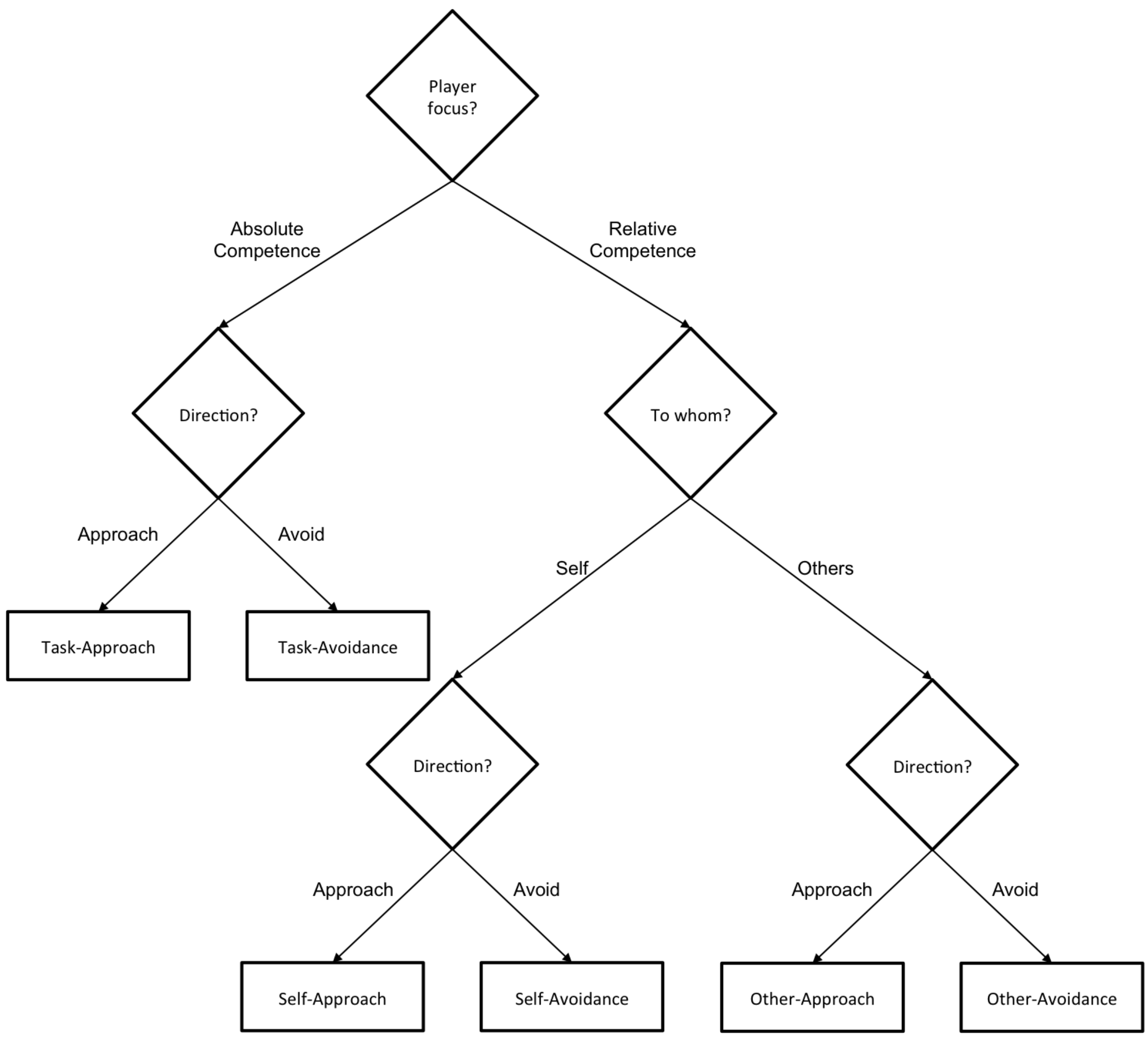

Figure 5. Flowchart representation of Gaming Goal Orientations model. Note that the six GGO dimensions are not mutually exclusive and can be simultaneously expressed by players to varying degrees.

The six GGO dimensions portray different kinds of goal-oriented motivations that players may have in a gaming context. It is important to note that the GGO dimensions are not mutually exclusive categories and that players likely have degrees of motivation across all six of them. Nevertheless, as suggested by Elliot et al. (2011), all six dimensions need not be incorporated into every study or implementation. Rather, it is reasonable to focus only on the dimensions deemed relevant to the investigated phenomena. GGO can be used to conduct continued research on individual player characteristics and motivations for gaming. Indeed, evidence for GGO's relevance to gameplay enjoyment was provided in this study's analysis of individual characteristics (see the discussion of research question 4). For practitioners, it is suggested that GGO may be a useful way to conceptualize an audience's motivation for play. Subsequently, design decisions can be made based on player motivations. For instance, a game might seek to cover several different motivational dimensions or cater to a specific audience of interest. Furthermore, considering the strong relationships between educational and gaming goal orientations, as well as the demonstrated applicability across these contexts, it would seem that educational game designers can benefit from using GGO in their design process.

The GEM-Individual Characteristics (GEM-IC) Model

The fourth research question asked, "To what extent are the individual characteristics of goal orientations, game usage, and gender related to GEM?" This question considered how the individual characteristics of goal orientations, game usage, and gender are related to the feature preferences contained in GEM. Results pertaining to these three key areas are discussed.

Gaming Goal Orientations (GGO)

A prior analysis in this study demonstrated the applicability of goal orientations to a gaming context (see discussion of research question 3). However, it remained unknown whether GGO were predictive of gameplay enjoyment. GEM-IC demonstrates that GGO dimensions are consistently the strongest predictors of gameplay enjoyment across the nine specific components of GEM. At least one GGO dimension appeared as a predictor in all nine GEM components, while some featured two (4), three (2), or four (1) GGO predictors. Furthermore, in all cases, a GGO dimension was the strongest single positive predictor of a given GEM component. Notably strong completely standardized loadings appeared for Task-Approach (.796) on Challenge, Other-Avoidance (.713) on Identity Other-Approach on Fantasy (.645), and Task-Avoidance (.635) on Companionship. In GEM-IC, GGO are clearly the strongest predictors of the various forms of gameplay enjoyment and can be deemed an area of high interest for future research.

Game Usage

Game usage variables, while appearing heavily throughout GEM-IC, generally serve as weak to moderate predictors of gameplay enjoyment. Some combination of genre preferences (e.g. shooting, action-adventure, sports) were predictors in all nine GEM components, although no loadings exceeded an absolute value of .255 and most were near or well below .150. Platform usage frequency variables, such as Wii and iOS, can be found in six of nine GEM components, but are the weakest predictors across the board with loadings of absolute value at or below .104. Similarly, the age that one began gaming, gaming skill, difficulty preference, multiplayer preference, and games played per month were included in the model, but all have weak loadings around .100. Interestingly, hours played per week and minutes played per session, both of which are commonly included in games research, were not substantial enough predictors to enter the model.

A few modest predictors of gameplay enjoyment should be highlighted against these trends. Logically, multiplayer preference (i.e. preferred number of play partners) was the second strongest predictor of Companionship (.272) and third strongest predictor of Multiplayer (.260). Meanwhile, enjoyment of the shooting genre related to Fidelity (.220) and Multiplayer (.227), while enjoyment of the action-adventure genre negatively related to Recognition (-.255). Aside from the noted relationships, game usage variables pale in comparison to GGO. Nevertheless, certain game usage variables may still serve a purpose in some research investigations.

Gender

Unexpectedly, the gender variable failed to make the model at all, which suggests that it is a rather poor predictor of gameplay enjoyment relative to the other characteristics included in this study. While much is made of gender theoretically in the field of game studies and observable differences between players may appear to exist along gender lines, empirical evidence related to gaming and gender has not been so resolute. This study provides additional empirical evidence that gender is not a substantive variable for understanding player differences in gameplay enjoyment. Indeed, it seems that a generic, overarching variable like gender is not a useful tool for understanding an intricate topic like gameplay preference. Based on the results of this study, it seems highly unlikely that gender will be a fruitful individual characteristic to include as a predictor in any thorough empirical examination of gameplay enjoyment.

Summary

GEM-IC used a multistage exploratory approach on a huge set of potentially influential individual characteristics to gain insights on what variables might predict gameplay enjoyment. As such, the model and equations provided by this analysis are not intended to be applied in a mathematical sense. Instead, GEM-IC provides vast insights into what individual characteristics may prove most valuable for researchers who seek an understanding of gameplay enjoyment. Thus, GEM-IC is an enabler of future research and points to promising and less promising focus areas. For instance, GGO variables were consistently the strongest predictors of gameplay enjoyment and are certainly worthy of further study. Meanwhile, game usage variables like multiplayer preference, platform usage, and genre enjoyment were predictors of minimal to moderate strength. Perhaps surprisingly, gender was not a statistically significant predictor in any part of the model. Likewise, common games research variables, like hours played per week and minutes played per session, failed to enter the model. Accordingly, it is suggested that researchers focus their efforts on detailed, motivational and behavioral characteristics directly associated with gaming contexts, rather than broad, demographic traits. Doing so is likely to produce more relevant results that distinguish between the intricacies of player preference.

Limitations and Future Research

The limitations of the reported study are discussed and suggestions for future research are offered.

Generalizability

The participants in this study came from a large, public university in the southwestern United States. They studied in a variety of fields, had a narrow age range (84% between 18 and 24), and were mostly male (70%). Many of the participants were undergraduate learners (80%), while some were graduate and continuing education students (20%). This study does not intend to suggest that generalizability exists beyond the confines of its sample. All readers are strongly encouraged to consider their own situations to determine the applicability of this study's results. It seems feasible that circumstances that are relatively congruent to this study stand a better chance of directly applying the results than circumstances that involve drastically different demographics and cultural identities.

Regarding the gender split in this study, it may comfort some readers to know that the preceding two GEM studies contained 64% and 59% females. In addition, the present study found that gender was not a differentiating variable when it comes to gameplay enjoyment. As for ages and cultures, it is felt that the results presented in this study would be greatly supported through replication across diverse participant groups.

Self Report

The data in this study were collected through a self-report questionnaire. This means that participants knowingly and willingly provided information that was requested of them. While there is no reason to believe nor evidence supporting the idea that participants were dishonest or imprecise in their responses, it cannot be known whether the information provided by participants was factual or free from honest mistakes. In future studies, it would be worthwhile to consider how alternative or mixed-methods approaches might support data validity. For instance, qualitative and biometric data could provide supporting information beyond the self-report measures used in this study.

Enjoyment and Outcomes

A common criticism of games research that investigates enjoyment, engagement, flow, and similar experiences challenges whether these items have any relationships to outcomes like improved academic performance, enhanced job skills, or better health metrics. Quick et al. (2012b) discuss the known links between enjoyment, technology acceptance, and learning, as well as provide suggestions for research that might lead to a better understanding of how gameplay enjoyment relates to learning. Additionally, there is some belief among game scholars that enjoyment is related to serious game outcomes. Fu et al. (2006, p. 362) asserted that "Whether or not a game offers enjoyment to the player is a key factor in determining whether the player will become involved and continue to learn through the game." Heeter et al. (2009, p. 111) concluded that "the most important threat to a serious game having its intended impact is when players dislike the game." Moreover, De Grove, Van Looy, and Courtois (2011, p. 50) found "a strong effect of the game experience on perceived learning which confirms that a positive, enjoyable game experience contributes to the experience of perceived learning." These works provide early evidence that enjoyment is not just critical for having a positive gameplay experience, but that it may be an essential requirement for games that aim to impact players. Nevertheless, it is important to note that this study only addressed fundamental and foundational elements of gameplay enjoyment, motivation, and behavior. Therefore, future research would be required to establish relationships between the contents of this study and any non-enjoyment outcomes derived from gameplay.

Practical Validation

Throughout the GEM line of research, a goal has been to provide detailed, empirical results that can applied in practice. GEM has been through sufficient iteration and statistical validation for it to be used as a practical design and development tool without further expansion and refinement. While suggestions have been made for how practitioners can apply the results of each study, the author himself only recently explored using GEM to design a game (Quick & Atkinson, 2012). Thus, a goal for future research is to adopt a design-based approach that examines GEM, GGO, and individual characteristics with players in genuine gameplay contexts. It is believed that GEM, GGO, and individual characteristics can be used to create games that will be more enjoyable and effective for their audiences. By employing a design-based approach, the empirical understandings derived from this line of research can be examined from a practical standpoint.

CONCLUSION

This study aimed to investigate the relationships between gameplay enjoyment and the individual characteristics of gaming goal orientations, game usage, and gender. The results of this study enable important new research and practice to take place surrounding video game experiences and player characteristics. Three empirical representations of gameplay enjoyment and individual characteristics have been offered to enable these valuable future works: Gameplay Enjoyment Model (GEM), Gaming Goal Orientations (GGO), and GEM-Individual Characteristics (GEM-IC). Drawing from these models, it is posited that researchers who hope to gain a deeper understanding of games and players will derive more meaningful results from investigating detailed, context-specific individual characteristics as compared to broad, demographic ones. Ultimately, it is believed that the GEM, GGO, and GEM-IC will be useful tools for researchers and designers who seek to make more effective gameplay experiences that meet the needs of their players.

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Table 1
Game Design Taxonomies

Taxonomy	Author(s)	Component	Description
MDA[a]	Hunicke et al., 2004	Fantasy	Imagining pretend worlds and characters
		Narrative	The "dramatic unfolding of events" (Schell, 2008, p. 109)
		Expression	Creating and customizing game objects
		Submission	"Leaving the real world behind and entering into a new, more enjoyable, set of rules and meaning" (Schell, 2008, p. 110)
		Sensation	Activating the five human senses
		Challenge	Solving problems
		Fellowship	"Friendship, cooperation, and community" (Schell, 2008, p. 109)
		Discovery	seeking and finding new things (Schell, 2008)
DPE[b]	Winn, 2008	Beauty	"That which pleases the senses" (Garneau, 2001, n.p.)
		Immersion	Imagining or physically entering a different environment (Garneau, 2001)
		Intellectual Problem Solving	"Finding solutions to problematic situations that require thought" (Garneau, 2001, n.p.)
		Competition	"An activity where the goal is to show one's superiority" (Garneau, 2001, n.p.)
		Social Interaction	"Doing things with other human beings" (Garneau, 2001, n.p.)
		Comedy	"Things that make one want to laugh" (Garneau, 2001, n.p.)
		Thrill of Danger	"Exhilaration coming from a dangerous activity" (Garneau, 2001, n.p.)
		Physical Activity	"Activities requiring intense physical movements" (Garneau, 2001, n.p.)
		Love	"Strong affection toward somebody" (Garneau, 2001, n.p.)
		Creation	"To make exist that which didn't" (Garneau, 2001, n.p.)
		Power	"Capacity of having a strong effect, of acting with strength" (Garneau, 2001, n.p.)
		Discovery	"Finding something that wasn't known before" (Garneau, 2001, n.p.)
		Advancement and Completion	"Going forward in, and eventually finishing, an activity" (Garneau, 2001, n.p.)
		Application of a Skill	"Using one's physical abilities in a difficult setting" (Garneau, 2001, n.p.)
		Altruism	Helping others, non-player characters (NPCs), or humankind (Heeter, et al., 2004)
		Learning	Increased "understanding of or knowledge about the real world" (Heeter, et al., 2004, p. 8)
GameFlow EGameFlow[c]	Fu et al., 2009; Sweetser & Wyeth, 2005	Concentration	A requirement of and opportunity granted to players
		Challenge	Should match the player's skill level

Taxonomy	Author(s)	Component	Description
		Skills	Mastery and development should be supported
		Control	Players should have control over their actions
		Clear Goals	Should be supplied at appropriate times
		Feedback	Should be of appropriate type given at appropriate times
		Immersion	Deep, effortless involvement by players
		Social Interaction	Opportunities should be provided
Motivations in Online Games	Yee, 2006; Yee et al., 2012	Achievement	Becoming powerful, optimizing a character, collecting rare items, competing with others
		Social	Chatting with others, grouping with others, keeping in touch with friends, being in a guild
		Immersion	Learning about game lore, immersing oneself in the game world, exploring the game world, creating a background story for a character
Motivational Pull SDT[d]	Ryan et al., 2006	Autonomy	Willingness to complete a task
		Competence	Desire for challenge and self-efficacy
		Relatedness	Feeling linked to others
		Presence	Immersion within the game world
		Intuitive Controls	Interface usability and seamlessness
Game Attributes	Wilson et al., 2009	Adaptation	Difficulty that adapts to player's skill level
		Assessment	How achievement is measured
		Challenge	The balance between obstacles and achieving goals
		Conflict	How problems are presented in the game
		Control	The amount of influence the player has over game elements
		Fantasy	Imaginary places, characters, and stories
		Equipment Interaction	How the game changes in response to player actions
		Interpersonal Interaction	Interactions that occur in physical space and time
		Social Interaction	Interactions that occur in a technology-mediated environment
		Language/ Communication	Rules that govern verbal and text communications within a game
		Location	The world (physical or virtual) in which the game occurs
		Mystery	Difference between information that is known and unknown to the player
		Pieces or Players	Narrative objects or people in a game
		Progress and Surprise	How the player advances towards game goals, including random events
		Representation	How real the player perceives a game to be
		Rules/Goals	Specific conditions that determine the win state and provide the player with goal progress feedback
		Safety	Difference between in-game (lesser) and out of game (more severe) consequences for failure
		Sensory Stimuli	Audiovisual stimuli that support immersion in a different reality

Taxonomy	Author(s)	Component	Description
Playfulness-Based Design	Hong et al., 2009	Degree of Uncertainty	A balance between chance events and player knowledge is needed
		Equal Conditions for Fair Play	Players are motivated when they perceive fair rules and the opportunity to win
		Opportunities for Competition and Cooperation	Competition and cooperation promote information sharing and strategy observation
		Level of Challenge	The flexibility, complexity, and difficulty of rules must be balanced
		Flexibility in Making Decisions	Trade-offs and risk-taking opportunities should promote engagement
		Level of Interactivity	Interactions between humans and the game system should promote engagement
Video Game Structural Characteristics	King et al., 2010	Social	How players communicate, cooperate, and compete; subfeatures include Social Utility, Social Formation/Institutional, Leader Board, and Support Network features
		Presentation	The aesthetic qualities of a game, such as graphics and sound; subfeatures include Graphics and Sound, Franchise, Explicit Content, and In-Game Advertising features
		Narrative and Identity	How players experience roleplaying and storytelling; subfeatures include Avatar Creation, Storytelling Device, and Theme and Genre features
		Reward and Punishment	How player actions are reinforced and discouraged; subfeatures include General Reward Type, Punishment, Meta-Game Reward, Intermittent Reward, Negative Reward, Near Miss, Event Frequency, Event Duration, and Payout Interval features
		Manipulation and Control	How players modify in-game elements and operate the physical user interface; subfeatures include User Input, Save, Player Management, and Non-Controllable features
ITaG	McNamara et al. (2010)	Feedback	Timing, content, control, and delivery affect the learning process
		Incentives	Performance-based rewards primarily affect extrinsic motivation
		Task Difficulty	Challenges should be matched to learner capabilities to support self-efficacy
		Control	Games provide learners with a sense control and personalization, while simultaneously directing how serious content is experienced
		Environment	The most evident aspects of games, including aesthetics, avatars, multimedia, and narrative, which may be difficult to incorporate into ITS

Note. Where no specific taxonomy name was given, a descriptive name based on the original publication is provided.
[a]Mechanics, Dynamics, Affects. These components come from the Affects portion of the framework and provide a vocabulary for how fun can be described in games.

[b]Design, Play, Experience. These components come from the Gameplay layer of the framework and describe how fun can be achieved in serious games based on work by Garneau (2001) and Heeter et al. (2004).
[c]In EGameFlow, Skills is renamed to Knowledge Improvement and Clear Goals is renamed to Goal Clarity.
[d]Self-Determination Theory.

Table 2
Player Type Taxonomies

Taxonomy	Author(s)	Player Type	Description
Synthesized Taxonomy	Bartle, 1996; Heeter, 2008; Klug & Schell, 2006; Squire & Steinkuehler, 2006	Achiever/ Power Leveler	Focuses on increasing points and levels
		Explorer	Works to expose underlying systems that operate, and discover unknown things about, the game world
		Socializer/Joker	Desires person-to-person interaction
		Killer	Imposes himself upon others, often in detrimental ways
		Storyteller/ Role Player	Takes on the identity of an in-game character to preserve and engage in the narrative of the fantasy world
		Competitor/ Performer	Strives to be better than others and demonstrate his abilities within the game world
		Collector	Accumulates large amounts of in-game objects
		Director	Leads others and manages in-game events
		Craftsman	Solves puzzles and creates in-game objects
SCT[a]	Weber & Shaw, 2009	Hedonist	Attracted to incentives related to enjoyment, while low in self-regulation
		Competitor	Attracted to competition, high in self-efficacy, and concerned with social judgment
		Organizer	Highly social and active, while high in self-regulation
		Rebel	Attracted to competition, concerned with social judgment, and highly flexible
		Team Player	Highly social and self-efficacious, while concerned with social judgment
		Socializer	Highly social and flexible, not attracted to competition, and low in self-regulation
Validator	Heeter, et al., 2009; Heeter et al., 2008; Magerko et al., 2010	Validator	Have a fixed mindset towards and performance-avoidance approach to gaming and are averse to failure; prefer the positive feedback of easy-to-win challenges to more difficult, skill-developing challenges that may result in failure
Play Motivation[b]	Westwood & Griffiths, 2010	Story-Driven Solo	Motivated by personal enjoyment and immersion
		Social	Averse to playing alone
		Solo Limited	Motivated by single-player experiences and instant gratification
		Hardcore Online	Motivated by being part of a social group, external rewards and achievements, graphics, and music
		Control/Identity Solo	Motivated by story and character development
		Casual	Motivated by personal enjoyment, graphics, and the ability to play at their own convenience

Taxonomy	Author(s)	Player Type	Description
2x2 Goal Orientations	Heeter, Lee, Medler et al., 2011	Super-Achievers	Have above median performance and mastery goal orientations
		Non-Achievers	Have below median performance and mastery goal orientations
		Performance-Only	Have above median performance and below median mastery goal orientations
		Mastery-Only	Have above median mastery and below median performance goal orientations
Vulnerable Subgroups	Heeter, Lee, Magerko et al., 2011	Resistant Gamers	Players who do not like a game and would not choose to play it if not assigned to do so
		Non-Gamers	Players with little gaming experience; quantified here as those who played one hour or less per week
Gameplay Styles	Ventura et al., 2012	Selective	Players who spend many hours on their favorite games
		Diverse	Players who play many different games per year
		Habitual	Players who spend many hours per week playing games

Note. Where no specific taxonomy name was given, a descriptive name based on the original publication is provided.
[a]Social Cognitive Theory.
[b]The suffix "Gamers" is omitted from each player type name in this taxonomy to reduce redundancy and improve readability.

Table 3

Features Evaluated for Inclusion in GEM

Feature	Hypothesized Component(s)	Optimal Component[a]	Decision
Play with friends	Companionship	Companionship	Retain
Spend time with friends	Companionship	Companionship	Retain
Chance Events	Exploration	Discovery	Retain
Surprising Things	Exploration	Discovery	Retain
Character's race is different from my own	Fantasy	Identity	Retain
Character's gender is different from my own	Fantasy	Identity	Retain
Multiplayer	Companionship	Multiplayer	Retain
Online multiplayer	Competition	Multiplayer	Retain
High scores	Competition	Recognition	Retain
Leaderboard	Competition	Recognition	Retain
Player rankings	Competition	Recognition	Retain
High level of skill required	Challenge Competition Exploration	Strategy	Retain
High level of strategy required	Challenge Competition Exploration	Strategy	Retain
Collect things	Exploration	--	Remove
Create things	Exploration	--	Remove
Build things	Exploration	--	Remove
Time limit	Challenge Competition	--	Remove
Solve problems	Challenge Exploration	--	Remove
Solve puzzles	Challenge Exploration	--	Remove
Destroy things	Competition	--	Remove
Kill things	Competition	--	Remove
Meet new people	Companionship Competition	--	Remove
Random events	Exploration	--	Remove
Freedom to play in different ways	Exploration	--	Remove
Character's abilities develop over time	Fantasy	--	Remove
Character's appearance is customizable	Fantasy	--	Remove
No defined ending	Fantasy Exploration	--	Remove
Real world setting	Fidelity	--	Remove
2D graphics	Fidelity	--	Remove
Music	Fidelity	--	Remove
Cartoon graphics	Fidelity	--	Remove
Human characters	Fidelity	--	Remove

[a]With the exception of the first two items, the Optimal Factor name differs from the Hypothesized Factor name because the preexisting hypothesized GEM components split into multiple derivative components once the new items were included in the model.

Table 4

Nested Model Comparison of CFI, RMSEA, and SRMR

Model	χ^2	df	RMSEA	SRMR	CFI
Unidimensional	3518.760	817	.105	.121	.577
Second Order	1606.211	808	.057	.093	.875
Correlated Traits	1238.249	781	.044	.057	.928
Bifactor	1028.020	740	.036	.046	.955

Note. χ^2 = chi square; df = degrees of freedom; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual; CFI = comparative fit index.

Table 5

Nested Model Comparison of Chi-Square Differences

Model	Single Trait	Second Order	Correlated Traits
Unidimensional	--		
Second Order	1912.549	--	
Correlated Traits	2280.511	367.962	--
Bifactor	2490.740	578.191	210.229

Note. Absolute differences in chi-square values between models are displayed. All differences are statistically significant at $p < .001$.

Table 6

Gameplay Enjoyment Model Feature Descriptions, Loadings, and Standard Errors

Feature	Description	Unstd. Load[a]	*SE*[a]	Std. Load[a]	*p*[a]	Factor	*p*[b]	Unstd. Load[b]	*SE*[b]	Std. Load[b]
1	Difficult to master	1.345	.419	.379	.001	CH	--	1.000	--	.617
2	Difficult to beat	1.074	.354	.332	.002	CH	.000	.937	.101	.633
3	Challenging difficulty level	1.178	.370	.363	.001	CH	.000	1.049	.112	.707
4	Challenging obstacles	.594	.239	.200	.013	CH	.000	.751	.103	.554
5	Socialize with others	2.308	.645	.568	.000	CP	--	1.000	--	.418
6	Play with people at parties	1.837	.548	.446	.001	CP	.000	1.051	.176	.433
7	Play with friends	1.699	.521	.439	.001	CP	.000	1.783	.263	.783
8	Spend time with friends	1.495	.458	.399	.001	CP	.000	1.325	.188	.601
9	Explore unfamiliar places	.399	.226	.116	.078	DC	--	1.000	--	.769
10	Discover unexpected things	.625	.241	.182	.009	DC	.000	.898	.082	.694
11	Search for hidden things	.675	.258	.184	.009	DC	.000	.769	.089	.557
12	Explore inner workings	1.206	.365	.311	.001	DC	.000	.637	.095	.436
13	Chance events	1.214	.354	.337	.001	DC	.000	.706	.087	.519
14	Surprising things	.688	.241	.215	.004	DC	.000	.654	.077	.541
15	Fictional characters	1.000	--	.241	--	FA	--	1.000	--	.660
16	Char abilities not real world	1.339	.334	.314	.000	FA	.000	.910	.103	.584
17	Imaginary creatures	1.189	.277	.282	.000	FA	.000	1.182	.107	.769
18	Fantasy world setting	1.121	.274	.266	.000	FA	.000	1.083	.105	.704
19	Realistic sound effects	1.286	.382	.331	.001	FI	--	1.000	--	.658
20	3D graphics	1.367	.416	.311	.001	FI	.000	1.160	.117	.675
21	Lifelike animations	1.316	.388	.347	.001	FI	.000	1.011	.095	.682
22	Realistic	1.180	.377	.281	.002	FI	.000	1.238	.115	.753

Feature	Description	Unstd. Load[a]	*SE*[a]	Std. Load[a]	*p*[a]	Factor	*p*[b]	Unstd. Load[b]	*SE*[b]	Std. Load[b]
	graphics									
23	Char identity different	1.236	.362	.298	.001	ID	--	1.000	--	.531
24	Char species different	1.231	.331	.334	.000	ID	.000	1.363	.159	.812
25	Char race different	1.135	.317	.332	.000	ID	.000	1.036	.127	.667
26	Char gender different	1.373	.381	.406	.000	ID	.000	.765	.107	.498
27	Multiplayer	1.729	.557	.417	.002	MP	--	1.000	--	.793
28	More than one player	1.704	.531	.418	.001	MP	.000	.875	.064	.705
29	Cooperate with players	2.053	.591	.512	.001	MP	.000	.633	.065	.519
30	Compete against players	2.565	.746	.619	.001	MP	.000	.614	.062	.488
31	Compete online	3.205	.904	.708	.000	MP	.000	.564	.067	.409
32	Online multiplayer	2.578	.750	.577	.001	MP	.000	.817	.065	.601
33	Display my skills in public	3.280	.906	.762	.000	RN	--	1.000	--	.216
34	Public recognition	3.382	.932	.773	.000	RN	.001	1.308	.382	.278
35	Compare skills with players	3.148	.905	.758	.001	RN	.003	1.267	.434	.284
36	High scores	2.166	.660	.505	.001	RN	.021	2.226	.967	.483
37	Leaderboard	2.806	.814	.661	.001	RN	.015	1.870	.768	.410
38	Player rankings	2.683	.794	.621	.001	RN	.005	3.050	1.086	.656
39	Experiment with strategies	1.210	.362	.361	.001	ST	--	1.000	--	.577
40	High level of skill	1.790	.512	.498	.000	ST	.000	1.100	.171	.592
41	High level of strategy	1.509	.438	.451	.001	ST	.000	.932	.149	.538

Note. Feature numbers correspond to those displayed in Figure 1. Completely standardized loadings are presented. Factor abbreviations: CH = Challenge, CP = Companionship, DC = Discovery, FA = Fantasy, FI = Fidelity, ID = Identity, MP = Multiplayer, RN = Recognition, ST = Strategy.
[a]Value associated with feature's relationship to the general factor of Enjoyment.
[b]Value associated with feature's specific factor.

Table 7

Gaming Goal Orientations Model Feature Descriptions, Loadings, and Standard Errors

Item	Statement	Unstd. Load	*SE*	Std. Load	*p*	Factor
1	To beat the game	1.000	--	.498	--	Task-Approach
2	To win on a challenging difficulty level	1.408	.195	.705	.000	Task-Approach
3	To overcome many challenges	1.196	.177	.649	.000	Task-Approach
4	Avoid being defeated by the game	1.000	--	.662	--	Task-Avoidance
5	Avoid losing on a challenging difficulty level	1.027	.114	.661	.000	Task-Avoidance
6	Avoid failing challenges	.983	.112	.643	.000	Task-Avoidance
7	To play better than I have in the past	1.000	--	.808	--	Self-Approach
8	To play well relative to how I have in the past	.995	.070	.786	.000	Self-Approach
9	To play better than I typically do	.924	.063	.802	.000	Self-Approach
10	Avoid playing worse than I normally do	1.000	--	.819	--	Self-Avoidance
11	Avoid playing poorly compared to my typical performance	.878	.058	.788	.000	Self-Avoidance
12	Avoid playing worse than I have in the past	.932	.057	.841	.000	Self-Avoidance
13	To outperform other players	1.000	--	.815	--	Other-Approach
14	To play well compared to other players	.959	.061	.823	.000	Other-Approach
15	To do better than other players	1.039	.060	.859	.000	Other-Approach
16	Avoid underperforming relative to other players	1.000	--	.793	--	Other-Avoidance
17	Avoid playing poorly compared to other players	1.018	.069	.793	.000	Other-Avoidance
18	Avoid doing worse than other players	1.088	.068	.841	.000	Other-Avoidance

Note. Feature numbers correspond to those displayed in Figure 2. Completely standardized loadings are presented.

Table 8

Statements Evaluated for Inclusion in Gaming Goal Orientations Model

Statement	Hypothesized Dimension
To discover many things	Exploration Task-Approach
To use the best strategies	Exploration Task-Approach
To know a lot about the game	Exploration Task-Approach
Avoid discovering too few things	Exploration Task-Avoidance
Avoid using the wrong strategies	Exploration Task-Avoidance
Avoid knowing too little about the game	Exploration Task-Avoidance
To socialize well with other players	Companionship Task-Approach
To cooperate well with other players	Companionship Task-Approach
To perform well with other players	Companionship Task-Approach
Avoid socializing poorly with other players	Companionship Task-Avoidance
Avoid cooperating poorly with other players	Companionship Task-Avoidance
Avoid performing poorly with other players	Companionship Task-Avoidance

Note. None of these statements were retained in the final model.

Table 9

GEM-Individual Characteristics Model Variable Descriptions, Loadings, and Standard Errors

Var.	Description	Unstd. Load	*SE*	Std. Load	*p*	GEM Factor
1	Task-Approach gaming goal orientation	1.142	.041	.796	.000	Challenge
2	Self-Avoidance gaming goal orientation	.159	.029	.141	.000	Challenge
3	Preferred difficulty level	.339	.078	.138	.000	Challenge
4	Frequency of tablet play	-.144	.044	-.083	.001	Challenge
5	Enjoyment of dance genre	.120	.036	.080	.001	Challenge
6	Gaming skill	-.172	.065	-.076	.008	Challenge
7	Enjoyment of mobile genre	-.105	.039	-.065	.007	Challenge
8	Age began playing	.042	.017	.064	.010	Challenge
9	Preferred number of companion players	.085	.034	.060	.012	Challenge
10	Frequency of PC play	.074	.034	.053	.030	Challenge
11	Task-Avoidance gaming goal orientation	.855	.049	.635	.000	Companionship
12	Preference for play with others	.424	.058	.272	.000	Companionship
13	Frequency of iOS play	-.158	.049	-.104	.001	Companionship
14	Age began playing	.060	.024	.083	.012	Companionship
15	Enjoyment of shooting genre	.127	.052	.083	.016	Companionship
16	Enjoyment of social network genre	.140	.056	.075	.013	Companionship
17	Enjoyment of arcade genre	.135	.053	.073	.011	Companionship
18	Self-Avoidance gaming goal orientation	.699	.066	.451	.000	Discovery
19	Self-Approach gaming goal orientation	.462	.072	.296	.000	Discovery
20	Enjoyment of action/adventure genre	.330	.088	.157	.000	Discovery
21	Enjoyment of sports genre	-.165	.076	-.091	.031	Discovery
22	Other-Approach gaming goal orientation	.827	.044	.645	.000	Fantasy
23	Other-Avoidance gaming goal orientation	.405	.050	.281	.000	Fantasy
24	Enjoyment of action/adventure genre	.380	.075	.175	.000	Fantasy
25	Enjoyment of sports genre	-.230	.054	-.122	.000	Fantasy
26	Enjoyment of RPG genre	.178	.058	.092	.002	Fantasy
27	Games played in past month	-.055	.015	-.092	.000	Fantasy
28	Enjoyment of platform genre	-.201	.065	-.085	.002	Fantasy
29	Enjoyment of shooting genre	-.144	.055	-.073	.009	Fantasy
30	Frequency of Wii play	.241	.085	.072	.004	Fantasy
31	Age began playing	.062	.025	.066	.012	Fantasy
32	Self-Approach gaming goal orientation	.363	.088	.221	.000	Fidelity
33	Other-Approach gaming goal orientation	.286	.065	.220	.000	Fidelity
34	Enjoyment of shooting genre	.442	.094	.220	.000	Fidelity
35	Enjoyment of sports genre	.347	.093	.182	.000	Fidelity
36	Enjoyment of arcade genre	-.375	.118	-.154	.002	Fidelity
37	Age began playing	.142	.042	.150	.001	Fidelity
38	Enjoyment of racing genre	.268	.106	.122	.012	Fidelity
39	Enjoyment of puzzle genre	-.276	.129	-.112	.032	Fidelity
40	Enjoyment of board game genre	.260	.121	.101	.031	Fidelity
41	Other-Avoidance gaming goal orientation	.816	.044	.713	.000	Identity
42	Age began playing	.135	.029	.181	.000	Identity
43	Enjoyment of card genre	-.233	.073	-.131	.002	Identity
44	Enjoyment of social network genre	.214	.079	.110	.007	Identity
45	Frequency of Wii play	.270	.104	.102	.009	Identity
46	Enjoyment of strategy genre	.158	.062	.101	.011	Identity
47	Enjoyment of racing genre	-.155	.069	-.090	.024	Identity
48	Play frequency	-.176	.085	-.084	.038	Identity
49	Frequency of iOS play	.126	.061	.080	.037	Identity
50	Self-Approach gaming goal orientation	.807	.090	.373	.000	Multiplayer
51	Task-Avoidance gaming goal orientation	.630	.099	.270	.000	Multiplayer

Var.	Description	Unstd. Load	*SE*	Std. Load	*p*	GEM Factor
52	Preference for play with others	.702	.107	.259	.000	Multiplayer
53	Enjoyment of shooting genre	.602	.105	.227	.000	Multiplayer
54	Enjoyment of action/adventure genre	-.421	.104	-.145	.000	Multiplayer
55	Enjoyment of sports genre	.276	.081	.110	.001	Multiplayer
56	Self-Avoidance gaming goal orientation	-.222	.076	-.104	.004	Multiplayer
57	Age began playing	.113	.046	.090	.013	Multiplayer
58	Frequency of iOS play	-.225	.091	-.085	.013	Multiplayer
59	Frequency of PSP play	.397	.178	.067	.025	Multiplayer
60	Enjoyment of action/adventure genre	-.494	.092	-.255	.000	Recognition
61	Task-Avoidance gaming goal orientation	.390	.072	.251	.000	Recognition
62	Other-Avoidance gaming goal orientation	.288	.055	.224	.000	Recognition
63	Self-Approach gaming goal orientation	.273	.074	.189	.000	Recognition
64	Enjoyment of shooting genre	.301	.075	.170	.000	Recognition
65	Task-Approach gaming goal orientation	.281	.074	.154	.000	Recognition
66	Enjoyment of dance genre	.285	.073	.150	.000	Recognition
67	Enjoyment of sports genre	.224	.066	.134	.001	Recognition
68	Enjoyment of mobile genre	.234	.085	.116	.006	Recognition
69	Enjoyment of RPG genre	-.187	.076	-.109	.014	Recognition
70	Preference for play with others	.187	.075	.103	.013	Recognition
71	Enjoyment of arcade genre	-.220	.086	-.103	.010	Recognition
72	Age began playing	.079	.034	.094	.021	Recognition
73	Self-Avoidance gaming goal orientation	.269	.034	.333	.000	Strategy
74	Task-Approach gaming goal orientation	.311	.047	.303	.000	Strategy
75	Enjoyment of strategy genre	.150	.039	.152	.000	Strategy
76	Other-Approach gaming goal orientation	.098	.026	.151	.000	Strategy
77	Gaming skill	.235	.079	.144	.003	Strategy
78	Difficulty preference	.217	.090	.124	.000	Strategy
79	Play frequency	-.149	.057	-.113	.009	Strategy
80	Enjoyment of mobile genre	-.115	.045	-.101	.011	Strategy
81	Frequency of DS play	-.140	.057	-.093	.014	Strategy
82	Age began playing	.038	.019	.081	.040	Strategy

Note. Variable numbers correspond to those displayed in Figure 3. Completely standardized loadings are presented. Variables are sorted in descending order by absolute standardized loading value within each GEM factor.

APPENDIX A

SURVEY INSTRUMENT

Demographics

1. Gender
( ) Female
( ) Male
( ) Prefer not to say

2. Age
( ) 17 or younger
( ) 18
…
( ) 79
( ) 80 or older
( ) 18 or older, but prefer not to say

3. As of today, are you an undergraduate college student?
( ) Yes
( ) No

Undergraduate Student Demographics

4. College student status (as of today)
( ) Freshman
( ) Sophomore
( ) Junior
( ) Senior
( ) Other
( ) Prefer not to say

5. Field of study___________

Non-Undergraduate Demographics

6. Highest educational degree completed (as of today)
( ) High school diploma (or equivalent)
( ) Some college
( ) Associate degree
( ) Bachelor's degree
( ) Master's degree
( ) Doctoral/professional degree
( ) None of the above
( ) Prefer not to say

7. Field of Work___________

Game Preferences

On this page, you will share your preferences for different video game features.

For the purposes of this survey, "video game" describes any type of digital game that you might play, including those on computers, home consoles, handhelds, mobile phones, or any other device. For example, Angry Birds, Words With Friends, FarmVille, Pac-Man, Tetris, Super Mario, Zelda, Pokemon, Halo, Portal, Gran Turismo, Madden NFL, and World of Warcraft are all considered video games.

8. Indicate how important each feature is to your enjoyment of a video game.

Difficult to master
Difficult to beat
Challenging difficulty level
Challenging obstacles to overcome
Socialize with others
Play with many people at parties
Play with friends
Spend time with friends
Explore unfamiliar places
Discover unexpected things
Search for hidden things
Explore the game's inner workings
Chance events
Surprising things
Fictional characters
Character's abilities do not exist in the real world
Imaginary creatures
Fantasy world setting
Realistic sound effects
3D graphics
Lifelike animations
Realistic graphics
Character's identity is different from my own
Character's species is different from my own
Character's race is different from my own
Character's gender is different from my own
Multiplayer
More than one player
Cooperate with other players
Compete against other players
Compete with other players online
Online multiplayer
Display my skills in public

Public recognition of the best players
Compare my skills with other players
High scores
Leaderboard
Player rankings
Experiment with different play strategies
High level of skill required
High level of strategy required
Collect things
Create things
Build things
Time limit
Solve problems
Solve puzzles
Destroy things
Kill things
Meet new people
Random events
Freedom to play in different ways
Character's abilities develop over time
Character's appearance is customizable
No defined ending
Real world setting
2D graphics
Music
Cartoon graphics
Human characters

Response choices for all items in question 8:
() Not important
() Slightly important
() Moderately important
() Very important
() Extremely important

Game Goals

On this page, you will share your goals for playing video games.

For the purposes of this survey, "video game" describes any type of digital game that you might play, including those on computers, home consoles, handhelds, mobile phones, or any other device. For example, Angry Birds, Words With Friends, FarmVille, Pac-Man, Tetris, Super Mario, Zelda, Pokemon, Halo, Portal, Gran Turismo, Madden NFL, and World of Warcraft are all considered video games.

9. The following statements represent types of goals that you may or may not have when playing video games. Indicate how true each statement is of you when playing video games.

To beat the game
To win on a challenging difficulty level
To overcome many challenges
Avoid being defeated by the game
Avoid losing on a challenging difficulty level
Avoid failing challenges
To play better than I have in the past
To play well relative to how I have in the past
To play better than I typically do
Avoid playing worse than I normally do
Avoid playing poorly compared to my typical performance
Avoid playing worse than I have in the past
To outperform other players
To play well compared to other players
To do better than other players
Avoid underperforming relative to other players
Avoid playing poorly compared to other players
Avoid doing worse than other players
To discover many things
To use the best strategies
To know a lot about the game
Avoid discovering too few things
Avoid using the wrong strategies
Avoid knowing too little about the game
To socialize well with other players
To cooperate well with other players
To perform well with other players
Avoid socializing poorly with other players
Avoid cooperating poorly with other players
Avoid performing poorly with other players

Response choices for all items in question 9:
() Not true
() Slightly true
() Moderately true
() Very true
() Extremely true

Game Usage

On this page, you will share information about your usage of video games.

For the purposes of this survey, "video game" describes any type of digital game that you might play, including those on computers, home consoles, handhelds, mobile phones, or any other device. For example, Angry Birds, Words With Friends, FarmVille, Pac-Man, Tetris, Super Mario, Zelda, Pokemon, Halo, Portal, Gran Turismo, Madden NFL, and World of Warcraft are all considered video games.

10. In an average week, how much time do you spend playing video games?
( ) None
( ) 15 minutes
( ) 30 minutes
( ) 1 hour
( ) 2 hours
…
( ) 10 hours
( ) 15 hours
…
( ) 40 hours
( ) 50 hours
( ) 60 hours
( ) 70 hours or more

11. In one average session, how much time do you spend playing a video game?
( ) 5 minutes
( ) 10 minutes
( ) 15 minutes
( ) 30 minutes
( ) 45 minutes
( ) 1 hour
( ) 1.5 hours
( ) 2 hours
( ) 3 hours
…
( ) 10 hours or more

12. How often do you play video games?
( ) Not at all
( ) Once per month
( ) Once per week
( ) A few times per week
( ) Every day

13. How skilled are you at playing video games?
( ) Not skilled
( ) Slightly skilled

( ) Moderately skilled
( ) Very skilled
( ) Extremely skilled

14. How difficult do you like your games to be?
( ) Not difficult
( ) Slightly difficult
( ) Moderately difficult
( ) Very difficult
( ) Extremely difficult

15. How many people do you prefer to play games with?
( ) None - I play alone
( ) One other person
( ) Two other people
( ) Three other people
( ) Four other people or more

16. How often do you play video games on each platform?

Nintendo Wii
Playstation 3
Xbox 360
Xbox Kinect
Nintendo DS/3DS
Sony PSP/Vita
Desktop computer
Laptop computer
Tablet (iPad, Galaxy, Kindle Fire)
iOS handheld (iPhone, iPod Touch)
Smartphone (not iPhone)
Mobile phone (not smartphone)

Response choices for all items in question 16:
( ) Not at all
( ) Once per month
( ) Once per week
( ) A few times per week
( ) Every day

17. How enjoyable is each video game genre to you?
(Example games are provided in parentheses)

Board game (Monopoly, Chess)
Puzzle (Tetris, Bejeweled)

Health/Fitness (Wii Fit, Zumba Fitness)
Roleplaying (Final Fantasy, Pokemon)
Online Roleplaying (EverQuest, World of Warcraft)
Card (Poker, Solitaire)
Sports (Madden NFL, NBA Live)
Racing (Gran Turismo, Mario Kart)
Dance (Just Dance, Dance Dance Revolution)
Action/Adventure (Zelda, Grand Theft Auto)
Platform (Super Mario, Sonic)
Shooting (Halo, Call of Duty)
Fighting (Super Smash Bros., Street Fighter)
Strategy (Civilization, StarCraft)
Music (Guitar Hero, Rock Band)
Arcade (Pac-Man, Space Invaders)
Mobile (Angry Birds, Fruit Ninja)
Social Network (FarmVille, Words With Friends)
Simulation (SimCity, The Sims)

Response choices for all items in question 17:
() Not enjoyable
() Slightly enjoyable
() Moderately enjoyable
() Very enjoyable
() Extremely enjoyable

18. At what age did you begin playing video games?
() 1
() 2
…
() 79
() 80 or older
() Prefer not to say

19. How many video games do you own?
20. How many video games have you played in the past month?
21. How many video games have you played in the past year?

Response choices for questions 19, 20, and 21:
() 0
() 1
…
() 10
() 15
() 20
() 25

() 50
() 75
() 100 or more

APPENDIX B

IRB APPROVAL

ASU Knowledge Enterprise Development

Office of Research Integrity and Assurance

To:	Robert Atkinson EDB
From:	Mark Roosa, Chair Soc Beh IRB
Date:	10/28/2010
Committee Action:	**Exemption Granted**
IRB Action Date:	10/28/2010
IRB Protocol #:	1010005605
Study Title:	Video Game Engagement and Gaming Preferences

The above-referenced protocol is considered exempt after review by the Institutional Review Board pursuant to Federal regulations, 45 CFR Part 46.101(b)(2) .

This part of the federal regulations requires that the information be recorded by investigators in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects. It is necessary that the information obtained not be such that if disclosed outside the research, it could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation.

You should retain a copy of this letter for your records.