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An Integrative Model of Predictors of Enjoyment in Console versus Mobile Video Games

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ABSTRACT

This study tested a model of enjoyment of video games focused on three important predictors; interactivity, realism and spatial presence. In a large, randomized experiment (*N* = 257), players of traditional console games were compared with their counterparts playing on mobile devices. The hypothesized model included perceived interactivity, perceived reality and spatial presence, with enjoyment as the outcome variable. In the final analysis, the model showed that console games produced higher perceived interactivity and perceived reality. Perceived reality and skill were the most powerful direct predictors of enjoyment. Perceived reality and perceived interactivity indirectly predicted enjoyment via powerful effects on spatial presence. The results suggest that mobile games are highly enjoyable, realistic, and presence-inducing, but console games still exceed them on these variables. The results highlight the importance of studying enjoyment of video games in the context of a model that considers concurrent effects of several game perception variables.

Keywords: *Video Games, Enjoyment, Interactivity, Perceived Reality, Spatial Presence, Mobile Gaming*

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1. Introduction

Tablet computing is gaining in popularity around the world. Competition in the field is growing as Apple, Samsung, Sony, Motorola, Toshiba, Hewlett Packard, Asus, Acer and Amazon have each released their own tablet computers into the marketplace (Amazon, n.d.). One of the most touted functions of these hand-held graphics and

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processing powerhouses is their capacity for gaming (Healy, 2011; Lowe, 2011). In fact, a recent Google survey reports that gaming is the top-ranked use for tablet devices, coming in even ahead of email (Dredge, 2011). Add that to the already healthy mobile game market for smartphones, and mobile gaming is proving to be a popular form of entertainment. In fact, the latest industry reports indicate that games for handheld devices are among the fastest growing segments of the business (Weber, 2012).

Hundreds of game applications, both free and paid, have been released for the various tablet operating systems as well as smartphones. But how do games on tablets or smartphones compare to their console counterparts in terms of spatial presence, interactivity, perceived reality, and enjoyment?

The answers to this question will give important insight into the implications of mobile gaming as a pastime. For instance, will the constant availability of games on handheld platforms enhance or detract from the quality of our work, family, and social lives? If mobile games for tablet computers are as appealing as their console-based counterparts, and if they are more appealing than their smartphone-style counterparts, the implication is clear. The easy accessibility of high-quality games that are highly interactive, realistic, and immersive may provide a ready distraction from arguably more important pursuits; thereby decreasing productivity, social and familial involvement, and health-related activities such as exercise. On the other hand, such games, in providing an easy escape, may actually enhance important aspects of life by relieving stress, providing a quick but satisfying relief from responsibility, and allowing sparks of fantasy and adventure into an otherwise lackluster work experience (see McGonigal, 2011). This study seeks to provide a starting point to discuss these important implications by analyzing a model that examines the combined impact of perceived interactivity, perceived reality, spatial presence, and perceived skill at the game on enjoyment, while also comparing player responses to games played on mobile and console devices.

2. Integrating Predictors of Video Game Enjoyment

Research on video games has identified several important variables that contribute to enjoyment, including (but not limited to) interactivity, presence (specifically, spatial presence), and perceived reality. These variables emerge in several studies as strong

determinants of the level of enjoyment players experience while gaming. However, these variables are typically studied in isolation. Recent research has begun to investigate the possibility that these factors may work closely together in the production of enjoyment of video games. The present study seeks to further investigate that possibility within the context of tablet and smartphone games; and will offer a comparison of console games to their counterparts on tablets and smartphones.

The basis of this research is a hypothesized model based on a similar framework proposed by Shafer, Carbonara, and Popova (2011). The model was suggested following the results of two studies investigating reactions to motion-based vs. traditional console games. Although originally suggested after analysis of data gathered in a study of enjoyment of motion-based video games, the model is highly adaptable to other gaming devices that differ technologically from traditional consoles. The model's strength is that it integrates several variables found to be related in past research, and, via path analysis, affords the opportunity to control for the various influence of each variable, while considering both direct and indirect effects. This model is designed to specifically investigate the impact perceived interactivity, perceived reality, perceived skill, and spatial presence on enjoyment (see Figure 1), and to investigate the following research question:

RQ1: What impact will gaming platform have on players' perceptions of interactivity, reality, and spatial presence?

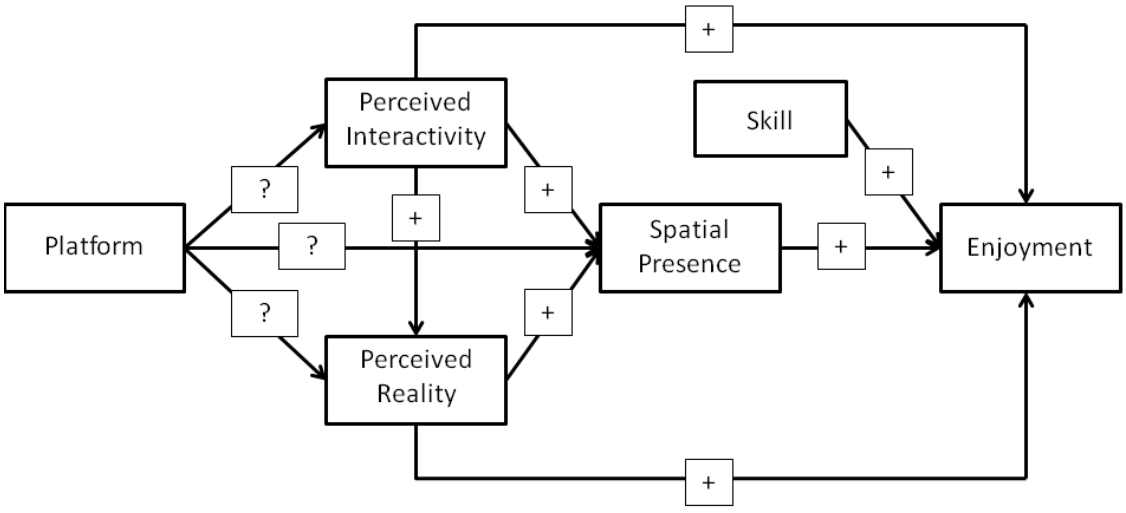

Figure 1: Hypothesized Model

It should be noted that this model is not intended to represent the entire process of enjoyment of video games or all of the variables involved. The process of the production of enjoyment is complex (Vorderer, Klimmt, and Ritterfeld, 2004); and this

model is relatively simple, with only six variables. The purpose of the model (and the present study) is to highlight how perceived interactivity, perceived reality, and spatial presence work in harmony to impact enjoyment within the context of mobile vs. console games. The reason for the focus on this relatively small set of variables is that these relationships have not yet been examined together in a single model, although past research suggests that they are closely related, and may be highly dependent upon one another. The following section delineates the past findings with regard to these variables, and provides the bases for the relationships hypothesized by the model in Figure 1.

2.1 Enjoyment

Enjoyment can be simply defined as pleasure derived from exposure to a mediated stimulus (Raney, 2003). But, as Raney (2003) also acknowledges, this explanation may be too simplistic. Enjoyment was long assumed to be a purely affective reaction, but more recent conceptualizations point out that cognition and emotion are dependent upon one another (see Zillmann, 2000). This dependency means that enjoyment is both an affective reaction and a cognitive process (Vorderer, Klimmt, and Ritterfeld, 2004). Enjoyment, as Vorderer, Klimmt and Ritterfeld (2004) point out, is wrought through pleasurable responses to content or characters that please us, but can also be experienced upon the satisfying resolution of a suspenseful scenario, a reflection upon the human condition that resonates with our own lives, or perhaps achievement and control experienced while using interactive games. Human beings engage in entertaining activities in order to experience enjoyment. The experience of enjoyment can translate into other gratifications (see Sherry, Lucas, Greenberg and Lachlan, 2006); but it is accurate to say that the outcome entertainment promises above all others is enjoyment. In terms of video games, scholars and game developers note that many video game players are not so concerned with beating a game to its final conclusion. Instead, the most fun (i.e., enjoyment) comes from the experience of playing (McGonigal, 2011). As already noted, several studies have identified important predictors of enjoyment of video games including perceived interactivity, perceived reality, and spatial presence. This study integrates these variables and investigates their combined impact on enjoyment in the context of a comparison of tablet and console games.

2.2 Perceived Interactivity

For the purposes of this study, perceived interactivity is the extent to which a user reports that they can actively participate in the game experience, for example, by affecting the form and content of the game (Klimmt and Vorderer, 2006; Steuer, 1992). Past research has identified factors that can contribute to a user's perception of interactivity; including responsiveness of the system and the range of motion or commands that can be used to control the game (i.e., effectance) and the users' sense that they can manipulate the game situation according to their goals (i.e., control; Klimmt, Hartmann and Frey, 2007). Together, effectance and control delineate the perception of interactivity, which impacts enjoyment (Klimmt, Hartmann, and Frey, 2007; Shafer, Carbonara and Popova, 2011;). Perceived interactivity has also been found to impact spatial presence and perceptions of reality or realism (Drettakis, Roussou, Reche and Tsingos, 2007; Laird and van Lent, 2001; Persky and Blaskovich, 2008; Shafer, Carbonara and Popova, 2011; Sheridan, 1994; Skalski, Tamborini, Shelton, Buncher and Lindmark, 2011; Slater and Wilbur, 1997; Tamborini and Skalski, 2006). This evidence leads to the following hypothesis:

H1: perceived interactivity will have a positive impact on enjoyment, spatial presence, and perceived reality.

2.3 Spatial Presence

In general, presence is the perception of virtual objects and environments "as actual objects in either sensory or nonsensory ways" (Lee, 2004, p. 44). It is the perception that nothing is between one's self and the virtual world; as Lombard and Ditton (1997) put it, the "perceptual illusion of nonmediation." Despite this simplifying statement, presence has been explicated in further theorizing as a multidimensional construct (Tamborini and Skalski, 2006), which includes spatial presence, social presence, and self-presence. This study focuses specifically on the dimension of spatial presence. In past research focusing on video game enjoyment, the concept of spatial presence has consistently emerged as a crucial component to the enjoyment experience (e.g., Klimmt and Vorderer, 2003; Shafer, Carbonara and Popova ,, 2011; Skalski, Tamborini, Shelton, Buncher, and Lindmark, 2011; Tamborini and Skalski, 2006). According to Wirth et al. (2007) "...Perceived self-location and, in most cases, perceived action possibilities are connected to a mediated spatial environment, and mental capacities are bound by the mediated environment instead of reality" (p. 497) during the experience of spatial presence. This definition seems to communicate that a gamer who is experiencing a high level of spatial presence feels that they inhabit the

virtual environment, and that the only possible actions are those that the environment allows. Awareness of the real world is diminished; and awareness of the virtual world takes precedence. Several studies present findings that establish a clear positive impact of spatial presence on enjoyment (Shafer, Carbonara and Popova, 2011; Skalski, Tamborini, Shelton, Buncher, and Lindmark 2011; Ravaja et al., 2006); therefore, it is predicted that:

H2: Spatial presence will positively impact enjoyment.

2.4 Perceived Reality

Perceived reality is the perception of the degree of correspondence between the media representation and the real-world content (Hall, 2003). Recent research on perceived reality of video games has attempted to empirically demonstrate the multidimensional nature of perceived reality of video games (Malliet, 2006; Ribbens and Malliet, 2010; Popova, 2010). This study adopts the latest explanation forwarded by Popova (2010), that views perceived reality as having a parsimonious six-dimensional structure. The six dimensions of perceived reality are Magic Window, Typicality, Identity, Utility, Perceptual Fidelity, and Virtual Experience (for a full explication of the six dimensions, see Popova, 2010; also Shafer, Carbonara and Popova, 2011). Together, these dimensions produce a robust measure of perceived reality. In previous research, perceived reality; measured by the collapsed subscales of each dimension, was found to positively impact enjoyment both directly and indirectly through spatial presence (Shafer, Carbonara and Popova, 2011). For the present study, it is predicted that:

H3: Perceived reality will positively impact both spatial presence and enjoyment.

2.5 Skill

In the context of playing video games, the feeling that one has the ability to effectively manipulate circumstances to one's own benefit is immensely satisfying (Klimmt, Hartmann and Frey, 2007). Such a feeling describes one's perception of skill at a video game. The ability to influence one's (virtual) environment gives a sense of control and power (Klimmt and Vorderer, 2003); certainly an enjoyable sensation. Skill has been found to significantly, positively impact enjoyment in several studies (Bracken and Skalski, 2009; Shafer, Carbonara and Popova, 2011; Skalski, Tamborini, Shelton, Buncher, and Lindmark, 2011). Similar to Shafer, Carbonara and Popova (2011), skill as measured in the present study is the degree to which the player feels they

performed well at playing the particular game they were assigned, and represents the players' post-gaming evaluation of their own performance in the game; their perception of skill. Therefore, it is hypothesized that:

H4: Perceived skill will positively impact enjoyment.

2.6 Platform Hierarchy

The hypothesized model predicts that the platform played will impact perceived interactivity, perceived reality, and spatial presence. However, in order for such a relationship to carry meaning, the platforms should be placed into a hierarchy that goes beyond the simple nominal categorization of platform type. The present study does not propose to control for and separately examine all differences between the platforms under study. Instead, the scope of this study is limited to the examination of simple differences between systems on the variables of interest. Variables such as screen size or interface were not parsed out from one another. Unfortunately, at the time of this writing, a method for direct comparison of screen size while controlling for interface, or a method for controlling for screen size while varying the interface was not available. However, given the technological differences between the platforms, they can be categorized into high, moderate, and low based on technological interactivity (Shafer, Carbonara and Popova, 2011). Technological interactivity “refers to the variance in range of physical interactions between user, device, and software” (Shafer, Carbonara and Popova, 2011 p. 592). The term was originally used to categorize the three existing motion-control systems for video games, the Wii, the Move, and the Kinect. In the present study, technological interactivity categorization will be based on the whole interface between user and game, which, in the case of mobile devices especially, integrates screen size and controller. See the methods section for a description of the platform categorization.

3. Methodology

The research question and the hypotheses were integrated into the proposed model (see Figure 1), and were investigated using a randomized experimental design with three distinct conditions. The conditions were labeled as high, moderate, and low technological interactivity; with iPod Touch games representing the low technological interactivity condition (and standing in as a proxy for smartphone games), iPad games

representing the moderate condition, and consoles representing the high condition. The criteria for classifying the devices as high, moderate, or low in technological interactivity are enumerated in section 3.4.

3.1 Participants

Data were collected from 257 student participants recruited from speech communication and digital media courses at a mid-sized research university in the southern-central United States. They were offered course or extra credit for their participation, along with other opportunities for similar credit. Demographic data indicated that the sample was 48% male and 52% female. Ethnicity of the sample was predominately white (non-Hispanic). Participants ranged in age from 18 – 30, with an average age of 20.1 years (SD = 1.81). All participants were required to read and acknowledge an IRB-approved consent form before proceeding with the study. Names were collected for extra credit purchases, but upon conclusion of data collection the names and course information were deleted from the original data set and moved to a separate file in order to protect the privacy of the participants.

3.2 Stimulus Material

Players were randomly assigned to play one of six games distributed across three gaming systems – the Xbox 360, the iPad (3rd Generation) and the iPod touch (5th Generation). The games and numbers of players for each are listed in Table 1:

Game	System	*n*
Halo 3	XBOX360	54
Call of Duty: Black Ops Zombies	XBOX360	50
N.O.V.A 2	iPad	41
Call of Duty: Black Ops Zombies	iPad	34
N.O.V.A 2	iPod Touch	36
Call of Duty: Black Ops Zombies	iPod Touch	42

Table 1: *N* of Players Per Game

All games are of the first-person shooter (FPS) genre. The study was limited to this genre in order to avoid confounds in variation of genre. Different types of games have different mechanics, and cross-genre comparisons can be difficult because of this. Therefore, all games were selected from the same genre based on popularity of the titles over the past few years and availability.

Halo 3 (Microsoft, 2007) is the third installment of the science fiction-based Halo series by Bungie. The main character is a super soldier fighting to save the galaxy from a coalition of alien races bent on destroying the Earth and the human species. Halo 3 is only available for the Xbox 360. A closely comparable mobile game is N.O.V.A 2 (Gameloft, 2010), in which the main character is a super soldier fighting to save the galaxy from an alien alliance which is threatening Earth. The characters of both games are outfitted in high-tech combat armor in which resides a helpful artificial intelligence system that guides players through the game. Similar weapons, vehicles, enemies, and landscapes are used. The similarities between the two games make them easily comparable for the purposes of this study.

Call of Duty: Black Ops Zombies can best be called a mini game that is included with the purchase of Call of Duty: Black Ops (Activision, 2010a). It is a survival game that involves keeping packs flesh-eating Nazi zombies at bay. The game was selected for this study because it is also available as a mobile app on iPad and iPod touch (Activision, 2010b). The gameplay between platforms is very nearly identical, and affords the opportunity for a valid comparison between systems.

3.3 Experimental Procedure

Participants assigned to console games were seated in front of a multimedia station with a 32” television displaying the online questionnaire. Participants assigned to iPad games were seated at a desk with the iPad positioned in front of them with the questionnaire displayed on the device’s browser. Participants assigned to iPod games were seated at a desk with the device and a paper copy of the questionnaire (the iPod’s cache size prevented answering part of the questionnaire, playing the game, and then resuming the questionnaire where the participant left off). Participants completed the pre-game demographics portion; then played the randomly assigned game for 15 minutes. Gameplay periods were timed by the research assistant. Participants then completed the game experience portion of the questionnaire which included questions of interactivity, perceptions of reality, presence, skill, and enjoyment. Each session lasted 30-40 minutes.

3.4 Measures

Independent Variables. This study used two pure independent variables, platform and skill. For platform, the three gaming platforms were categorized according to their level of technological interactivity. Technological interactivity was determined by

analyzing the way the three platforms interface with their users, both in terms of screen size and controller attributes. Console games are categorized as high in technological interactivity. The Xbox 360 controller has a total of 11 buttons (including 2 thumb joysticks and a direction pad). These buttons are typically accessed with the thumbs and index fingers of both hands. In addition, console games are typically played on screens larger than those offered by tablets or smartphones. In the present study, a 32-inch television was used, which has a screen area of over 3,285 cm^2. The iPad was categorized as moderate in technological interactivity. The device has a screen size of approximately 448 cm^2. In addition to the smaller screen, game players typically interface with the on-screen controls only with their thumbs. The iPod Touch 4th Generation has a screen size of about 39 cm^2. The controls for games mirror those of the iPad, and are typically accessed with only the thumbs. The much smaller screen makes the on-screen controls smaller and, ostensibly harder to precisely access. Therefore the iPod Touch ranks low in technological interactivity. Using this hierarchy of high, moderate, and low technological interactivity, the platform variable is expected to impact perceived interactivity, perceived reality, and spatial presence. However, the valence of those relationships is the subject of RQ1.

Skill was measured using two items: “I played the game well” and “I’m good at this game”. The questions were answered on a 5-point Likert-type, agree-disagree scale. Cronbach’s α indicated good reliability, α = .91. This measurement of skill follows that of Shafer, Carbonara and Popova (2011).

Independent/Dependent Variables. Perceived interactivity, perceived reality, and spatial presence served as both dependent (endogenous) and independent (exogenous) variables in the model. They serve as partial mediators between platform and enjoyment. Perceived interactivity was measured using a nine-item, five-point Likert-type scale adapted from a measure used by Wu (2006; 2005). The measure was originally developed to measure perceived interactivity of web sites (e.g., “I was in total control over the pace of my visit to this Web site”). Therefore, slight modification was necessary (e.g., I was in total control over the pace of my experience with this game”). Reliability statistics indicated good internal consistency for the perceived interactivity scale; Cronbach’s α = .80.

Spatial Presence was measured using the Spatial Presence subscale of the ITC-Sense of Presence Inventory (ITC-SOPI: Lessiter, Freeman, Keogh, and Davidoff, 2001). This measure was developed as cross-media measure of spatial presence experiences and includes 19 items, such as “I felt I was visiting the places in the video

game environment". Each item was assessed using a 5-point scale ranging from 'strongly disagree' to 'strongly agree.' The scale has been shown to be reliable and valid (Lessiter, Freeman, Keogh, and Davidoff, 2001; Shafer, Carbonara and Popova, 2011). Cronbach's alpha for the subscale was strong, α = .90.

Perceived reality was measured using Popova's (2010) perceived reality measure for video games. The 29-item scale measures six dimensions of perceived reality: magic window (α = .64), typicality (α = .55), identity (α = .70), utility (α = .77), perceptual fidelity (α = .72), and virtual experience (α = .73). Questions were answered on a 5-point Likert-type agree-disagree scale. Due to low alpha levels for some subscales, and the necessity to limit the number of parameters estimated in the path model, the subscales were combined to yield a single aggregated measure of perceived reality. Observed Cronbach's alpha for the aggregated perceived reality scale was strong, α = .87.

Dependent Variable. Enjoyment was the sole pure dependent variable in the study. Enjoyment was assessed using 13 modified items taken from previous studies (Raney, 2002; Raney and Bryant, 2002; Shafer, Carbonara and Popova, 2011). Some sample items are: "The game made me feel good" and "I enjoyed the game." Each item was rated on an 11-point scale, ranging from 0 (not at all) to 10 (extremely). Observed Cronbach's α = .91, indicating strong internal consistency. The measure used in the present study follows Shafer, Carbonara and Popova, (2011), and is an adaptation of the measure used by Raney (2002; Raney and Bryant, 2002) in the study of enjoyment of narrative films.

4. Results

As a preliminary check to ensure the randomization process worked as intended, previous exposure to the FPS genre was assessed. If the randomization process was successful, the proportion of players with FPS experience to players without FPS experience should be relatively consistent throughout the three conditions. Participants were asked: "Have you ever played a game similar to the one you played before (regardless of the system you played it on)?" Answer choices were "Yes" or "No". Of the 257 total participants, 205 (79.8%) answered Yes, and 52 (20.2%) answered No. A simple crosstabs procedure indicated that these proportions were not significantly different in any of the three conditions.

4.1 Path Analysis Results

Path analysis was conducted to investigate the relationships predicted by the hypothesized path model. In its first iteration, the model showed poor fit, χ^2 (4, N = 257) = 31.11, p < .001; RMSEA = 0.165; AGFI = .79; NNFI = .83. The model showed that the path from platform to spatial presence was insignificant. Platform, categorized by technological interactivity, had no significant direct impact on spatial presence. The path was consequently dropped from the model. Modification indices suggested that a path from skill to perceived interactivity would significantly improve model fit, and so the path was added and the model re-analyzed. Results are shown in Figure 2. Quality indices indicated an acceptable fit for the model, χ^2 (2, N = 257) = 3.71, p = .156; RMSEA = 0.058; AGFI = .96; NNFI = .99, 90% CI for RMSEA: (0.035; 0.14), pClose = .11. All paths were significant. The results revealed that platform, categorized according to technological interactivity, impacted only perceived interactivity and perceived reality. The only important un-hypothesized relationship was found between skill and perceived interactivity. This finding will be discussed further in the following section.

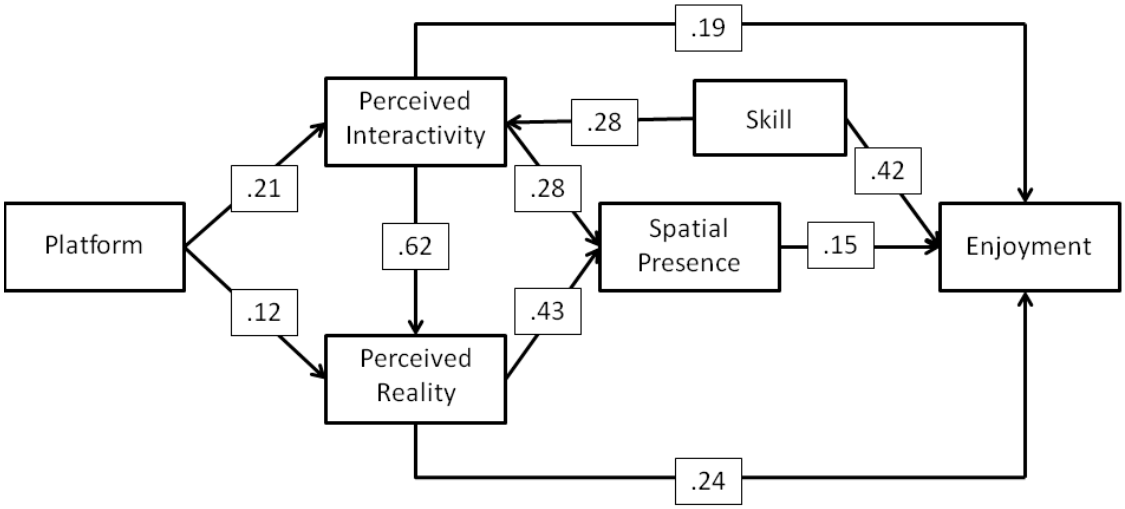

Figure 2: Final Path Model

4.2 Research Question Analysis and Hypothesis Testing

RQ1. Research question 1 inquired as to the specific effect platform would have on players' perceptions of interactivity, reality, and spatial presence. The results of the path model, as noted, show positive effects of platform on perceived interactivity and perceived reality, not on spatial presence.

H1. Hypothesis 1 predicted that perceived interactivity would have a positive impact on enjoyment, spatial presence, and perceived reality. As the model shows, all three effects were found, and the impact of perceived interactivity on perceived reality was the strongest in the model. H1 is supported.

H2. Hypothesis 2 predicted that spatial presence would have a positive effect on enjoyment. This effect was present in the model, but was one of the weaker effects in the model. Skill, perceived reality, and perceived interactivity all emerged as stronger predictors of enjoyment. H2 is supported.

H3. Hypothesis 3 predicted that perceived reality would positively impact both spatial presence and enjoyment. H3 is supported; the results of the path analysis shows that the impact of perceived reality on spatial presence was the second strongest in the model.

H4. Perceived skill was expected to positively impact enjoyment in H4. The results show that skill was the strongest direct predictor of enjoyment in the model. H4 is supported.

4.3 Post-Hoc Analysis

As a follow-up analysis, the three platforms were compared on perceived interactivity and perceived reality to determine just where the differences indicated by the path analysis results lay. A multivariate analysis of variance (MANOVA) was conducted that included both perceived interactivity and perceived reality. For perceived interactivity, the overall F test was significant, $F(2, 254) = 7.20$, $p = .001$. iPod Touch players ranked lowest ($M = 2.58$, $SD = 0.61$), but were not significantly different than iPad players ($M = 2.65$, $SD = 0.61$), $p = 1.00$. Console players ($M = 2.90$, $SD = 0.63$) ranked significantly higher in perceived interactivity than iPad or iPod Touch players ($p = .018$ and $p = .001$, respectively; see Figure 3).

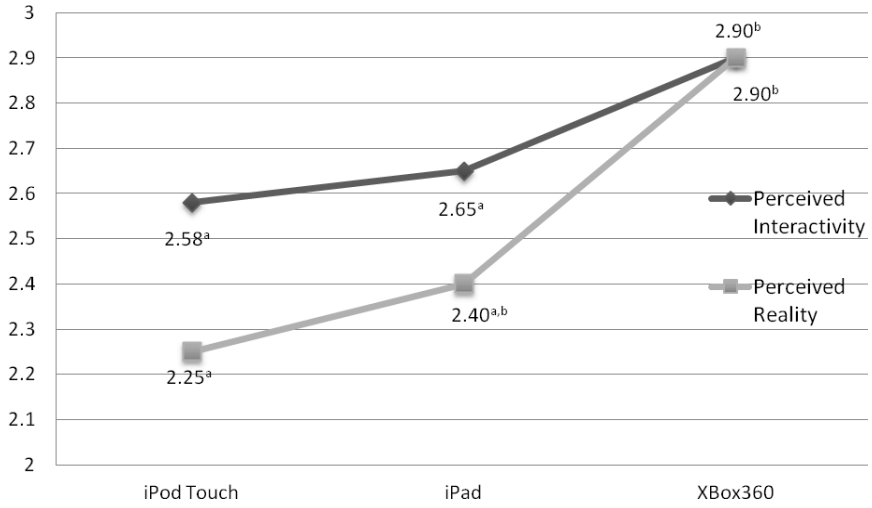

Figure 3: Perceived Interactivity and Perceived Reality Levels by Platform. *Note:* different superscripts are significantly different by line, $p < .05$

For perceived reality, the overall F test was significant, $F(2, 254) = 9.22$, $p < .001$. iPod Touch players again ranked lowest ($M = 2.25$, $SD = 0.36$) but were not significantly different than iPad players ($M = 2.40$, $SD = 0.43$) for perceived reality, $p = 0.10$. Console players ($M = 2.90$, $SD = 0.63$) ranked significantly higher in perceived interactivity than iPod Touch players ($p < .001$), but were not significantly different from iPad players ($p = .152$, also see Figure 3).

5. Discussion

This study investigated player enjoyment of video games played on mobile devices as compared to games played on traditional consoles. The variables were integrated into a path model that considered the combined impact of perceived interactivity, perceived reality, and spatial presence on enjoyment. The hypothesized relationships were largely supported. Enjoyment was significantly and positively predicted by perceived interactivity, perceived reality, spatial presence, and skill. These findings give a small indication of the complexity of the enjoyment process with regard to video games. They reinforce past video games research that has found that these variables, in isolation, impact enjoyment, and that they effect each other (Lombard, Reich, Grabe, Bracken, and Ditton , 2000; Shafer, Carbonara and Popova,, 2011; Skalski and Whitbred, 2010; Skalski, Tamborini, Shelton, Buncher, and Lindmark, 2011).

5.1 Direct and Indirect Model Effects

Perceived interactivity was found to have both direct and indirect effects on enjoyment. The direct impact on enjoyment was relatively small, yet the indirect impact through perceived reality and spatial presence was strong. Perceived reality also strongly impacted spatial presence, which in turn significantly (although not strongly) predicted enjoyment. Perceived reality had the second-strongest direct impact on enjoyment.

5.2 The Powerful Effects of Skill

Skill was the most powerful direct predictor of enjoyment. Skill also had an indirect impact on enjoyment through perceived interactivity. Skill implies being able to manipulate the controls in such a way that the game responds with favorable results. Therefore, the more skill demonstrated on the players' part, the more that players find that the game is responsive to them. The path from skill to perceived interactivity was not hypothesized initially because the studies upon which the proposed model is based did not find a significant relationship between skill and the other predictors in the model. However, the relationship can be explained by findings of research that examined skill in terms of effectance and control, and by work that considered game enjoyment in the context of the psychology of play.

In the context of playing video games, the feeling that one has the ability to effectively manipulate circumstances to one's own benefit is immensely satisfying (Klimmt, Hartmann and Frey, 2007). The ability to influence one's (virtual) environment gives a sense of control and power (Klimmt and Vorderer, 2003). To the extent that players feel they can effectively manipulate the game world (i.e., they realize a high level of skill), they will perceive the game as more interactive, which leads to heightened enjoyment (Klimmt, Hartmann and Frey, 2007).

5.3 Game Enjoyment Depends on the Player

Taken together, these findings indicate that enjoyment is determined by many factors (several of which, such as narrative quality, were not included in this analysis). Overwhelmingly, however, enjoyment of video games is a user-directed experience. User perceptions of the elements offered by the game are paramount to the enjoyment process. While game inputs certainly play a role in the process, users, it seems, are able to determine much of their own enjoyment, whether consciously or subconsciously, via their own perceptions.

5.4 Effects of Platform

Platform, as categorized according to technological interactivity, had a significant impact on both perceived interactivity and perceived reality. There was no significant effect of platform on spatial presence. Unfortunately, the limitations of the study make interpretation of this result difficult. Players reported greater perceived interactivity and greater perceived reality when playing games on platforms higher in technological interactivity. Two factors, screen size and controller type, may be independently responsible for this result. Because of the inability at this point in time to test console games on large screens with touch controls, these factors could not be parsed out from each other. Future studies may be able to resolve the confound of screen size and interface by limiting data collection to mobile devices only and games that have options for control style.

The lack of a direct effect of interactivity on spatial presence, which is contrary to the hypothesized relationship, is likely due to the much stronger mediating effects of perceived reality and perceived interactivity. In retrospect, this finding makes sense in light of the application of the psychology of play to video games (see Klimmt and Vorderer, 2003). Spatial presence in video games is produced when players sense of the virtual world is strengthened 1) by an awareness that they are having a noticeable and satisfying impact on the game world (Klimmt, Hartmann and Frey, 2007; Klimmt and Vorderer, 2003; Steuer, 1992; Wirth et al., 2007), and 2) by a sense that the virtual world is internally realistic and does not violate its own laws, and has some realistic components that are related to real life (i.e., external realism; Busselle and Bilandzic, 2008; McMahan, 2003). Therefore, the finding that platform had no significant effect on spatial presence is reasonable; perceived interactivity and perceived reality should mediate between the player's use of a certain platform and their sense of presence within the virtual environment produced by that game platform.

5.5 Limitations

As already noted, due to the goal of comparison between console and mobile games, it was not possible to control for differences in interface. Therefore the confound of screen size with controller type is a limitation of this study that provides an excellent opportunity for future research.

This study also suffers from the common limitation of a convenience sample of students. The fact that this is a common limitation in research such as this does not remove the concern. However, our relatively homogenous sample falls into the

demographic of a large portion of gamers (ESA, 2011). While our results are not generalizable to all gamers, past research has shown that student samples often introduce less error into research than a representative sample might (Basil, 1996). Due to random assignment to condition, it is hoped that the risks associated with this limitation have been minimized.

A third point to note here is that the six dimensions of perceived reality were collapsed into a single aggregate variable. This necessarily sacrifices a more detailed and nuanced picture. It is possible that analyzing each component of perceived reality would give insight into which dimensions influence spatial presence, and which influence enjoyment. However, the method of collapsing the scale into a single measure was deemed necessary in order to limit the number of parameters being estimated in the path model, thereby increasing the power of the analysis.

6 Conclusion

This study lends support to the argument for studying enjoyment of video games not in the context of isolated variables, but in a way that takes several important predictors into account (Shafer, Carbonara and Popova,, 2011). The model tested in this study includes variables that seem to consistently coexist and covary within the minds of gamers as they play. Perceptions of interactivity, reality, and spatial presence, as well as evaluations of skill, all blend to produce enjoyment. This study confirms that, despite the recent rise in popularity of mobile devices and gaming on those devices, console games are perceived as more interactive and more realistic, which increases enjoyment of them beyond their mobile counterparts. However, it is important to note that tablet games especially can produce high levels of perceived interactivity, perceived reality, spatial presence and enjoyment, making them perhaps an acceptable substitute for console games away from home or away from the computer desk. This evidence naturally raises questions about displacement; spending more time playing games on mobile devices may distract attention from other, arguably more important activities such as work or socializing. By the same token, the ability to enter an immersive and compelling virtual world, even when away from the computer, may mean that a time of escape, relaxation and refreshment is even more accessible; enhancing and enriching what may have been a stressful or boring day of mindless work (see McGonigal, 2011). What is important, then, is that the scholarly community press forward with the investigation into the real-world impact of games and their

usage. As we discover more about how games are enjoyed and used, we will be in a more credible position to suggest how they can be used, with discretion, to enhance, and not detract from, our everyday activities.

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