Empirical Taxonomies of Gameplay Enjoyment:
Personality and Video Game Preference

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ABSTRACT

A survey study was conducted to better understand how gameplay enjoyment relates to players' personality traits and video game preferences. This study demonstrated that the core design elements of games that lead to enjoyment can be empirically identified. Similarly, it showed that considering personality, an individual characteristic, can produce informative insights about how players perceive gaming experiences. Whereas video game research has historically emphasized either games or players in isolation (Juul, 2010), this study is an initial effort towards a holistic approach that considers how design features and player characteristics combine to generate enjoyable video game experiences. Two empirical taxonomies for creating more enjoyable game experiences are presented.

Keywords: *Enjoyment, Game Design, Individual Characteristics, Personality, Player Types, Taxonomy, Video Games*

INTRODUCTION

Over the past decade, the use of video games for learning, health intervention, social awareness, and other beneficent ends has emerged as a prime interest in research and practice alike (Bergeron, 2006; Bogost, 2007; Gee, 2003, 2007; McGonigal, 2011; Prensky, 2007; Salen & Zimmerman, 2003). However, detailed empirical examinations into the characteristics of games and their players that generate enjoyable experiences are scarce. The core design elements that make video games enjoyable are believed to be empirically identifiable (Quick & Atkinson, 2011). Likewise, the personal characteristics that affect players' perceptions of games can be empirically determined. Whereas studies have historically emphasized either games or players in isolation (Juul, 2010), this research examines game design and player characteristics in unison. It is important to consider game design and player perceptions in tandem, because both are integral parts of game experiences. A combined empirical understanding of game design and players will enable designers, educators, and other stakeholders to systematically create more effective video game experiences.

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Past Game Design and Player Taxonomies

Several past taxonomies have attempted to describe game design and players. These were primarily born out of professional experience, observation, and theory. A popular classification of gamers comes from designer Richard Bartle (1996). He described the players of text-based Multi-User Dungeons (MUDs) 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 users of one massively multiplayer online roleplaying game (MMORPG), Squire and Steinkuehler (2006) suggested that players could be categorized as power levelers obsessed with gaining levels through mechanical gameplay or role players interested in maintaining the fiction of the game world. Furthermore, Bateman and Boon (2006) categorized players as being conquerors, managers, wanderers, or participants, while Klug and Schell (2006) grouped players into competitors, explorers, collectors, achievers, jokers, directors, storytellers, performers, and craftsmen. After crossing the works of Bartle (1996), Squire and Steinkuehler (2006), and Klug and Schell (2006) with learning style theory, Heeter (2008) presented an integrated model of play styles and learning styles that featured an expanded taxonomy of 13 player types. While each of these classifications offers intuitive player types, all have yet to be sufficiently validated empirically.

A framework that attempts to comprehensively describe video game design is LeBlanc's Mechanics, Dynamics, and Affects (MDA). MDA offers a taxonomy of eight terms to describe what makes games fun to players. These are *sensation*, *fantasy*, *narrative*, *challenge*, *fellowship*, *discovery*, *expression*, and *submission* (Hunicke, LeBlanc, & Zubek, 2004). While MDA offers a compelling framework for game design and an attractive vocabulary for how fun can be defined, it remains empirically unverified.

Building from MDA, Winn (2008) created the Design, Play, and Experience (DPE) framework to describe the design of serious games, which are games created for primary purposes other than entertainment. DPE expands upon MDA by offering several additional ways that fun can be achieved in games, such as through competition, physical activity, altruism, and learning. Yet, as with MDA, DPE offers a lucid and relevant framework for game design, but is empirically unproven.

In contrast, a few past pursuits have produced empirical game design taxonomies that are relevant in very specific contexts. In a survey of 3,000 MMORPG players, Yee (2006) factor analyzed a set of 40 items inspired by Bartle's (1996) taxonomy. As a result, he concluded that the components of *achievement*, *social*, and *immersion* represent MMORPG players' underlying motivations for play. While Yee's motivation components are insightful and potentially applicable to research specifically on MMORPG players, they may not hold true for or fully explain the motivations of other players.

Wood, Griffiths, Chappell, and Davies (2004) sought to identify the characteristics of games that attract players and motivate them to continue playing. They asked self-identified gamers to report how important a series of game design features were to their enjoyment of video games. Each design feature belonged to one of several categories, such as sound, graphics, or character development. 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. Their taxonomy included *social*, *manipulation and control*, *narrative and identity*, *reward and punishment*, and *presentation* features. Subsequently, Westwood and Griffiths (2010) employed this taxonomy in a study of 40 avid gamers who averaged 11.5 hours of play per week. This pursuit resulted in the definition of six player types: *story-driven*

solo gamers, *social gamers*, *solo limited gamers*, *hardcore online gamers*, *control/identity solo gamers*, and *casual gamers*.

Wood et al. (2004) set the foundation for examining the structural characteristics of video games and King et al. (2010) and Westwood and Griffiths (2010) greatly advanced this pursuit with compelling results. Yet, to date this line of research has focused solely on players who commit a substantial amount of their time to gaming. In pursuing a broader understanding of game design, it can be expected that only some players will be as committed to gaming as the participants in these studies. Rather, a full range of gaming experience and commitment is anticipated to exist in the player population, especially considering the increasing popularity of casual, social network, and mobile games.

Though valuable within their specific contexts, the described taxonomies tend to focus on specialized gamer populations or game types, which likely limits their generalizability. Moreover, prior research in game design and player types demonstrates a lack of consideration for moderate, infrequent, and non-gamers, which likely constitute a large majority of players. Furthermore, many of the past taxonomies are insufficiently supported or completely unsupported by empirical research, which makes their validity and comprehensiveness questionable.

This research aims to provide empirical findings that are applicable to a variety of players. Rather than focusing only on avid gamers or expert players of a specific game or genre, all potential players are embraced. This includes infrequent and non-gamers. When considering the design of games, especially in learning contexts, it is important to focus on the full range of anticipated players, rather than solely those with extensive prior experience (Heeter, Lee, Magerko, & Medler, 2011). Doing so should increase the capability of a game design to meet the needs of its audience and yield an effective experience.

For the purposes of this study, 18 distinct video game features were selected to gauge players' video game preferences. The 18 design features covered topics such as graphic styles, game world settings, roleplaying, cooperative and competitive opportunities, and gameplay activities.

Measuring Personality

Cattell (1950, p. 2) defined personality as "that which permits a prediction of what a person will do in a given situation." For the purposes of this research, personality can be thought of as a set of individual characteristics that explain how a person will perceive video game experiences. The Five Factor Model (FFM) forms the foundation for the approach taken to measure personality in this study. Drawing upon a long history of prior research, the FFM was created as a unified model of personality (see Digman, 1990 for a history of FFM development). It explains human personality using the five primary dimensions of Neuroticism, Extraversion, Openness to Experience, Conscientiousness, and Agreeableness (McCrae & John, 1992).

In 1999, Goldberg (1999) launched the International Personality Item Pool (IPIP), a public domain repository containing thousands of questionnaire items relevant to personality research. Subsequently, Goldberg (1999) generated a 300-item public domain instrument to measure the FFM dimensions, as well as 30 underlying personality subtraits. This instrument is known as the International Personality Item Pool Representation of the NEO PI-R (IPIP-NEO). Later, Johnson (2001) formed a 120-item version of the IPIP-NEO. This instrument has shown comparable reliability and validity to the NEO PI-R, which is widely regarded as the most valid and reliable commercial instrument for measuring the constructs of the FFM (Costa & McCrae, 1992; Johnson, 2000, 2001, 2005). Due to its proven statistical record and accessibility, the 120-item IPIP-NEO was selected as a starting point for measuring personality in this study. Limitations to the overall size of the questionnaire instrument precluded the inclusion of all 120 items. As a result, 60 items representing 15 personality subtraits were selected from Johnson's (2001) NEO-IPIP for use in this study.

Although no precise definitions of the FFM dimensions nor their subtraits are agreed upon (Digman, 1990; McCrae & John, 1992), the 15 personality subtraits included in this study can be described as follows based on their underlying items. The FFM dimension associated with each personality subtrait is included in parentheses.

- Achievement-Striving: working hard and exceeding expectations (Conscientiousness).
- Activity Level: having a busy, on the go lifestyle with little spare time (Extraversion).
- Altruism: concerning oneself with helping others and others' feelings (Agreeableness).
- Anger: losing one's temper and being prone to annoyance and irritation (Neuroticism).
- Assertiveness: taking control of things and leading others (Extraversion).
- Cooperation: maintaining an amiable disposition and avoiding conflict (Agreeableness).
- Dutifulness: telling the truth, following the rules, and keeping promises (Conscientiousness).
- Emotionality: experiencing intense emotions and understanding others' emotions (Openness).
- Excitement-Seeking: enjoying reckless, wild, and adventurous activities (Extraversion).
- Gregariousness: preferring company, large crowds, and conversing with many people (Extraversion).
- Imagination: taking pleasure in vivid fantasies and getting lost in thought (Openness).
- Morality: averse to cheating and taking advantage of others (Agreeableness).
- Self-Consciousness: feeling uncomfortable with strangers, attention, and difficult social situations (Neuroticism).
- Self-Discipline: being well-prepared and carrying out plans (Conscientiousness).
- Self-Efficacy: believing in one's ability to excel and successfully complete tasks (Conscientiousness).

Relationships Between Personality and Game Preferences

A limited number of studies have addressed the relationships between personality and video game preferences. Those that have addressed this relationship did not examine the constructs of personality and games in enough detail to yield findings that can be put to practical use. For instance, an online survey of 314 gamers revealed that competition and challenge were the most important features to the enjoyment of games (Vorderer, Bryant, Pieper, & Weber, 2006, p. 2). However, 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).

This lack of specificity is omnipresent in the games and personality research to date. Hartmann and Klimmt (2006) reviewed the existing literature on personality and video game choice. Having offered several examples of non-significant findings in studies where broad personality traits were used to predict generic video game use, they concluded that "empirical studies building on multivariate theoretical models, which hypothesize the impact of intertwined personality factors, should be more useful for explaining a highly domain-specific behavior like computer game choice" (Hartmann & Klimmt, 2006, p. 117). Hence, as a result of the past treatment of gaming as a singular, simplified entity, Hartmann and Klimmt (2006) emphasized the importance of distinguishing between complex and diverse game types. Furthermore, they called for empirical studies that "increase the level of detail of both involved personality constructs as well as preferred and selected computer games" (Hartmann & Klimmt, 2006, p. 123).

This research set out to provide the level of detail necessary to yield informative and practically useful findings about the relationships between players' personality traits and their preferences for video games. A deep inspection of personality was achieved by assessing 15 subtraits of the Five Factor Model using 60

IPIP-NEO items (Johnson, 2001), in contrast to measuring only the overarching Big Five traits or using an abbreviated scale with reduced reliability and validity, such as the Ten-Item Personality Inventory (Gosling, Rentfrow, & Swann, 2003). The complexity and diversity of video game preference was respected by employing 18 features that compose a variety of game types. By answering the call for greater specificity in empirical research, this pursuit aims to build upon the work of its predecessors and advance the understanding of video games and personality.

Holistic View of Games Research

In *A Casual Revolution*, Jesper Juul (2010, p. 53) describes the tendency of academics to adopt either a "player-centric" or "game-centric" view when researching video games. Juul suggests that neither perspective alone is sufficient to describe video games. Researchers with player-centric perspectives tend to focus on how and why users play games, but neglect how game design influences player perception. Researchers with game-centric perspectives tend to focus on game design methods, but neglect the influence of player characteristics on game experiences. This research is an initial step towards a holistic approach that considers how design features and player characteristics combine to generate enjoyable video game experiences. In taking this perspective, it is anticipated that a more complete and purposeful understanding of video games and players can be achieved.

This study sought answers to the following research questions:

1. What underlying categories of design features influence player enjoyment of video games?
2. What underlying player types can be identified based on players' video game design feature preferences and personality traits?

METHOD

Participants

A total of 293 questionnaire responses were collected from undergraduate learners at a large public university in the southwestern United States (a 92% completion rate after 25 duplicate, blank, and straight-line responses were removed). The participants ranged in age from 18 to 61, with a median age of 21. Further, 81% were between the ages of 18 and 26. By gender, 64% were female and 36% were male. All undergraduate class levels were represented, with 36% juniors, 25% sophomores, 22% seniors, and 16% freshman. The participants came from diverse fields of study, including education, psychology, literature, history, foreign language, biology, chemistry, business, and communications, amongst others. They were recruited through a computer literacy course that fulfilled a university general studies requirement. They earned course credit for participating.

Procedure

An online questionnaire was made available to potential participants via the *SurveyMonkey.com* website. Prior to launch, the questionnaire was pilot tested with 16 participants. Revisions were made to improve item clarity and the interpretability of the resulting questionnaire data. Subsequently, all responses for this study were collected during a three-month period in late 2010.

Instrument

The questionnaire used in this study consisted of three primary parts. The first section determined participants personality traits. The second section measured their video game preferences. The third section gauged their video game play habits. In addition to the three primary sections, each participant also reported his or her age, gender, class standing, and field of study.

The personality section asked respondents to indicate how accurately 60 statements described them as a person. These statements were scored on a five-point scale that ranged from *Very inaccurate* (1) to *Very accurate* (5). The statements were derived from the 120-item IPIP-NEO (Johnson, 2001). All of Johnson's IPIP-NEO items and their corresponding personality subtraits were individually analyzed to choose only those that were most anticipated by the researchers to be relevant to video game preferences. Each of the 60 selected items relates to one of the 15 personality subtraits included in this study (four items per subtrait). Three sample statements from the personality section are provided.

- Experience my emotions intensely.
- Seek adventure.
- Have a vivid imagination.

The video game preferences section contained 18 items that asked participants to rate how important certain design features were to their enjoyment of video games. These items were scored on a five-point scale that ranged from *Not at all important* (1) to *A must-have feature* (5). Three sample items from the video game preferences section are provided.

- The game is set in a fantasy world.
- The game includes challenging obstacles that must be overcome.
- The game allows me to play with others online.

The video game habits section contained items that addressed gameplay tendencies. Specifically, participants self-reported their hours played per week, minutes played per session, overall gaming skill, preference for play with others, platform ownership and use, and preferred genres. Response choices and scales were generated to correspond with each individual item. Three sample items from the video game habits section are provided.

- How many hours per week do you spend playing video games?
- In general, how skilled are you at playing video games?
- Which video game genres do you most prefer to play?

Data Analyses

Two primary data analyses were undertaken to address the research questions posed in this study. First, a factor analysis was conducted on the video game preferences data to determine the underlying design elements that influenced players' enjoyment of video games. Second, a cluster analysis was conducted on the identified game design elements and participants' personality traits to determine the underlying player types represented. Together, these analyses revealed the relationships among participants' video game preferences and personality traits.

RESULTS

The application and results of the factor and cluster analyses used to explore video game preferences and personality traits are reported in detail.

Results of Video Game Preferences Factor Analysis

A principal-axis factor analysis was conducted on 18 Likert-style items from a video game preferences questionnaire. Data were collected from 293 participants (16.3:1 ratio of subjects to items). A Kaiser-Meyer-Olkin measure of sampling adequacy (KMO = .849) suggested that the dataset contained a sufficient degree of multicollinearity to be factorable (Kaiser, 1970, 1974). Individual measure of sampling adequacy (MSA) values for the items ranged from .744 to .909, indicating that the degree of intercorrelation amongst the variables was sufficient for factoring (Kaiser, 1970, 1974). Further, a Bartlett test of sphericity rejected the null hypothesis ($X^2_{(153)} = 2353.06, p < .001$) that

Table 1. Variable correlation matrix

	4	5	8	11	12	13	15	16	17	18	19	20	21	22	23	27	28	33
4	--																	
5	.22	--																
8	.11	.10	--															
11	.07	.30	-.18	--														
12	.57	.42	.04	.27	--													
13	.23	.13	.04	.28	.39	--												
15	.20	.29	.10	.22	.34	.34	--											
16	.23	.34	.11	.20	.39	.25	.56	--										
17	.18	.27	.14	.18	.27	.27	.52	.70	--									
18	.17	.21	-.01	.27	.19	.44	.26	.23	.25	--								
19	.16	.42	.15	.24	.22	.18	.35	.54	.49	.30	--							
20	.31	.54	.00	.30	.44	.20	.34	.37	.27	.30	.36	--						
21	.17	.48	.07	.31	.34	.27	.36	.44	.32	.34	.40	.57	--					
22	.23	.26	.08	.20	.25	.49	.28	.24	.23	.45	.27	.32	.40	--				
23	.7	.22	.19	.14	.26	.43	.69	.42	.48	.27	.34	.23	.27	.49	--			
27	.13	.30	-.24	.55	.35	.22	.17	.20	.15	.31	.20	.51	.39	.20	.10	--		
28	.33	.27	.10	.30	.39	.42	.57	.44	.53	.27	.36	.36	.39	.30	.63	.37	--	
33	.30	.50	.13	.26	.46	.29	.32	.55	.45	.31	.61	.40	.43	.35	.34	.24	.44	--

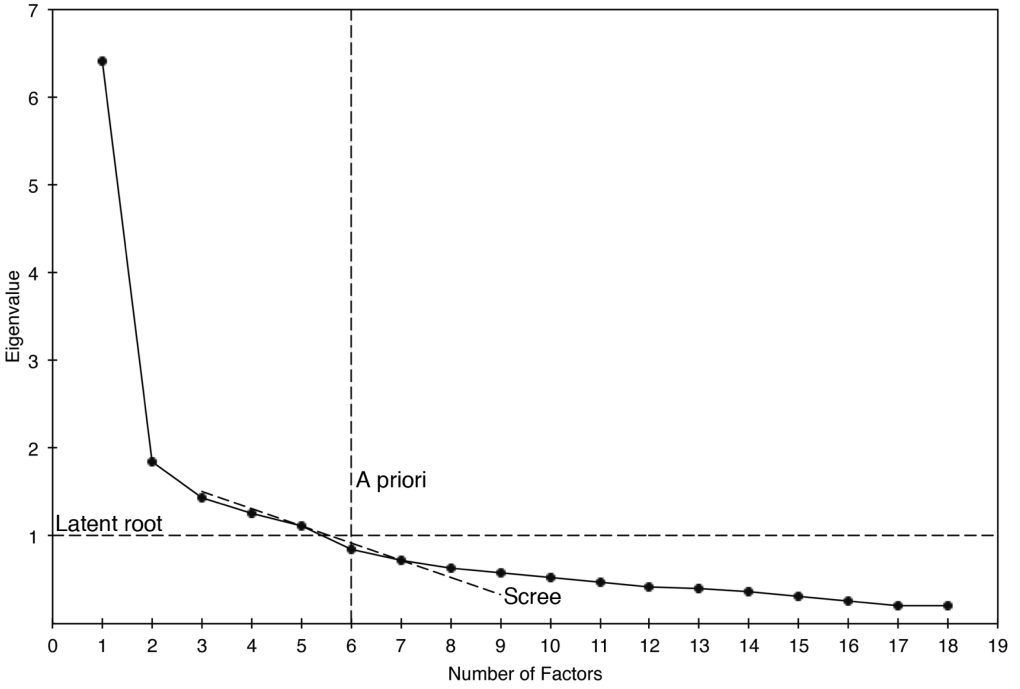
Note. The first row and column in the matrix present the variable numbers in ascending order.

the correlation matrix was an identity matrix, thereby supporting the application of factor analysis (Hair, Black, Babin, & Anderson, 2010). The correlation matrix for the 18 items can be found in Table 1.

The goal of this analysis was to arrive at parsimonious, conceptually evident, and justifiable factors. Direct Oblimin (oblique) rotation was employed for its ability to yield a realistic and interpretable factor solution from the collected data. Further, the factor correlations introduced by oblique rotation correspond with the a priori supposition that one's video game feature preferences are likely to be related in the real world. A range of potential factors to extract was determined using a combination of the latent root criterion (Kaiser, 1960), scree test criterion (Cattell, 1966), and a priori knowledge. This range and its defining criteria are illustrated in Figure 1. Conceptual knowledge of game design and a preceding preliminary factor analysis (Quick & Atkinson, 2011) suggested that six factors should be expected, the latent root criterion suggested five, and the scree test suggested five to seven. All three potential solutions were examined to ensure that the proper solution was found. The five-factor and seven-factor solutions yielded structures with several cross loadings and difficult to interpret factors. Thus, the six-factor solution, which was parsimonious and conceptually evident, was confirmed to be optimal.

The analysis produced a simple structure containing six factors, each composed of two to four items. The individual item loadings, which ranged from 0.43 to 0.95, are presented in Table 2. Item communalities ranged from 0.39 to 0.92, with the exception of item eight. In spite of its low communality (0.20), item eight was retained due to its essential conceptual role in defining and supporting the interpretation of its associated factor. The correla-

Figure 1. Cutoff plot demonstrating criteria used to determine range of potential factor solutions. The latent root criterion suggested five factors, the scree test suggested five to seven factors, and a priori knowledge suggested six factors.



tions amongst the factors were low to moderate, ranging from 0.10 to 0.50, and are reported in Table 3. As shown in Table 4, the six-factor solution accounted for 58% of the total variance in video game preference, with each factor contributing between 7% and 13%. All analyses were conducted in *R* (R Development Core Team, 2010) and factor loadings were derived using the *fa* function from the *psych* package (Revelle, 2011b).

All six factors represent a manipulable design feature that influences undergraduate students' enjoyment of a video game. The items within each factor represent specific aspects of the primary design feature. The factors were named in consideration of their items and loadings, as well as the standard terminology used in the field of game design. The six factors are described individually.

The first factor accounted for 13% of the variance in video game enjoyment and is composed of four items. The factor loadings for each item are contained in parenthesis.

1. The game allows my character to take on a species other than my own (.71).
2. The game is set in a fantasy world (.68).
3. The game allows my character to take on a race other than my own (.68).
4. The game allows my character to take on a gender other than my own (.60).

This factor has been named *Fantasy* and represents the enjoyment of fantasy-world settings and roleplaying as species, races, and genders other than the player's own.

The second factor accounted for 12% of the variance in video game enjoyment and is composed of three items.

1. The game allows me to search for hidden things (.84).

Table 2. Six-factor solution loadings and communalities

Variable	Description	Fantasy	Exploration	Fidelity	Companionship	Challenge	Competition	h^{2a}
16	Other species	.71						.68
17	Fantasy world	.68						.65
19	Other gender	.68						.57
33	Other race	.60						.62
23	Search for hidden things		.84					.82
15	Collect things		.71					.65
28	Explore unfamiliar places		.54					.60
12	3D graphics			.95				.92
4	Realistic graphics			.60				.39
27	Play with friends				.81			.74
11	More than one player				.59			.42
8	Single player				-.44			.20
22	Difficult to master					.66		.60
13	Challnging obstacles					.58		.57
18	High core					.53		.41
20	Play online						.57	.64
5	Meet new people						.52	.52
21	Display skills in public						.43	.64

Note. Table presents standardized loadings. Variables are presented in descending order by loading within each factor. Loadings with absolute values less than .30 were suppressed.

[a]Communality. The uniqueness (u^2) for each item can be calculated as $1 - h^2$.

Table 3. Six-factor solution correlation matrix

	Fantasy	Exploration	Fidelity	Companionship	Challenge	Competition
Fantasy	--					
Exploration	.50	--				
Fidelty	.37	.33	--			
Companionship	.24	.16	.34	--		
Challenge	.26	.38	.29	.22	--	
Competition	.35	.10	.30	.30	.23	--

Table 4. Six-factor solution sum of squared loadings and variance explained

	Fantasy	Exploration	Fidelity	Companionship	Challenge	Competition
Sum of Squared Loadings[a]	2.42	2.09	1.66	1.61	1.45	1.27
Proportional Variance	0.13	0.12	0.09	0.09	0.08	0.07
Cumulative Variance	0.13	0.25	0.34	0.43	0.51	0.58

[a]The sum of squared loadings take into account the correlation between the factors due to oblique rotation (Revelle, 2011a) and therefore do not equal the sum of the factor loadings within each column from Table 2.

2. The game allows me to collect things (.71).
3. The game allows me to explore unfamiliar places (.54).

This factor has been named *Exploration* and represents the enjoyment of searching for hidden things, collecting things, and exploring unfamiliar places.

The third factor accounted for 9% of the variance in video game enjoyment and is composed of two items.

1. The game features 3D graphics (.95).
2. The game features realistic graphics (.60).

This factor has been named *Fidelity* and represents the enjoyment of realistic, 3D graphics.

The fourth factor accounted for 9% of the variance in video game enjoyment and is composed of three items.

1. The game allows me to play with friends (.81).
2. The game requires more than one player (.59).
3. The game requires only a single player (-.44).

Note that the third item has a negative loading with the factor. This indicates that a preference for single-player games is inversely related with the factor. Accordingly, this factor has been named *Companionship* and represents the enjoyment of playing with friends and multiplayer games.

The fifth factor accounted for 8% of the variance in video game enjoyment and is composed of three items.

1. The game is difficult to master (.66).
2. The game includes challenging obstacles that must be overcome (.58).
3. The game allows me to compete for a high score (.53).

This factor has been named *Challenge* and represents the enjoyment of mastering difficult games, overcoming challenging obstacles, and competing for high scores.

The sixth factor accounted for 7% of the variance in video game enjoyment and is composed of three items.

1. The game allows me to play with other people online (.57).
2. The game gives me the opportunity to meet new people (.52).
3. The game allows me to display my skills in public (.43).

This factor has been named *Competition* and represents the enjoyment of playing with others online, meeting new people through gaming, and displaying one's skills publicly.

Results of Video Game Preferences and Personality Cluster Analysis

A cluster analysis was performed to address three primary goals of this research. First, the cluster analysis produces an empirical taxonomy

of gamers based on personality traits and video game preferences. Second, the analysis assists in reducing a large dataset of personality and video game preference variables by categorizing participants into a few, distinct, interpretable groups. Third, the analysis reveals relationships among personality traits and video game preferences that directly address the objectives of this study.

All 293 respondents were included in the cluster analysis. They were clustered according to 21 variables that describe their individual video game preferences (six variables) and personality traits (15 variables). The six design features that influence player enjoyment of video games (Fantasy, Exploration, Fidelity, Companionship, Challenge, and Competition), as identified by the preceding factor analysis, were included as variables in the cluster analysis. Individual item responses were averaged to derive scores along these six game design factors. Additionally, the 15 personality traits assessed in this study (Achievement-Striving, Activity Level, Altruism, Anger, Assertiveness, Cooperation, Dutifulness, Emotionality, Excitement-Seeking, Gregariousness, Imagination, Morality, Self-Consciousness, Self-Discipline, and Self-Efficacy) were included as variables in the cluster analysis. These 15 personality factors are existing subscales from the NEO IPIP (Johnson, 2001) and were computing by averaging participants' responses to individual items. Together, the game preference and personality variables were selected for their relevance to the objectives of this research and retained for their ability to distinguish between the resulting clusters.

A hierarchical agglomerative cluster analysis was conducted using Euclidean distance. Ward's linkage method was selected for its ability to produce large, evenly-sized clusters from the dataset. The percentage change in heterogeneity, as quantified by the increase in total within-cluster sum of squares when moving from one solution to the next, was used as a stopping rule to determine the optimal number clusters produced by the analysis. Additionally, practical considerations were taken into account. For instance, given the sample size and number of variables used, a solution with greater than 10 clusters would likely not yield meaningful distinctions nor sufficient membership in the clusters. Furthermore, fewer than three clusters would likely not yield useful insights into the examined relationships. Hence, it was expected that a reasonable solution would contain three to ten clusters and emerge prior to any substantial increase in within-cluster sum of squares. Lastly, multiple alternative clustering techniques and solutions were examined prior to concluding upon the optimal solution. All analyses were conducted in *R* and clusters were derived using the *hclust* function from the *stats* package (R Development Core Team, 2010).

The optimal solution was determined to contain six clusters. The clusters were profiled using centroids that represent the average score on each variable across all members of the cluster. To aid in the interpretation and reporting of the clusters, the centroid variable scores were standardized and are displayed in Table 5. In interpreting the cluster solution, both the individual attributes of each cluster and the relative differences between the clusters were considered. Note that the standardized personality values presented in each cluster description are used to highlight the unique traits of each cluster relative to the other clusters. As such, they should not be misunderstood as high or low raw values in isolation. Moreover, video game play habit variables, which are relevant to, but not included in the cluster analysis, were used to further describe the groups and support their validity. Video game play habit variables include self-reported hours played per week, minutes played per session, gaming skill, preference for play with others, platform ownership and use, and genre preferences. Table 6 presents the play habit variables for each cluster.

The six clusters are described individually and patterns across the groups are examined. Note that the cluster names were generated by combining the group's most prevalent game preference and personality characteristics. The cluster names alone are not sufficient to describe the intricacies that exist within each group. The

Table 5. Cluster centroid game preference and personality variables

Variable	DC	EFC	IFE	CC	ICF	CCC
Fantasy	-1.10	*-1.47*	**0.11**	-0.93	-1.06	-1.00
Exploration	-0.29	-0.38	**0.70**	-0.04	0.36	*-0.60*
Companionship	1.53	1.18	*-0.43*	1.36	0.08	**1.61**
Competition	-1.00	**-0.64**	*-1.62*	-1.35	-1.34	-0.70
Fidelity	0.46	0.76	**1.30**	0.49	1.06	*-0.05*
Challenge	0.40	0.55	*-0.05*	0.46	**0.91**	0.75
Achievement-Striving	0.62	0.92	*-0.03*	**0.94**	0.63	0.68
Activity level	-0.69	-0.32	-0.61	**0.11**	*-0.80*	-0.31
Altruism	0.89	0.79	**1.03**	*0.65*	0.91	1.00
Anger	-1.77	*-2.46*	**-0.49**	-2.00	-1.64	-2.38
Assertiveness	0.24	0.32	0.34	**0.43**	*0.00*	0.17
Cooperation	0.34	0.21	*-1.36*	0.61	**0.86**	0.41
Dutifulnes	**1.22**	0.97	*0.79*	0.94	1.03	0.88
Emotionality	*-0.21*	-0.05	-0.14	-0.04	**0.45**	0.28
Excitement-Seeking	-0.67	-0.07	**0.29**	-1.07	*-1.16*	-0.42
Gregariousness	-0.04	-0.09	*-1.54*	-0.38	-1.24	**-0.03**
Imagination	-0.18	-0.51	**1.98**	*-0.85*	0.06	0.26
Morality	1.36	0.83	*-0.28*	0.98	**1.37**	1.02
Self-Consciousness	*-2.07*	-1.75	**-0.80**	-1.78	-1.36	-1.95
Self-Discipline	0.00	0.08	*-0.67*	**0.66**	-0.02	-0.31
Self-Efficacy	0.94	1.12	**1.48**	0.82	0.92	*0.70*

Note. Table values use within-case standardization. Highest values are bolded and lowest values are italicized. Cluster names are abbreviated as follows: DC = Dutiful Companion; EFC = Extraverted Fidelitist Companion; IFE = Introverted Fidelitist Explorer; CC = Conscientious Companion; ICF = Introverted Challenge-Seeking Fidelitist; CCC = Calm Challenge-Seeking Companion.

entire description of each cluster must be studied for a complete understanding of the players who are represented.

Cluster one, the *Dutiful Companion* (DC), composes 21% of the total sample, with 13% of all males and 26% of all females being members. Companionship (z = 1.53), Fidelity (z = 0.46), and Challenge (z = 0.40) are most important to the enjoyment of Dutiful Companions, while Fantasy (z = -1.10), Competition (z = -1.00), and Exploration (z = -0.29) are least important. In terms of personality, DCs are characterized by relatively high levels of Morality (z = 1.36) and Dutifulness (z = 1.22), and low levels of Self-Consciousness (z = -2.07), Activity Level (-0.69), and Emotionality (z = -0.21). DCs play video games for an average of 1.09 hours per week and 35.02 minutes per session, both the lowest of all clusters. On a scale of one to five, DCs have an average skill level of 2.00, also the lowest of all clusters. Most prefer to play with one other person (44%), while fewer play alone (27%) or with more than one other person (27%). A high percentage are Nintendo DS owners (24%), but they have relatively low overall ownership (22%) and weekly usage (9%) of gaming platforms. DCs most prefer the racing/driving (44%) and card (35%) genres and least prefer roleplaying (11%) games.

Table 6. Cluster centroid play habit characteristics

Characteristics	DC	EFC	IFE	CC	ICF	CCC
Hours/week[a]	1.09	2.36	3.60	1.34	1.39	1.37
Minutes/session[b]	35.02	62.46	74.38	40.81	47.77	38.23
Gaming skill[c]	2.00	2.86	2.45	2.29	2.28	2.19
Plays with[d]	27% Alone 44% One 27% More	26% Alone 18% One 53% More	29% Alone 31% One 35% More	19% Alone 46% One 35% More	47% Alone 33% One 19% More	16% Alone 9% One 72% More
Preferred genres[e]	44% Racing 35% Card	53% Sports 53% Shoot	63% Action 61% Shoot	52% Racing 50% Tie	49% Puzzle 42% Strat-egy	47% Puzzle 42% Music
Platform ownership[f]	22%	27%	34%	25%	21%	23%
Platform use[g]	9%	12%	17%	9%	6%	7%

Note. All characteristics were self reported by study participants. Cluster names are abbreviated as follows: DC = Dutiful Companion; EFC = Extraverted Fidelitist Companion; IFE = Introverted Fidelitist Explorer; CC = Conscientious Companion; ICF = Introverted Challenge-Seeking Fidelitist; CCC = Calm Challenge-Seeking Companion.

[a]Average hours spent playing games each week.

[b]Average minutes spent playing games each session.

[c]Average skill level of cluster members on a scale from one to five.

[d]Percentage of cluster members who prefer to play alone, with one other player, and more than one other player.

[e]Percentage of cluster members who indicated a preference for the stated genres. Only the top two are listed for each cluster. The tie for CC is between Adventure and Sports.

[f]Average percentage of cluster members who own one or more platforms (Wii, Xbox 360, PS3, DS, PSP, iPod Touch).

[g]Average percentage of cluster members who play games weekly on one or more platforms (Wii, Xbox 360, PS3, DS, PSP, iPod Touch).

Cluster two, the *Extraverted Fidelitist Companion* (EFC), composes 19% of the total sample, with 30% of all males and 13% of all females being members. Companionship (z = 1.18), Fidelity (z = 0.76), and Challenge (z = 0.55) are most important to the enjoyment of Extraverted Fidelitist Companions, while Fantasy (z = -1.47), Competition (-0.64), and Exploration (z = -0.38) are least important. Further, EFCs place the most importance of any cluster on Competition and the least of any cluster on Fantasy. In terms of personality, EFCs are characterized by relatively high levels of Self-Efficacy (z = 1.12) and Achievement-Striving (z = 0.92), and low levels of Anger (z = -2.46) and Imagination (z = -0.51). EFCs play video games for an average of 2.36 hours per week and 62.46 minutes per session, both the second highest of all clusters. They have an average skill level of 2.86, which is the highest of all clusters. Most prefer to play with more than one other person (53%), while fewer play alone (26%) or with one other person (18%). They have the highest ownership (37%) and weekly use (18%) of the PlayStation 3 console, and their overall platform ownership (27%) and weekly use (12%) are relatively high. EFCs most prefer the sports (53%) and shooting (53%) genres, and least prefer card (26%) games.

Cluster three, the *Imaginative Fidelitist Explorer* (IFE), composes 17% of the total sample, with 27% of all males and 12% of all females being members. Fidelity (z = 1.30), Exploration (z = 0.70), and Fantasy (z = 0.11) are most important to the enjoyment of Imaginative Fidelitist Explorers, while Competition (z = -1.62), Companionship (z = -0.43), and Challenge (z = -0.05) are least important. Additionally, IFEs place the most importance of any cluster on Fidelity, Exploration, and Fantasy, and the least of any on Competition, Companionship, and Challenge. In terms of personality, IFEs are characterized by relatively high levels of Imagination (z = 1.98), Self-Efficacy (z =

1.48), and Altruism (z = 1.03), and low levels of Gregariousness (z = -1.54) and Cooperation (z = -1.36). IFEs play video games for an average of 3.60 hours per week and 74.38 minutes per session, both the highest of all clusters. IFEs have an average skill level of 2.45, which is second highest among the clusters. The majority prefer to play with more than one other person (35%), although many also play with one other person (31%) or alone (29%). IFEs have the highest overall ownership (34%) and weekly use (17%) of gaming platforms. Further, they have the highest ownership and weekly use of every surveyed platform, except the PlayStation 3 and Nintendo Wii. IFEs most prefer the action (63%) and shooting (61%) genres, and least prefer card (18%) and music/dance (22%) games.

Cluster four, the *Conscientious Companion* (CC), composes 16% of the total sample, with 12% of all males and 19% of all females being members. Companionship (z = 1.36), Fidelity (z = 0.49), and Challenge (z = 0.46) are most important to the enjoyment of Conscientious Companions, while Competition (z = -1.35), Fantasy (z = -0.93), and Exploration (z = -0.04) are least important. In terms of personality, CCs are characterized by relatively high levels of Achievement-Striving (z = 0.94), Self-Discipline (z = 0.66), and Assertiveness (z = 0.43), and low levels of Excitement-Seeking (z = -1.07) and Imagination (z = -0.85). CCs play video games for an average of 1.34 hours per week and 40.81 minutes per session. They have an average skill level of 2.29. The highest percentage of any cluster prefers to play with one other person (46%), while some play with more than one other person (35%) and few play alone (19%). CCs have moderate overall weekly use (9%) of gaming platforms, in spite of having the highest percentage of Nintendo Wii owners (50%). CCs most prefer the racing/driving (55%), adventure (50%), and sports (50%) genres, and least prefer fighting (13%) and card (19%) games.

Cluster five, the *Introverted Challenge-Seeking Fidelitist* (ICF), composes 15% of the total sample, with 7% of all males and 19% of all females being members. Fidelity (z = 1.06), Challenge (z = 0.91), and Exploration (z = 0.36) are most important to the enjoyment of Introverted Challenge-Seeking Fidelitists, while Competition (z = -1.34), Fantasy (z = -1.06), and Companionship (z = 0.08) are least important. Further, ICFs place the most importance of any group on Challenge. In terms of personality, ICFs are characterized by relatively high levels of Morality (z = 1.37), Cooperation (z = 0.86), and Emotionality (z = 0.45), and low levels of Gregariousness (z = -1.24), Excitement-Seeking (z = -1.16), and Activity Level (z = -0.80). ICFs play video games for an average of 1.39 hours per week and 47.77 minutes per session. They have an average skill level of 2.28. The highest percentage of any cluster prefers to play alone (47%), while some play with one other person (33%), and few play with more than one other (19%). ICFs have the lowest overall ownership (21%) and weekly use (6%) of gaming platforms. ICFs most prefer the puzzle (49%) and strategy (42%) genres, and least prefer fighting (16%) and roleplaying (16%) games.

Cluster six, the *Calm Challenge-Seeking Companion* (CCC), composes 11% of the total sample, with 10% of all males and 11% of all females being members. Companionship (z = 1.61), Challenge (z = 0.75), and Fidelity (z = -0.05) are most important to the enjoyment of Calm Challenge-Seeking Companions, while Fantasy (z = -1.00), Competition (z = -0.70), and Exploration (z = -0.60) are least important. In addition, CCCs place the most importance of any cluster on Companionship, and the least on Exploration and Fidelity. In terms of personality, CCCs are characterized by relatively high levels of Altruism (z = 1.00) and Emotionality (z = 0.28), and low levels of Anger (z = -2.38) and Self-Consciousness (z = -1.94). CCCs play video games for an average of 1.37 hours per week and 38.23 minutes per session. They have an average skill level of 2.19. More than any other cluster, CCCs prefer to play with more than one other person (72%), and the fewest of any other cluster play alone (16%) or with one other person (9%). Although they have the highest ownership of the iPod Touch (38%),

CCCs have the second lowest weekly use (7%) of gaming platforms. CCCs most prefer the puzzle (47%) and music/dance (42%) genres, and least prefer roleplaying (6%) and action (19%) games.

DISCUSSION

In discussing the theoretical and practical relevance of this work, past game design and player taxonomies are compared and contrasted to the taxonomies found in this study. Related observations and implications for research and practice are described. The limitations of this study are explained and suggestions for future research are offered.

Comparison of Game Design Taxonomies

In response to the first research question, "What underlying categories of design features influence player enjoyment of video games?" a six-factor taxonomy composed of 18 total game design features emerged. In comparison to prior works, this study's taxonomy of design elements that influence video game enjoyment shows strong similarities with preceding taxonomies of game design. To begin, recall that the Mechanics, Dynamics, and Affects (MDA) framework provides eight terms that describe how fun can be achieved in games (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).

MDA's and this study's Fantasy component are nearly identical in describing the enjoyment of fictional worlds and characters. To a lesser extent, MDA's Narrative, Expression, and Submission terms also appear to relate to Fantasy as defined in this study. To some extent, this study's Fidelity relates to MDA's Sensation, since they involve the stimulation of visual senses. MDA's and this study's Challenge components similarly entail overcoming difficulties and solving problems. Fellowship in MDA seems to correspond strongly to Companionship in the present taxonomy, as these elements involve friendship and multiplayer experiences. Meanwhile, MDA's and this study's Exploration equivalently speak of searching for and finding things as a source of pleasure. One dimension that is not explicitly defined in MDA, but was found in this study, is Competition.

The strong similarities among design elements found in this study's Fantasy, Fidelity, Challenge, Companionship, and Exploration components and MDA's Fantasy, Sensation, Challenge, Fellowship, and Discovery terms provides evidence that these components are salient in influencing player enjoyment. The weaker associations between MDA's Narrative, Expression, and Submission terms and this study's Fantasy dimension could indicate that a finer gradation of categories can be theoretically hypothesized than can be empirically justified. The absence of an explicit Competition term in the MDA framework could represent a theoretical overlooking or the implicit placement of competition somewhere else in the framework.

In its discussion of affective gameplay goals, the Design, Play, and Experience (DPE) framework named 16 forms of fun, including "beauty, immersion, intellectual problem solving, competition, social interaction, comedy, thrill of danger, physical activity, love, creation, power, discovery, advancement and completion, application of an ability, altruism, and

learning" (Garneau, 2001; Heeter et al., 2004; Winn, 2008, p. 1016). From this extensive list, a number of items are well-represented in this study's taxonomy. For example, beauty appears to relate strongly to Fidelity along the lines of high-fidelity graphics and environments, immersion reflects the imaginary settings and character of Fantasy and intellectual problem solving is a key element of Challenge. Social interaction and competition respectively correspond to Companionship and Competition, while discovery is a primary component of Exploration. The remaining forms of fun listed in DPE may show some relationships to the design elements derived from this study, though the connections would be more tenuous than those mentioned. Like MDA, DPE may have offered more forms of fun than can be empirically justified in a single study, but the similarities found nonetheless indicate harmony between theoretical and empirical views of the game design elements that influence player enjoyment.

In contrast to MDA and DPE, Yee (2006) took an empirical approach and focused on the motivations of MMORPG players. Yee's three primary components can be described as follows.

- Achievement: the desire to advance one's status, optimize performance, and compete with others.
- Social: the desire to communicate, build relationships, and work with others.
- Immersion: the desire to discover new things, roleplay, and customize one's character.

Yee's Achievement relates to this study's Competition and Challenge, especially in regards to mastery performance and demonstrating one's skill in relation to other players. Meanwhile, Social matches Companionship, both of which entail playing and cooperating with friends. Further, Yee's Immersion equates to Fantasy and Exploration in regards to discovery, imaginary worlds, and roleplaying. Only Fidelity fails to appear in Yee's taxonomy, possibly because it was not represented in that study's instrumentation. Otherwise, Yee's components strongly associate with the design elements found in this study. These two empirical examinations of game design, although conducted using different populations, support one another.

King et al. (2010) offered a taxonomy of five features that initiate and motivate sustained gameplay.

- Social: how players communicate, cooperate, and compete.
- Presentation: the aesthetic qualities of a game, such as graphics and sound.
- Narrative and Identity: how players experience roleplaying and storytelling.
- Reward and Punishment: how player actions are reinforced or discouraged.
- Manipulation and Control: how players modify in-game elements and operate the physical user interface.

Here, Social shows a direct relationship to this study's Companionship and Competition dimensions, as these describe friendly and competitive multiplayer gaming. Presentation pairs with Fidelity, both elements being concerned with a game's aesthetic realism. The roleplaying and storytelling features that compose Narrative and Identity correspond closely to Fantasy. To some degree, Reward and Punishment relate to Competition and Challenge in that they are both concerned with player performance and the rewards of success. On the other hand, Manipulation and Control refer largely to user interface design and are not well-represented in this study's taxonomy. Likewise, Exploration appears in the present taxonomy, but is not substantially present in King et al.'s (2010) taxonomy. In sum, the resemblances between these taxonomies further support the links between this study's findings and past theoretical and empirical works on the design of video games.

In addition to these comparisons, Quick and Atkinson (2011) found a correspondence of 83% between a preliminary game design taxonomy similar to the one presented here and those from ten preceding publications.

Although the taxonomies were created for different purposes and used disparate methods, they nevertheless showed strong similarities. The authors concluded that this correspondence likely represents a convergence of empirical findings and theory in the research and practice of game design. Here too, it is suggested that the strong similarities in game design taxonomies represents the identification of genuine design elements that influence players' perceptions of games.

An important feature that the presented taxonomy offers above and beyond the preceding taxonomies is specific definitions for the design factors. Each of the six design factors is described by its underlying features, thereby yielding a precise definition for each factor. Another benefit that the reported taxonomy provides that cannot be found in the others is an indication of the relative influence of each design factor. For example, the Fantasy component accounted for the most total variance (13%), while Competition accounted for the least (7%). Since a larger amount of variance is accounted for by Fantasy, this could suggest that players differ more strongly in this preference. In contrast, Competition may be relatively thought of as a more stable factor, since it represents less variance.

Comparison of Player Taxonomies

In response to the second research question, "What underlying player types can be identified based on players' video game design feature preferences and personality traits?" a six-player taxonomy built from six game design elements and 15 personality traits emerged. This study's taxonomy is largely unique in comparison to prior works. 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, the following 9 distinct player types remain.

- Achiever/Power Leveler/Conqueror: focuses on increasing points and levels.
- Explorer/Wanderer: works to expose the underlying systems that operate, and discover unknown things about, the game world.
- Socializer/Joker/Participant: 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.

Meanwhile, the four types identified by Bateman and Boon (2006) can be thought of as combinations of these same player types.

- Conqueror: combination of the Achiever/Power Leveler and Competitor/Performer types.
- Wanderer: combination of the Explorer and Storyteller/Role Player types.
- Manager: combination of the Director and Craftsman types.
- Participant: combination of the Socializer/Joker and Storyteller/Role Player types.

Later, Westwood and Griffiths (2010) employed an empirical methodology to identify player types. They reported the following six gamer types, which are distinct from those found in the aforementioned taxonomies.

- Story-driven solo gamers: motivated by personal enjoyment and immersion.
- Social gamers: averse to playing alone.
- Solo limited gamers: motivated by single-player experiences and instant gratification.

- Hardcore online gamers: motivated by being part of a social group, external rewards and achievements, graphics, and music.
- Control/identity solo gamers: motivated by story and character development.
- Casual gamers: motivated by personal enjoyment, graphics, the ability to play at their own convenience.

Due to a historical lack of specificity in defining player types and the absence of detailed personal characteristics and play habits, it would be difficult and speculative to attempt to categorize the preceding player types within this study's taxonomy of player types. This is particularly true considering that none of the prior taxonomies conceptualize personality traits in similar fashion to this study. Although the past taxonomies do appear to describe shades of gamer behaviors and motivations, they have not been sufficiently validated through empirical research and do not examine players at the level of detail presented in this study.

The major deficiency in prior player taxonomies is a way to clearly identify and link players to their preferred game designs. The inclusion of personal characteristics in this study has allowed for this connection to be made and lead to a taxonomy that substantially expands upon those found in the preceding literature. Each player type that emerged in this study has a rich set of personality traits to match its video game preferences. Furthermore, the presented taxonomy incorporates self-reported play habits data, including hours played per week, minutes played per session, gaming skill, preference for play with others, platform ownership and use, and genre preferences to enhance the player type descriptions and assist in validating them. Thus, the taxonomy of player types found in this study is more descriptive than its predecessors. Lastly, since it incorporates personality as a link between players and games, this taxonomy should be more applicable to practitioners seeking to align game designs to target audiences.

One remaining question, which is being explored through continued research, is whether game preference and personality share any predictive or dependence relationships. If such relationships exist, the presented taxonomies could be employed to design games that meet the needs of specific player types. For instance, in choosing the most appropriate game for her students, a teacher might assess learners' personality traits and game preferences to select a game that fits the most prevalent player types present in the classroom. However, further refinement and validation are needed beyond the current study for the provided taxonomies to be employed confidently in this manner.

Limitations and Future Research

As an initial pursuit towards understanding the relationships among game design elements and player personality traits, this study is not without its limitations and subsequent inspirations for future research. For instance, a limitation in this study is its unknown generalizability beyond the sample. The participants in this study came from a large public university in the United States. While the sample was diverse in its own right, it may not be representative of players in other world locations or of different cultures. In particular, the large percentage of females in this sample may not match the demographics of other locations. Likewise, no claims of applicability outside of the sample are made, even though the reported findings may intuitively seem to apply elsewhere. Accordingly, this study needs to be replicated with diverse populations to ensure that the findings hold for other demographic groups.

Next, although the reported game design taxonomy showed high correspondence with past pursuits, it should be noted that comparisons between different taxonomies are not perfect. Since the various game design taxonomies have been created by different people, at different times, using disparate methods, and for different purposes, one to one comparisons are not possible. Therefore, past works can only be used to inform and understand subsequent works up to a certain extent. In addition, it is likely that the presented game design taxonomy can still be further refined, expanded, and validated. Perhaps additional core elements need to be

added to the taxonomy, while each individual element is better refined with a greater number of more specific items. Moreover, the taxonomy should be empirically validated through replication. All of these adjustments would lead to a game design taxonomy of greater practical use.

Continuing, while personality was shown to be a descriptive personal characteristic in this study, there are many different types of personality models and not all individuals may be perfectly described through personality assessments. In addition, there are many other potential player characteristics that could be explored. For example, physiological attributes, motivational orientations, culture, gender, and life circumstances may substantially impact how players perceive games. Therefore, future research should continue to examine such variables to better understand the influence of personal characteristics on player perception of game experiences.

Lastly, tools need to be developed to accompany the taxonomies provided by this research. Without tools that allow designers, educators, and other practitioners to apply these findings to their everyday work, the provided taxonomies are of limited practical use. Accordingly, a long-term goal of this research is to develop the tools necessary for these taxonomies to be employed in practice.

CONCLUSION

This study has demonstrated that the core design elements of games that lead to enjoyment can be empirically identified. Similarly, it has shown that considering personality, a personal characteristic, can produce informative empirical insights about how players perceive gaming experiences. Two taxonomies for creating more enjoyable game experiences for players have been offered. However, additional empirical research is needed to refine, expand, and validate this work. Furthermore, tools need to be created that will allow designers, educators, and others employ these taxonomies towards beneficent ends in practice. This study considered the combined influence of game design and player characteristics, which lead to robust findings about the enjoyment of the gameplay experience. Ultimately, this pursuit should lead to a holistic understanding of games and players that affords the creation of more effective game experiences for players.

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