“i”PLAY:
THE PSYCHOLOGICAL EFFECTS OF CUSTOMIZED FEEDBACK IN VIDEOGAMES

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ABSTRACT

RYAN ROGERS: “i”Play:
The Psychological Effects of Customized Feedback in Videogames
(Under the direction of Sriram Kalyanaraman)

This dissertation extended the concept of customization to the domain of videogames and explored the nuances of individualized feedback in concert with other important variables in the gaming context (distraction during game play and information on player progress). Specifically, Study 1 employed a 2 (distraction: low vs. high) x 3 (feedback type: customized, non-customized, no feedback) experimental design to explore the interplay between feedback and distraction on the outcome measures of attitude toward the game and game performance. The results revealed that customized feedback was superior to other forms of feedback in generating positive attitudes toward content as well as improving performance of certain types of behaviors. These effects were mediated by perceptions of motivation and relevance. Study 2 aimed to further unravel the role of distraction in customized feedback by including progress information as an additional independent variable. Specifically, Study 2 employed a 2 (distraction: low vs. high) x 4 (progress information: no progress information, low progress medium progress, high progress) experimental design, where all participants were provided individualized feedback. The findings revealed some unexpected patterns such that the absence of any progress information invoked most favorable attitudes while participants in the high distraction condition exhibited high scores on the performance measure via decreased attention. In summary, this dissertation puts forth several explanations for inconsistencies in feedback research while touting

the benefits of providing customized feedback.

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CHAPTER 1

INTRODUCTION

The permeation of videogames into modern American society is indisputable. A majority of households have some form of gaming device and games have the distinguished position as the most lucrative segment in entertainment media (Industry facts, 2012; Sherr, 2012). Not surprisingly, the videogame industry has seeped into a variety of other applications and environments. Indeed, the increasing recognition of uses for games has led to the coining of the term "gamification," or the use of game elements in venues that do not inherently include such elements to elicit a desired behavior (Deterding, O'Hara, Sicart, Dixon, & Nacke, 2011). Commonly, gamification is implemented in marketing, education, and employee training (e.g., Nike's use of a game that promoted their winter line of clothing [Sanina, 2011]; *Darfur is Dying*, a game designed to educate users on the crisis in Darfur [Whalen, 2006]).

Typically, gamification employs elements like competition, rewards, and narratives to make activities that are boring or arduous seem more engaging and enjoyable (Herger, 2011; Reeves & Read, 2009). As a result, gamified content increases the likelihood that a user will perform a desired behavior more than if the content did not include game elements. The incorporation of gamification elements in diverse environments is testament to popular belief about their efficacy. For instance, Comcast employed a competitive game for sales employees that resulted in a 127 percent increase in daily appointment bookings (Marsh, 2013), Samsung offered game-style rewards on their website, increasing user activity by 500 percent (Swallow,

2012), and when a compelling storyline was used in the Autodesk 3ds Max software trial, twice as many packages were sold than when the software trial did not use a storyline (Mott, 2013).

While elements such as competition, rewards, and narrative have helped to increase adherence to desired goals/outcomes, one element of gamification that has been proposed as particularly important is feedback (Bridgett, 2010; Dickey, 2005; McGonigal, 2011; Reeves & Read, 2009; Sorokanich, 2013**)**. Feedback, defined as information about a previous behavior that is intended to alter subsequent behaviors so they are more congruent with a desired outcome (Hawkins, Kreuter, Resnicow, Fishbein, & Dijkstra, 2008; Wiener, 1961), is implicit in nearly every genre of videogame. Whether a player is trying to achieve a high score in *Frogger*, navigating a dungeon in *The Legend of Zelda*, or playing a friend in *Pong*; feedback is essential to videogames because it is the means by which a player (or player's performance) is funneled toward the game's goal.

The element of feedback is considered one of the most important developments in human behavior (Goetz, 2011; Senge, 1990) and the notion that feedback improves performance is so widely accepted that many studies focus on the nuances of feedback rather than its mere presence or absence (e.g., Carnagey & Anderson, 2005; Hawkins et al., 2008; Ryan, Rigby & Przybylski, 2006). However, a careful examination of the literature reveals inconsistencies within feedback research including: varying/conflicting effects of feedback, incongruent operational definitions, and a lack of a strong theoretical foundation (Carver & Scheier, 2001; Diclemente, Marinilli, Singh, & Bellino, 2001; Hattie & Timperlay, 2007; Kluger & DeNisi, 1996; Ramaprasad, 1983).

One possible reason for the existing inconsistencies is that feedback is presented in a "one size fits all" mode. This is somewhat surprising considering that game players' competence

levels vary widely and such generic feedback fails to account for players' inimitable attributes. Of course, feedback addresses player performance but this represents broad segmentation of the gaming population based on performance as opposed to addressing unique characteristics of the individual players (see Noar, Benac, & Harris, 2007; Park, McDaniel, & Jung, 2009). Perhaps, feedback that is personalized to each individual may result in more effective—and desired—outcomes. In fact, this supposition has received tremendous support in various new media domains with highly customized content engendering more positive attitudes (Briñol & Petty, 2006; Celsi & Olson, 1988; Kalyanaraman & Sundar, 2008; Kamali & Loker, 2002; Simonson, 2005; Valenzuela & Dhar, 2004) as well as greater adherence to intended behaviors (Adriaanse, de Ridder, & de Wit, 2009; Ansari & Mela, 2003; Emmons et al., 2004; Pelletier & Sharp, 2008; Rimer & Kreuter, 2006; Wan, 2008; Webb, Simmons, & Brandon, 2005).[1]

Consequently, this dissertation attempts to test the possibility that customized feedback would be perceived as more beneficial than generic or non-customized feedback in videogames. While there are numerous elements that may lend themselves to fruitful empirical investigation in juxtaposition with customized feedback, two elements that appear to be particularly important are distractions and progress information. Distractions and progress information are important to consider not only because both are germane to videogames but also because the effects of feedback, distractions, and progress information on attitude and performance are intertwined (Drolet & Luce, 2004; Fishbach & Dhar, 2005; Huang & Zhang, 2011; Ward & Mann, 2000).

[1] Videogames already offer robust customization. In *Elder Scrolls, Dark Souls*, *Soul Caliber*, and *Call of Duty*, players create their own character, customizing the appearance through facial features, hairstyle, eye color, etc. Likewise, some games, like *Halo 4*, *Worms Armageddon*, and *Little Big Planet* offer level editors that allow players to build a game space however they choose. And new videogames like *Killer Instinct* are capable of automatically adjusting settings like preferred controller configurations and favorite characters when players pick up a controller (Liebl, 2013).

Specifically, feedback and progress information should increase positive attitudes and improve performance while distraction should do the inverse.

In Study 1, the effects of customized feedback are analyzed under varying levels of distraction. Distractions, like a ringing telephone or a new email, are commonly encountered while playing videogames (Brasel & Gips, 2011) and should negatively impact performance as well as attitudes (Drolet & Luce, 2004; Lamble, Kauranen, Laakso, & Summala, 1999; Ward & Mann, 2000). Although these deleterious effects have been explained by distractions, they might also be attributed to the implementation of ineffective feedback. Indeed, the effects of distractions on attitude and performance are similar to those of ineffective feedback (Carver & Scheier, 2001; Diclemente et al., 2001; Hattie & Timperlay, 2007; Kluger & DeNisi, 1996). Perhaps, the examination of feedback and distractions in concert may provide useful insights in determining the critical element.

Study 2 explores the assumption that feedback is more influential when it provides clear information on progress toward a goal (Connellan & Zemke, 1993, Fleming & Levie, 1993; Kluger & DeNisi, 1996). In games, players often receive progress information such as how many more experience points are required to "level up" or how much progress has been made toward completing the game. Importantly, this
information can influence users differently depending on the progress information presented (Fishbach & Dhar, 2005; Huang & Zhang, 2011). If feedback presents progress as slow and difficult, users may give up on the task (Huang & Zhang, 2011); if feedback presents progress as fast and easy, users may be less inclined to exert optimum effort on the goal/outcome (Fishbach & Dhar, 2005). However, progress information elicits effects that have also been explained by different types of feedback, like positive or negative feedback (Carnagey & Anderson, 2005;

Hattie & Timperlay, 2007; Reinecke et al., 2012). Thus explanations for the effects of progress information might be subsumed by the effects of feedback. Consequently, examining customized feedback alongside progress information is a valuable pursuit.

Ultimately, this dissertation employs two experiments to help shed light on the effects of customized feedback while users are distracted from the primary task and when users receive different types of progress information. Doing so could help develop an understanding of how to optimize feedback as well as identify a potential explanation of inconsistent findings within feedback research.

This dissertation is structured as follows: first, it reviews pertinent literature on feedback and customization and proposes hypotheses for study. After detailing the methods and results of an experiment designed to test the hypotheses, it points out the implications of the study and proposes a second study. Study 2 reviews literature on progress information, which is included as an additional variable for examination. After discussing the methods, results, and implications of Study 2, the dissertation concludes with a general discussion.

Literature Review

Feedback

Norbert Wiener, who is credited with formalizing the concept of feedback, described feedback as follows: "when we desire a motion to follow a given pattern, the difference between this pattern and the actually performed motion is used as a new input to cause the part regulated to move in such a way as to bring its motion closer to that given by the pattern" (Wiener, 1961, p. 6). With foundations in engineering (Mindell, 2003), feedback has been applied to many other domains such as cybernetics, ecology, and human behavior (Bowlby, 1969; Miller, Galanter, & Pribram, 1960; Goetz, 2011; Senge, 1990). Accordingly, Wiener's definition has been adapted and updated, but in most scenarios, feedback generally describes the same process: an individual is given information about a previous behavior and this information is intended to improve performance on a subsequent behavior (Hattie & Timperlay, 2007, p. 81; Hawkins et al., 2008, p. 459; Winne & Butler, 1994, p. 5740). Terms like "feedback loop" (Carver & Scheier, 2001; Ramaprasad, 1983) and "feedback intervention" (Glanz, Schoenfeld, & Steffen, 2010; Haug, Meyer, Ulbricht, Gross, & Rumpf, 2010; Kluger & DeNisi, 1996; Ruiter, Werrij, & de Vries, 2010) are commonly used and refer to the same overarching concept.

The manifestation of feedback has assumed many shapes: grades in classrooms that help students pursue educational goals (Hattie & Timperley, 2007), reciprocity in counseling sessions that help patients achieve therapeutic goals (Thiemann & Goldstein, 2001), annual employee evaluations that help companies/employees provide better products/services (Connellan &

Zemke, 1993), and automobile speedometers that provide information to help motorists drive legally and safely (Goetz, 2011). Even the perception of feedback (i.e., feedback that does not necessarily reflect exact performance), is effective in influencing individual performance or perceptions of performance (Beedie, Lane, & Wilson, 2012; Gu, Zhong, & Page-Gould, 2013; Reinecke et al., 2012). For example, in one study, participants were told they had performed well or performed poorly regardless of their actual performance and this false feedback altered feelings of competence and autonomy (Reinecke et al., 2012). This highlights one important aspect of feedback, it is authoritative and should be obeyed.

At the operational level, feedback has been examined in many different ways. In health studies, feedback has been operationally defined as: providing information on health risks, assessments of health behaviors, information on bodily responses, and reviewing recorded behaviors (Glanz et al., 2010; Griffiths, 2002; Krebs, Prochaska, & Rossi, 2010; Thiemann & Goldstein, 2001). In new media environments, feedback has been operationalized by providing aural and visual rewards like flashing lights and mechanical ringing tones (Lim et al., 2012; Wood, Griffiths, Chappell, & Davies, 2004), web page loading information (Crystal & Kalyanaraman, 2004), and tactile sensations (Ahn, 2011).[2]

While several theoretical perspectives of feedback have been proposed, one that is particularly compelling in the context of the current investigation is feedback intervention theory (FIT) (Kluger & DeNisi, 1996). FIT presents feedback as a complex process in which user dimensions and message attributes interact to determine the efficacy of feedback. Building upon FIT, this dissertation argues that feedback fundamentally describes a dialogue between the user

[2] It should be noted that these operationalizations do not vary according to individual users. In other words, they are not customized.

and the interface.[3] In videogame environments, player input is assessed by the game and the game in turn conveys information back to the player, communicating progress (or lack of progress) toward the game goal. Then, the player's next input should incorporate this newly acquired information and the cycle repeats. In essence, the experience of playing a game relies on feedback. In videogames, it is generally accepted that feedback, like a scoring mechanism, is used to enhance player performance by helping players reach game goals (Bowman, 1982; Lee, Luchini, Michael, Norris, & Soloway, 2004).

Furthermore, videogames are optimal delivery systems for feedback because they allow for feedback that is immediate, continuously displayed, automatically delivered to the player, and presented in a controlled environment. Juul (2010) used the videogame *Guitar Hero* as an example of effective videogame feedback. In *Guitar Hero*, when players are performing well, a recognizable songs plays, the screen lights up with bonuses, and the crowd cheers with delight. When players are performing poorly, the recognizable song is interrupted by harsh, out-of-tune notes, the screen changes to an ominous color, and the crowd boos the performance. But *Guitar Hero* only represents one example of videogame feedback. Even older games, like *Pac-Man*, use feedback. Each ghost Pac-Man eats shows a point value, which is then added to the player's total score. On top of the visual satisfaction of seeing the score increase, the game uses audio cues to denote certain behaviors. Pac-Man's iconic "wakka wakka" indicates the game is still going and points are still being accrued. Alternately, the player hears a lowering droop when Pac-Man dies, indicating a setback to the game goal.

[3] This conceptualization of feedback is closely related to conceptualizations of interactivity (Kalyanaraman & Sundar, 2008; Sundar, Kalyanaraman, & Brown, 2003). Under this conceptualization, feedback can be understood as goal-oriented interactivity, a notion central to the overall experience with videogame content.

While a wide variety of feedback mechanisms are described above, this dissertation focuses on one of the most common—and applicable—manifestations of feedback in games: the performance summary page. These pages are typically separated from moments of game play such that the game has programmed breaks in which players are given information on their performance while a new set of challenges (e.g., a new level) are loaded for the players. In a game like *Trials HD*, each level is concluded with a performance summary page that indicates level completion time, the number of player faults, and the medal earned: gold, silver or bronze. Performance summary pages are even provided in games without clearly demarcated levels. For instance, in *Call of Duty*'s multiplayer mode, players can access a performance summary page that details how many times they have died, how many times they have killed opponents, and which weapons they are most effective with. These pages display player performance information to help players understand how they are performing and how they might improve their performance.

Regardless of the type of feedback presented in games, one thing stands out: it is non-customized. All players receive the same feedback information. In *Pac-Man,* the same scoring mechanism and sound effects are used for all players. In *Guitar Hero,* all players receive the same information. Of course, feedback already varies based on the quality of the players' performances but the content is not individualized to some notion of the self (Briñol & Petty, 2006; Kalyanaraman & Sundar, 2006). Rather, players are assessed and grouped based on their skills and competencies. Meaning, players who are highly skilled receive the same or similar feedback and so do those who are poorly skilled or moderately skill. In turn, this dissertation aims to explore the effects of feedback when it is customized to the individual player. The main conjecture in the current study is that feedback will be more effective when it resonates with

users on a uniquely individual level.

Customization

Customization can be described as creating messages for individual users (Kalyanaraman & Sundar, 2006). Customized messages are distinct from generic messages because generic messages are intended for all audience members without differentiation (Noar et al., 2007). Often, terms like personalization, matching, tailoring, and customization are used interchangeably in different disciplines (Hawkins et al., 2008; Latimer, Katulak, Mowad, & Salovey, 2005; Lustria, Cortese, Noar, & Glueckauf, 2009; Noar et al., 2007; Park et al., 2009; Rimer & Kreuter, 2006; Sundar & Marathe, 2010). While these terms do have nuanced definitions, their overarching meanings are largely the same: they all refer to individualized content (Kalyanaraman & Sundar, 2006; Wheeler, Petty, & Bizer, 2005; Wheeler, DeMarree, & Petty, 2008) that caters to "some aspect of the self" (Briñol & Petty, 2006, p. 583).

To date, customization has received substantial attention in media effects, marketing, psychology, health communication and even videogames. Within videogame studies, character customization has received the bulk of attention (Bailey, Wise, & Bolls, 2009; Kim & Sundar, 2012; Trepte & Reinecke, 2010). Character customization is the practice of building or altering an in-game character to fit player preferences. Many games allow players to customize character appearance or abilities. This type of customization can be used to accurately recreate the player within the game but is not necessarily used to do so. There is evidence that character customization in videogames functions similarly to customization elsewhere (e.g., Fox & Bailenson, 2009; Lee et al. 2004; Lim, 2006; Schmierbach, Limperos, & Woolley, 2012; Teng, 2010).

In new media, especially videogames, customization is the norm rather than the exception. Pandora Internet Radio allows users to construct unique radio stations based on their individual music preferences. Nike.com allows users to build personalized sneakers that fit their fashion sense. Videogames like *Battlefield 3, Deus Ex, Tomb Raider,* and many others allow players to customize their equipment, identification badge, skills, control schemes, display settings, etc. However, feedback remains largely untouched by customization in scholarly research.

In practice too, customized feedback in videogames has been quite superficial and has largely been limited to the presence of leaderboards and high score listings that allow players to compare their scores with their personal friends' scores. Games like *Gears of War 3* and *Portal 2* allow for this sort of comparison. This customization puts the player's score in a personal context and, presumably, the information displayed should be of more interest to the player. The comparison to friends' performances represents only one possibility of how feedback can be customized in a videogame and, because it is minimally integrated into the videogame experience, can be easily missed or ignored by players. Given the essential role of feedback in videogames and the importance of feedback broadly, this study employs a more rigorous and thorough application of customized feedback in videogames that permeates more than just high score listings. The following section explains the proposed effects of customized feedback.

Effects of Customized Feedback

A synthesis of research on the effects of feedback and customization reveals that the two elements are assumed to positively impact attitudes toward content and performance on goal–related tasks (Ansari & Mela, 2003; Briñol & Petty, 2006; Carver & Scheier, 2001; Connellan & Zemke, 1993; Gee, 2005; Hattie & Timperley, 2007; Hawkins et al., 2008; Juul, 2010;

Kalyanaraman & Sundar, 2006; Latimer et al., 2005; Malone, 1981; McGonigal, 2011; Ramaprasad, 1983; Reeves & Read, 2009). For example, feedback concerning drinking behaviors and eating habits is more successful in improving health behaviors than health information that does not include feedback (Chiauzzi, Green, Lord, Thum, & Goldstein, 2005; Kypri, & McAnally, 2005). Meanwhile, receiving feedback is enjoyable (Sherry, 2004; Sundar & Kim, 2005; Teo, Oh, Liu, & Wei, 2003), encouraging (McGonigal, 2011; Reeves & Read, 2009), satisfying and appealing to users (Ryan et al., 2006; Tamborini, Bowman, Eden, & Grizzard, 2010). In examining the effects of individualized content, there is evidence that customized information can change behaviors such that people alter their actions to comply with customized health messages (Briñol & Petty, 2006; Latimer et al., 2005), and are also more likely to use or purchase personalized products (Celsi & Olson, 1988; Kamali & Loker, 2002; Valenzuela & Dhar, 2004). Similarly, customized health interventions (Lustria et al., 2009; Noar, Crosby, Benac, & Troutman, 2011; Rimer & Kreuter, 2006) and customized new media platforms/products (Ansari & Mela, 2003; Kalyanaraman & Sundar, 2006; Kamali & Loker, 2002) elicit more positive attitudes toward content than their non-customized counterparts.

However, the empirical support for effects of feedback is far less consistent than the largely uniform empirical support for customization. Despite the widely popular assumption that feedback increases positive attitudes and improves performance, nearly a third of feedback studies show no effects of feedback or the inverse of expected effects (Kluger & DeNisi, 1996). This is due, in part, to the broad definition of feedback, which allows for diverse applications within studies (Carver & Scheier, 2001; Diclemente et al., 2001; Hattie & Timperlay, 2007). Among these diverse applications, research has demonstrated that certain types of feedback are more consistent than others.

Findings are typically less consistent when: users cannot isolate a relevant goal within feedback, when users do not perceive feedback to be directly applicable (Carver & Scheier, 2001; Hattie & Timperley, 2007), and when feedback does not encourage user focus (Diclemente et al., 2001; Kluger & DeNisi, 1996). In light of these inconsistent findings, the unifying theme appears to be that feedback is ineffective when it does not address the individual. In each instance, customized feedback could address the shortcomings, confer more authority, and potentially rectify the inconsistencies, resulting in more positive attitudes and more improved performance.

Another important consideration that likely impacts the efficacy of customized feedback is whether or not the feedback is considered positive or negative. Notably, there is a lack of consistency within the feedback literature regarding positive and negative feedback. On one hand, positive and negative feedback have been defined in terms of performance evaluation and the corresponding emotional valence such that positive feedback (performing well) elicits positive emotions and negative feedback (performing poorly) provides negative emotions (Carnagey & Anderson, 2005; Connellan & Zemke, 1993; Hattie & Timperley, 2007; Reinecke, et al., 2012). Under this paradigm, positive feedback is, "you did very well, keep up the good work" and negative feedback is, "you did poorly, you should try harder next time." Of course, feedback in the form of negative performance evaluations has different effects than positive performance evaluations (Carnagey & Anderson, 2005; Hattie & Timperley, 2007; Reinecke et al., 2012).

On the other hand, positive and negative feedback can also refer to the direction the feedback funnels the discrepancy between the input value and the goal value (Ramaprasad, 1983; Carver & Scheier, 2001). Positive feedback drives the input values away from a specific value.

Negative feedback reduces the discrepancy between the input values and a specific value. In other words, positive feedback is designed to make the discrepancy between an input and a value larger or a more positive number while negative feedback is designed to make the value of the discrepancy a smaller number, thus chipping away at a larger original input value. This distinction could be discerned from an "approach/avoid" perspective (Carver & Scheier, 2001; Ramaprasad, 1983). "Approach" feedback works to funnel performances toward a goal by telling users which actions to pursue. "Avoid" feedback pushes performances away from an undesired state. Carnagey and Anderson (2005) illustrated this distinction by offering study participants a positive performance evaluation through point accrual or a negative performance evaluation through point deduction for harming pedestrians in a videogame. Players changed their play style based on whether or not they were encouraged to "approach" or "avoid" this behavior.

Whether positive/negative feedback is regarded in terms of emotional valence or "approach/avoid" behaviors, positive and negative feedback elicit different effects. This illuminates another proposition put forth in this dissertation, customized feedback effects will vary based on whether a performance is described to users as a "positive" behavior or a "negative" behavior. As a result, describing "positive/negative" behaviors should predict different findings in this study and this distinction might help provide more consistency in feedback research.

Distractions and Customized Feedback

In new media environments, like videogames, it is common for people to switch between media formats on an average of four times per minute (Brasel & Gips, 2011). Thus, when people receive feedback in a game they are likely distracted from it. This "cognitive overload"—the prevailing state when the user's capacity for mental processes is depleted—is one of the main

challenges of creating effective multimedia (Mayer & Moreno, 2003). Cognitive capacity is often depleted when two or more cognitive processes are in opposition and cognitive resources become scarce (Sweller, 1988). The result is distraction.

When distracted, feedback should be less effective because users are mentally encumbered and less focused on the goal (Hattie & Timperley, 2007; Kluger & DeNisi, 1996). Negative effects of distractions have been found in diverse domains—for instance, distractions have been found to impede safe driving (Lamble et al., 1999) as well as healthy eating goals (Ward & Mann, 2000). Likewise, distractions can create unpleasant cognitive burdens while reducing an individual's ability to fully consider goals during decision-making processes (Drolet & Luce, 2004).

To accurately explore the effects of customized feedback, distractions should be simulated in a lab setting. One way to simulate distractions in a lab is to induce cognitive load with secondary tasks such as digit memorization (Drolet & Luce, 2004; Shiv & Huber, 2000; Ward & Mann, 2000). These memorization tasks adequately distract individuals and detract from goals (Drolet & Luce, 2004; Lamble et al., 1999; Ward & Mann, 2000). Within the context of this dissertation, the current proposition is that when feedback is customized to the user, he or she will be more likely to maintain focus (not become distracted) than if the feedback had not been customized. In other words, distractions should not be as deleterious when customized feedback is implemented.

Mechanisms of Customized Feedback

Up to this point, this dissertation has implied that customized feedback can effectively increase positive attitudes and improve performance, but has ignored *how* customized feedback should enhance positive attitudes and performance. Drawing from existing research on

customization and feedback, the proposition is that customized feedback functions through increased attention, motivation and relevance.

In terms of attention, the assumption that feedback improves performance and increases positive attitudes through increased attention is one of the main tenets of FIT (Kluger & DeNisi, 1996) and is echoed throughout the feedback literature (Hattie & Timperley, 2007; Hawkins et al., 2008; Glanz et al., 2010). The suggestion is that feedback addresses a personal performance and therefore relates to the individual. This generates interest and engagement with the feedback, and ultimately, leads to more attention. Subsequently, increased attention results in more positive attitudes toward content and improved performance. According to FIT, feedback is ineffective when users are inattentive. However, empirical evidence of this relationship is limited and theoretical postulations explicitly invite verification of this prediction (Hawkins et al., 2008; Kluger & DeNisi, 1996). Simultaneously, customization, by including individualized content, can be used to capture the attention of individuals, thereby increasing positive attitudes toward content and improving performance (Ansari & Mela, 2003; Hawkins et al. 2008; Rimer & Kreuter, 2006; Wheeler et al. 2005). The supposition then, is that customized feedback will more effectively increase positive attitudes and improve performance than non-customized feedback by increasing attention levels.

The second proposed mechanism of customized feedback is motivation. Feedback corrects missteps toward goals through information and guidance (Connellan & Zemke, 1993; Hattie & Timperley, 2007; Hawkins et al., 2008). Other studies have shown that feedback creates perceptions of responsibility and increases perceptions of challenge (Bowman, 1982; Gee, 2005). In other instances, feedback can reinforce behaviors by outlining satisfying rewards that might be accrued as a result of performing a behavior (Lim et al., 2012; Ryan et al., 2006). Lastly,

feedback helps to keep users focused on tasks (Griffiths, 2002). While not necessarily labeled as such, each of these examples details a different path in which feedback leads to increased motivation. The broad assumption being that when individuals are more motivated, they exert more effort on a task and thus improve their performance (Bowman, 1982; Connellan & Zemke, 1993; Hattie & Timperley, 2007; 2008; Lim et al., 2012; Malone, 1981; Ryan et al., 2006). In accordance with the inconsistent descriptions of motivation in feedback studies, this assumption has not received consistent empirical support. On the other hand, customization generally increases motivation because it meaningfully contextualizes content and makes goals personal (Briñol & Petty, 2006; Celsi & Olson, 1988; Pelletier & Sharp, 2008; Rimer & Kreuter, 2006; Ruiter et al., 2006; Wheeler et al., 2008). Thus, customized feedback should meaningfully contextualize content/goals and further increase the effort exerted on a task. That is, customized feedback should increase motivation, which should lead to increased positive attitudes and improved performance.

Lastly, this study proposes that customized feedback will increase positive attitudes and improve performance through perceived relevance. The feedback literature has offered little empirical evidence of this relationship but has vaguely alluded to it. Specifically, effective feedback should include goals that are relevant to users (Carver & Scheier, 2001; Hattie & Timperley, 2007) and feedback should be perceived as relevant by virtue of providing an individual performance assessment (Kluger & DeNisi, 1996). Customization, meanwhile, is noted for increasing perceptions of relevance. When individuals see aspects of the self in content, they perceive the content to be relevant to them (Ansari & Mela, 2003; Fleming & Petty, 2000; Lavie, Sela, Oppenheim, Inbar, & Meyer, 2010; Petty & Cacioppo, 1990; Wheeler et al., 2008; Wheeler et al., 2005; Williams-Piehota et al., 2009). Subsequently, content that is relevant is

more liked and more persuasive (Petty & Cacioppo, 1979, 1990; Ruiter, Kessels, Jansma, & Brug, 2006; Webb et al. 2005).

Importantly, customized feedback directly addresses the role of individualization in feedback, something that has largely been ignored in feedback research. Specifically, feedback does not necessarily take full advantage of customization. According to FIT (Kluger & DeNisi, 1996), individual level performance evaluation in feedback is capable of increasing positive attitudes and improving performance but customized feedback should benefit further from advantages of customized content and thereby heighten the likelihood of increasing positive attitudes and improving performance. In turn, customized feedback should demonstrate whether or not individualized content plays a larger role in feedback than previously predicted.

Hypotheses

By extending the principles of customization to feedback, feedback should benefit from the effects of customization. Specifically, customized feedback should be more effective than non-customized feedback at improving performance and players should have more positive attitudes toward the game when the feedback is customized

H1: Customized feedback will be more favorably perceived (in terms of increased positive attitudes and improved game performance) than will non-customized feedback.

Distractions, as implemented by cognitive load, will result in worse attitudes toward the game and worse performance on game goals.

H2: Playing while distracted will result in worse game performance and less positive attitudes toward the game than playing without distraction.

The degree to which feedback type and distractions are dependent on each other is also assessed. Based on the preceding review, distractions may limit the effects of non-customized feedback but not customized feedback.

H3: Distractions will impede the effects of non-customized feedback on positive attitudes and game performance but not customized feedback.

Lastly, this study tests how the effects of customized feedback and distractions on attitudes and game performance are mediated by attention, motivation, and perceived relevance.

H4: The relationship between feedback type/distraction and game performance/attitude toward the game will be mediated by attention, motivation, and perceived relevance such that more attention, motivation and perceived relevance will result in more positive attitudes and more increased performance.

CHAPTER 2

STUDY 1

Method

This study examined how customized feedback compared with other types of feedback while users were distracted. Distractions were implemented to more accurately simulate an actual game play experience and test the boundaries of feedback in a new media environment. Consequently, this study implemented a 2 (distraction: low and high) x 3 (feedback type: customized, non-customized and no feedback) design.

Participants

One hundred five ($N = 105$) participants were recruited from communication courses at a southeastern university. The majority of participants were women (75.70%), Caucasian (75.80%), and between the ages of 20 and 22 years old (86.70%), $M = 21.05$, $SD = 2.76$. Participants were evenly distributed across conditions.

Stimulus

Participants played a researcher-designed game called *Spare Change!* In this game, dollar bills and bombs fell from the top of the screen. The object of the game was to move the dollar signs into a "bank" bin and the bombs into a "trash" bin on the bottom of the screen. Participants read the following description of the game: "In this game you will have the chance to win gift cards for your favorite things! In order to earn the gift cards, you must guide falling dollar signs into the bank bin at the bottom of the screen. Different dollar signs are worth different values.

Also, make sure you throw bombs into the trash or they will decrease the money you have collected!" The dollar values that fell from the top of the screen were: $1, $5, $10, $20 and $50. The size of the dollar bill corresponded to the dollar amount ($1 was smallest, $50 was largest).[4]

Player performance was obscured to the participants by including more dropping dollar signs and bombs than the player could accurately keep track of (five per second), and by including descriptions of point calculations that made real time assessment difficult. Specifically, participants were told, "The prize you are working toward will randomly change during each level so you will accrue points toward all goals each time you play!" In a pretest with ten participants, this manipulation proved satisfactory as none of the participants could accurately decipher their score.

Feedback Type

In the customized feedback condition, players received feedback in the form of a performance summary page. The feedback contained information based on individual preferences of the player. Specifically, the feedback referenced the player's favorite restaurant, favorite store, favorite musician, among other things. For a template of the customized feedback performance summary page, see Appendix A. In the non-customized feedback condition, players received the same performance summary page with no individual differences acknowledged (see Appendix B). In the no-feedback condition, players played the game with no indication of their performance via performance summary page. Regardless of condition, game play mechanics remained identical.

Importantly, feedback was manipulated to control for differences in performance evaluation because different types of feedback carry different emotional value (Hattie &

[4] Importantly, participants could not actually win gift cards in this game but they participated in the experiment believing that it was a possibility.

Timperley, 2007; Reinecke et al., 2012). In this study, all participants—regardless of whether they were competent players or not—received an identically valenced performance evaluation. To do so, this study provided a vague performance evaluation that stated, "Your score makes you eligible to win a gift card…" By obscuring the point calculation and by including vague performance evaluation, participants were encouraged to perceive the performance summary pages as legitimate and accurate (even though they were experimentally manipulated).

It is worth noting, that another pretest was performed with 25 participants to ensure efficacy of the manipulation. Three items assessing *perceived customization* were used to check the efficacy of the manipulation. Example items included, "The feedback in the game is customized according to my preferences," and "The feedback in the game is unique to me." These items were measured on a 9-point Likert-type scale where 1 represented "strongly disagree" and 9 represented "strongly agree." These items demonstrated high reliability (α = .95).

This pretest demonstrated that participants perceived the customized feedback (M = 7.44, SD = 1.77) to be more "customized" than non-customized feedback (M = 3.40, SD = 2.25), $F(1, 22) = 23.31$, $p < .001$, $\eta^2 = .72$. One other item asked the participants to rate, in dollars, how much they perceived the prizes to be worth. Participants did not perceive the customized feedback prizes to be any more or less valuable than the non-customized feedback prizes. The equity in value in the main experiment was further facilitated by game instructions, which stated, "All gift cards will be redeemable for $100 of the designated prize."

Distraction

Participants in the high distraction condition memorized an eight-digit number while participants in the low distraction condition memorized a two-digit number (Drolet & Luce,

2004; Shiv & Huber, 2000; Ward & Mann, 2000). Numbers were generated using an online random number generator. The numbers can be found in Appendix C.

Procedure

Participants were randomly assigned to one of the six conditions. Based on procedures suggested by Kalyanaraman and Sundar (2006), a pre-questionnaire was issued to participants two weeks ahead of their participation in the main experiment to allow for feedback to be suitably customized to the individual. Specifically, participants filled out an online questionnaire for an ostensibly separate project. This questionnaire collected information on individual participants regarding their preferences. Once this data was collected, individual versions of the game were created for those randomly assigned to the customized feedback condition. The game was designed specifically for each participant such that when they entered their email address into the game, a unique version of the game was loaded for the player.

During the main experiment, participants played two levels of the game. Often, games are split into "levels" where different levels represent different challenges or sections of the game. This is a common practice for older games such as *Galaxian* and *Pac-Man* as well as newer games like *Mirror's Edge*, *Splosion Man*, and *Candy Crush Saga*. Using two levels allowed players to receive feedback from the game after level one but before level two. As a result, players continued playing the game after receiving feedback. In other words, feedback was delivered at the end of level one in order to inform performance on level two. Once participants completed level one and received feedback, they filled out a pencil and paper questionnaire that assessed the dependent variables (with the exception of game performance which was assessed with a measure of actual performance change on level two). Upon leaving the facility,

participants were fully debriefed regarding the nature of the experiment and the deception related to the game rewards.

Chief Dependent Variables

Attitude toward the game was measured with a scale adapted from Kalyanaraman and Sundar (2006). The scale included 11 items in which participants rated if they found the game to be: appealing, exciting, good, etc. These items were measured on a 7-point Likert-type scale where 1 represented "strongly disagree" and 7 represented "strongly agree." These items demonstrated high reliability ($\alpha = .95$).

Game performance was assessed through player score on level two. Level one served as a baseline measure of performance before the player received any feedback. Performance on level two was analyzed for improvement or decline in performance from level one. *Game performance* was assessed with two variables: cash collected and bombs collected. These were treated as distinct because they represent a "positive" behavior (collecting cash) and a "negative" behavior (ensuring bombs don't lower score) (Carver & Scheier, 2001; Ramaprasad, 1983). Importantly, participants' actual performance was not displayed to the player in order to control for valence of feedback, but their actual performance was recorded to a remote server to allow for analysis by the researcher.

Potential Mechanisms

Perceived relevance was also measured with a scale adapted from Kalyanaraman and Sundar (2006). Six items measured perceived relevance of the game. An example item was, "The game did not have anything to do with me or my life." These items were measured on a 7-point Likert-type scale where 1 represented "strongly disagree" and 7 represented "strongly agree." Items measuring perceived relevance demonstrated high reliability ($\alpha = .81$).

Motivation was assessed with a six-item scale adapted from Harter (1981). Sample items included, "I was invested in improving my score in the game," and, "I would have liked to keep trying to improve my score in the game." Items were measured on a 7-point Likert-type scale where 1 represented "strongly disagree" and 7 represented "strongly agree." These items also had high reliability ($\alpha = .91$).

Attention was measured with a scale adapted from Baer, Smith, and Allen (2004). Of the eight items, sample items included, "When I'm playing the game, I focus on the game, nothing else," and, "When I'm playing the game, my mind wanders off and I'm easily distracted (reverse coded)." Items were measured on a 7-point Likert-type scale where 1 represented "strongly disagree" and 7 represented "strongly agree." The eight item scale demonstrated low reliability ($\alpha = .52$). Consequently, a factor analysis was performed disregarding the established scale. The factor analysis revealed that two items had low factor loadings. Those items were not used when summing the other six items.[5] The remaining items exhibited high reliability ($\alpha = .83$).

Control Variables

A series of control measures were also included in the questionnaire. Namely, *gender, age, multitasking ability, game experience* and *perceived game skill* were assessed. These measures were included based on prior research on effects of videogame play (Boot, Kramer, Simons, Fabiani, & Gratton, 2008; Green & Bavelier, 2003; Okagaki & Frensch, 1996; Prensky, 2001). *Multitasking ability* was adapted from Xu (2008) and assessed with 3 items such as, "I am comfortable doing several activities at the same time." These items were measured on a 7-point Likert-type scale where 1 represented "strongly disagree" and 7 represented "strongly agree."

[5] Both items eliminated alluded to activities participants might rather be doing ("When I'm playing the game, part of my mind is occupied with other topics, such as what I'll be doing later, or things I'd rather be doing"). Since participation was not likely a desired activity, these responses might have reflected a desire to be doing something else, not attention.

These items demonstrated high reliability (α = .88). Participants were also asked to rate their *perceived game skill* on a 7 point Likert-type scale where 1 represented "not at all skilled" and 7 represented "highly skilled." *Game experience* was assessed by measuring how many hours per day participants played videogames.

The same scale used in the pretest assessing *perceived customization* was used to check the efficacy of the manipulation of the main experiment. However, these items were measured on a 7-point Likert-type scale instead of a 9-point scale where 1 represented "strongly disagree" and 7 represented "strongly agree." These items also demonstrated high reliability (α = .96).

For the distraction manipulation, at the end of the experiment participants were required to recall the digit string they were asked to memorize. If participants could not accurately recall the digit string then they were eliminated from analysis as this reflected a lack of dedicating cognitive resources to memorization and, ultimately, a lack of manipulation efficacy.

Strategy for Data Analysis

In order to assess the above hypotheses, preliminary ANOVAs and ANCOVAs were used to identify main effects of the independent variables on outcome variables. In order to assess H1, H2 and H3, one ANCOVA and two ANOVAs were run. Each had a different dependent variable, attitude toward the game, bombs collected and trash collected. Then, a MANCOVA was used to assess independent variables' impact on potential mediators. Both ANCOVA and MANCOVA were used because they allowed for group comparisons based on the experimental manipulations. These results from these tests determined which variables were included in more complex subsequent analyses of meditation for H4. Specifically, appropriate variables were entered into the PROCESS macro simultaneously to test for mediation (Hayes,

2012). All covariates were removed from the ANOVAs because they had no impact on the significance of results when game performance variables were entered as the outcomes.

Results

A one-way analysis of variance (ANOVA) revealed a statistically significant effect for the customized feedback manipulation, $F(2, 102) = 40.50$, $p < .001$, $\eta^2 = .44$. A follow-up post hoc analysis using a Bonferroni correction indicated that participants in the customized feedback condition ($M = 4.75$, $SD = 2.03$) perceived the videogame feedback to be significantly more ‘‘customized’’ than their counterparts in the non-customized feedback condition ($M = 2.14$, $SD = 2.04$, $p < .001$), and those in the no feedback condition ($M = 1.98$, $SD = .95$, $p < .001$). Since the no feedback and non-customized feedback conditions included no customized content there was no significant difference between those who received non-customized feedback and those who received no feedback.

In terms of the distraction manipulation, 11 participants were unable to accurately recall the digit string or recorded the digit string on a piece of paper. These participants were eliminated from analysis and were not included among the stated 105 participants.

The correlations between dependent variables were tested. Table 1 summarizes the correlations between potential mediators and outcomes. Based on the finding that the outcomes (attitude, cash collected and bombs collected) were unrelated, separate analyses were performed on each. This finding offers preliminary evidence that the performance behaviors are unrelated due to their positive/negative descriptions.

The ANCOVA was run with feedback type and distraction entered as fully crossed independent factors. Gender, age, race, multitasking ability, game experience and perceived game skill were included as covariates. Attitude toward the game was entered as the outcome. In

both ANOVAs, feedback type and distraction were entered as fully crossed independent factors. In one, cash collected was entered as the outcome variable and in the other, bombs collected was entered as the outcome variable.

H1 predicted that customized feedback would be more favorably perceived (in terms of increased positive attitudes and improved game performance) than would non-customized feedback. This hypothesis was partially supported as the ANCOVA revealed a main effect on attitude, $F(2, 102) = 9.66$, $p < .001$, $\eta^2 = .16$. A post hoc analysis using a Bonferroni correction revealed that participants in the customized feedback condition ($M = 3.64$, $SD = 0.92$) had significantly more positive attitudes toward the videogame than those in the non-customized feedback condition ($M = 2.85$, $SD = 1.12$, $p < .01$), and those in the no feedback condition ($M = 2.56$, $SD = 1.08$, $p < .01$). There was no significant difference between those who received non-customized feedback and those who received no feedback. However, the ANOVAs revealed no main effect of feedback type on performance for cash collected, ($F(2, 102) = 2.02$, $p = .21$, $\eta^2 = .03$, no feedback $M = .68$, $SD = 5.81$, non-customized feedback $M = -2.18$, $SD = 6.94$, customized feedback $M = -.95$, $SD = 6.05$), and bombs collected ($F(2, 102) = 0.67$, $p = .51$, $\eta^2 = .01$, no feedback $M = -2.29$, $SD = 8.06$, non-customized feedback $M = -.27$, $SD = 8.54$, customized feedback $M = -.55$, $SD = 7.44$).

The same series of analyses were used to assess H2. H2 predicted that playing while distracted would result in worse game performance and less positive attitudes toward the game than playing without distraction. This hypothesis was not supported. According to the ANCOVA, distraction had no significant main effect on attitudes toward the game, $F(1, 103) = 1.13$, $p = .29$, $\eta^2 = .01$, low distraction $M = 3.03$, $SD = 1.12$, high distraction $M = 2.94$, $SD = 1.15$). There were also no significant effects according to the ANOVAs testing cash collected

($F(1, 103) = .12$, $p = .73$, $\eta^2 = .00$, low distraction $M = -.61$, $SD = 6.94$, high distraction $M = -1.03$, $SD = 5.16$), and bombs collected ($F(1, 103) = .18$, $p = .67$, $\eta^2 = .00$, low distraction $M = -1.38$, $SD = 8.95$, high distraction $M = -.70$, $SD = 6.84$).

H3 predicted that distractions would impede the effects of non-customized feedback on positive attitudes and game performance but not customized feedback. The ANOVAs and ANCOVA did not support this hypothesis. There were no significant interaction effects when attitude was the outcome variable, $F(2, 99) = .57$, $p = .57$, $\eta^2 = .01$. Table 2 summarizes the means and standard deviations for H3 as related to attitude. There were also no significant interaction effects when game performance was the outcome variable, (cash collected $F(2, 99) = 1.04$, $p = .36$, $\eta^2 = .02$., bombs collected $F(2, 99) = 1.96$, $p = .15$, $\eta^2 = .04$). Table 3 and Table 4 summarize the means and standard deviations for H3 as related to game performance.

H4 predicted that the relationship between feedback type/distraction and game performance/attitude toward the game would be mediated by attention, motivation, and perceived relevance such that more attention, motivation and perceived relevance would result in more positive attitudes and more increased performance. In order to assess this hypothesis, a preliminary MANCOVA was employed. Feedback type and distraction were entered as independent factors. Motivation, attention, and perceived relevance were entered as dependent variables. Gender, age, race, multitasking ability, game experience and perceived game skill were included as covariates. This analysis revealed a significant multivariate effect of feedback type, $F(8, 136) = 4.22$, $p < .001$, Wilks' $\Lambda = .64$, $\eta_p^2 = .20$. There were no significant effects for distraction, $F(4, 68) = .99$, $p = .42$, Wilks' $\Lambda = .94$, $\eta_p^2 = .05$, nor were there significant interaction effects $F(8, 138) = 1.34$, $p = .23$, Wilks' $\Lambda = .86$, $\eta_p^2 = .07$. As for the ANCOVAs associated with this analysis, there were no significant effects for distraction nor were there

significant interactions between feedback type and distraction. There were, however, significant differences between feedback type conditions for means of motivation and perceived relevance in the predicted directions. Table 5 summarizes means and *F* values for the effects of feedback type on potential mediating variables.

Then, to more thoroughly test the role of potential mediating variables, the PROCESS macro (Hayes, 2012) was used for both attitude and game performance. To test this hypothesis related to attitude, model 4 (see Figure 1) using 2,000 bootstrap samples and 95% CI, was used. This tested for both direct and indirect effects from the independent variable (feedback type) on the outcome (attitude toward the game). Motivation and perceived relevance were entered as potential mediating variables. Gender, age, race, multitasking ability, game experience and perceived game skill were included as covariates. Distraction and attention were removed from the analysis since they yielded no significant effects in previous analysis. The indirect effects of feedback type on attitude were significant via motivation (point estimate = .17, Boot SE = .11, CI [.06, .34]), and perceived relevance (point estimate = .18, Boot SE = .08, CI [.04, .36]). Notably, there was no direct effect of feedback type on attitude when accounting for mediators.

The PROCESS macro (Hayes, 2012) was then used to assess H4 as related to game performance by implementing the same techniques described above (see Figure 2). However, game performance was entered as the outcome variable instead of attitude. Importantly, this was performed twice. Once for cash collected and once for bombs collected. Again, distraction and attention were removed from the analysis. There were no direct effects of the independent variable but there was an indirect effect of feedback type on game performance (bombs collected) via motivation (point estimate = 1.08, Boot SE = .53, CI [.25, 2.38]).

To summarize the results from Study 1, distraction had no significant effects. Customized feedback increased positive attitudes toward the game via perceived relevance and motivation. Also, customized feedback improved game performance in terms of bombs collected via increased motivation.

Discussion

Study 1 was implemented to assess the impact of customized feedback and distractions on game performance and attitude toward the game. This study also examined possible mechanisms underlying these effects.

H1 predicted that customized feedback would be more favorably perceived (in terms of increased positive attitudes and improved game performance) than would non-customized feedback. This hypothesis was supported in terms of the attitude measure but not the game performance measure. The fact that customized feedback improves attitudes is consistent with results from previous customization studies that have demonstrated how customization increases positive attitudes toward content (Ansari & Mela, 2003; Celsi & Olson, 1988; Kalyanaraman & Sundar, 2006; Noar et al., 2011; Rimer & Kreuter, 2006). Indeed, customized feedback was more effective in eliciting positive attitudes than non-customized feedback and no feedback. As for game performance, analysis revealed that there were no significant improvements or declines in performance between level 1 and level 2 regardless of condition. Although there may be many possible explanations for this, the most parsimonious one is that vague progress information left players unaware of how to calibrate their actions on level 2 in order to improve performance.

H2 was not supported. This hypothesis predicted that those distracted would have less positive attitudes toward the game and worse game performance than those not distracted. This finding is inconsistent with assumptions based on FIT (Kluger & DeNisi, 1996). While this

unexpected finding may have a number of explanations, it is possible the game was not demanding enough or interesting enough for the distraction manipulation to take effect.

H3 predicted interaction effects between feedback type and distraction on attitudes toward the game and game performance but there were no significant effects. This further indicates that the distraction manipulation was not effective in significantly altering the psychological outcomes measured in this study.

H4 predicted that the effects of customized feedback and distractions on attitudes and game performance would be mediated by motivation, perceived relevance, and attention. Specifically, it predicted that customized feedback would increase motivation, perceived relevance, and attention. Subsequently, higher levels of motivation, perceived relevance, and attention would lead to more positive attitudes toward the game and more improved performance. To begin, this section will discuss the direct effects of the experimental conditions on potential mediators before discussing the indirect effects.

Customized feedback positively impacted motivation and perceived relevance but not attention. When participants received customized feedback they were more motivated to pursue in-game goals. The personalized prizes presented to participants in the customized feedback condition likely prompted greater motivation to succeed in the game than generic prizes or a lack of prizes because the personalized prizes were exactly what the participants desired. The increased motivation in the customized condition suggests that the type of feedback implemented is critical to increasing motivation, not necessarily the mere act of receiving feedback.

In a similar vein, when feedback contained individualized content, participants perceived the content to be more relevant to them. Feedback might increase perceived relevance in other ways as well but customization is an effective strategy for generating perceived relevance for

users who are playing a new game.

Interestingly, feedback type had no impact on participants' attention levels. This finding runs in opposition to previous research on feedback and customization (e.g., Ansari & Mela, 2003; Hawkins et al., 2008; Kluger & DeNisi, 1996; Hattie & Timperley, 2007; Glanz et al., 2010; Rimer & Kreuter, 2006; Wheeler et al. 2005). Games—as a prime example of interactive media—may be more effective in capturing user attention than other types of media and thus uncovering significant effects may be more difficult.

To summarize the direct effects on potential mediators, customized feedback increased motivation and perceived relevance. As for indirect effects, the effect of feedback type on attitude was fully mediated by motivation and relevance. The direct effect was not significant. In other words, customized feedback resulted in more positive attitudes toward the game because players felt more motivated and perceived the game to be more relevant to them. So, receiving feedback increased positive attitudes but only insofar as it induced motivation and perceived relevance. The present data indicate that if game designers or communication scholars want to engender positive attitudes toward game content, feedback should be individualized and oriented toward increasing motivation and perceived relevance.

In terms of game performance, there were no mediation effects for perceived relevance. However, customized feedback had a positive impact on motivation, and increased motivation led to more improved performance in the game as related to bombs collected but not cash collected. There was no direct effect of customized feedback on bombs collected. Essentially, when people were more motivated to play well, they did, and customized feedback served as a source of motivation. In this instance, the increased motivation, likely derived from the preferred prizes, improved game performance. This finding illuminates the mechanism through which

feedback can improve game performance.

The fact that this relationship existed for bombs collected but not cash collected indicates that when feedback increased motivation, it may lead to enhancing certain types of performances but not others. In this case, the bombs lowered the players' scores and therefore presented a threat. When feedback was individualized, participants were more motivated to avoid negative outcomes (avoid having their score lowered with bombs) but not to pursue positive outcomes (collect cash). Indeed, when feedback relates to the self, people become more focused on self-protection goals (Baumeister, 1998; Kluger and DeNisi, 1996; Rogers, 1975; Wheeler et al., 2008). The findings in H4 fit this logic. When a player encountered customized feedback, he or she was reminded of the self and thus became protective of the self. This made negative outcomes more important to the player and helped them protect elements related to the self. Thus, customized feedback helped to improve performance related to preserving the self but not necessarily enhancing the self (collecting cash). This finding illuminates the importance of treating performance behaviors differentially.

While the findings from Study 1 help illuminate how feedback functions, the lack of findings are also suggestive. Specifically the lack of significant results related to distraction and attention are particularly puzzling. There is a wealth of literature that predicts clear differences between distracted users versus non-distracted users and the digit memorization task employed has been an effective manipulation in many previous studies (Drolet & Luce, 2004; Hattie & Timperley, 2007; Kluger & DeNisi, 1996; Lamble et al., 1999; Mayer & Moreno, 2003; Shiv & Huber, 2000; Ward & Mann, 2000). Perhaps there was an element in the videogame content or in the experience of playing the videogame that subsumed the distraction. Furthermore, no significant effects were observed with attention despite robust support in the literature (Ansari &

Mela, 2003; Glanz et al., 2010; Hattie & Timperley, 2007; Hawkins et al. 2008; Kluger & DeNisi, 1996; Rimer & Kreuter, 2006; Wheeler et al. 2005). Given the purpose of this dissertation, exploring the inconsistencies of feedback effects, and the lack of findings related to key elements (distraction and attention), it appears worthwhile to examine these elements more closely.

One characteristic of feedback that is generally accepted as beneficial is clear progress information (Connellan & Zemke, 1993, Fleming & Levie, 1993; Kluger & DeNisi, 1996). That is, feedback that includes progress information is more effective than feedback that does not include progress information. Indeed, if people can see how much they have progressed on a goal, they are likely to be more attentive. Also, if the primary task, in this case game play, is more capable of capturing attention then distractions have more potential efficacy (as opposed to if the primary task does not capture attention and there is nothing to effectively distract from). As such, the inclusion of progress information in feedback might aid in further exploration of these elements.

CHAPTER 3

STUDY 2

Given the purported importance of distraction on customized feedback, Study 2 reexamines distraction in concert with progress information. All participants in Study 2 received customized feedback.

In order to uncover effects of distractions, a different manipulation could be used. However, Study 1 employed a bona fide manipulation and one that has enjoyed considerable support in several studies (Drolet & Luce, 2004; Lamble et al., 1999; Mayer & Moreno, 2003; Shiv & Huber, 2000; Ward & Mann, 2000). Thus, altering the manipulation would not likely beget significant results. Another possibility is that something about the game experience in Study 1 dissipated the effects of distraction. Indeed, one of the principal attributes of effective feedback, progress information, was omitted from Study 1. Given the central role of progress information in feedback (Connellan & Zemke, 1993, Fleming & Levie, 1993; Kluger & DeNisi, 1996), its omission might be one reason the findings were lukewarm in Study 1. Examining distraction in concert with progress information may help uncover significant effects. Thus Study 2 examines the interplay of distraction and progress information.

Progress Information

Progress is movement toward a defined goal (Fishbach & Dhar, 2005; Hawkins, Lambert, Vermeersch, Slade, & Tuttle, 2004). Progress information, then, is a representation or communication of movement toward a goal. In the domain of new media, progress information

has been tied to notions of usability (Crystal & Kalyanaraman, 2004; Nielsen, 1998). Usability is broadly defined as the ease with which a system can be used (Nielsen, 2003). As such, progress information helps show users how to improve performance and, thus, makes the system simpler to use. With regard to feedback, progress information in feedback communicates the discrepancy between goal and performance (Ashby, 1956; Goetz, 2011; Carver & Scheier, 2001).

As for operationalizations, progress information can take a variety of shapes (Nielsen 1998). For example, a meter that fills to indicate how much of a file has downloaded would be considered progress information. The display of distance traveled on a road trip via GPS or odometer would also be considered progress information.

In empirical studies, progress information has also taken diverse shapes. Progress information has been varied by presentation speed (Card, Robertson, & Mackinlay, 1991; Miller 1968) and method of presentation (Hawkins et al., 2004). Progress information displays have also been varied by percent-done indication (Myers, 1985), the amount of completion displayed, or ambiguous signs of advancement like a spinning ball or moving disc (Nielsen, 1998).

In videogames, progress information is given to players when they succeed or fail in order to help them confirm their actions or correct their missteps (Gee, 2005; Juul, 2010). Videogames implement a wide range of progress information as well. Role-playing games award players with experience points that allow them to "level up" their characters. This is often presented as a fraction (10,000/40,000 experience points) like in *World of Warcraft*. Players are also allowed to advance their character using a "skill tree" where progress on one "branch" works toward allowing access to other branches, as seen in *Borderlands* and *Dead Island*. In other cases, progress is denoted with meters that fill when specific actions meet goals like in

Gears of War: Judgment and *Halo 4*. In any case, progress information is ubiquitous in videogames.

Effects of Progress Information

In the feedback literature, progress information has been deemed critical to increasing positive attitudes and improving performance (Connellan & Zemke, 1993, Fleming & Levie, 1993; Kluger & DeNisi, 1996). Indeed, receiving progress information is pleasant (Gee, 2005) and helps to reduce frustration and confusion (Ramsay, Barbesi, & Preece, 1998). These findings have been consistent across domains such as health communication (Hawkins et al., 2004) and education (Schunk & Swartz, 1993).

Most notably, progress information varies in terms of level of advancement communicated such that different levels of progress should impact performance on tasks and attitudes toward content differentially. Particularly, progress information that indicates little movement toward a goal can makes users feel that a task is difficult and therefore engenders negative attitudes and impedes task performance (Huang & Zhang, 2011). On the other hand, progress information that suggests imminent goal completion encourages the perception that the task can be easily and effortlessly accomplished (Fishbach & Dhar, 2005). Thus, it seems reasonable to expect that progress information should differ whether it indicates high progress, low progress, or moderate progress.

Mechanisms of Progress Information

When considering the nuances, the effects of progress information have largely been explained through motivation and self-esteem. The motivation to pursue goals increases and decreases based on the progress information presented (Zhang & Huang, 2010). Not surprisingly,

high motivation is tied to improved performance on goals and more favorable attitudes toward content while low motivation is linked to worse performance and less favorable attitudes.

Progress information also impacts performance and attitudes through self-esteem (Hattie & Timperley, 2007; Schunk & Pajares, 2002). If people are told they have done well (made considerable progress), they will feel better about themselves. The inverse is also accurate. Accordingly, those experiencing low (high) self-esteem will harbor negative (positive) attitudes toward content and have less (more) improved performance (Hattie & Timperley, 2007; Schunk, 1991; 1995). Moreover, those experiencing high self-esteem demonstrate more persistence on tasks, which should further improve task performance (Baumeister, 1998; Schunk, 1995).

In summary, information that indicates high progress increases motivation and self-esteem. Increased motivation and self-esteem should presumably lead to improved performance and favorable attitudes toward content. However, the variability of progress information has generally been omitted from feedback research. Accounting for different levels of progress may help better comprehend the role of customized feedback and distractions while shedding further light on the findings observed in Study 1. Importantly, studies should include more than two levels of progress information as an inverted U pattern has been suggested for these effects (Fishbach & Dhar, 2005)

Distractions and Progress Information

Feedback that includes progress information is not likely a panacea for distractions (Brasel & Gips, 2011). But the negative effects of distraction should be blunted when feedback indicates high progress because it is more motivating and increases self-esteem. However, if progress information indicates low progress and lowers motivation and self-esteem, the effects of distraction might be strengthened.

Hypotheses

Based on the preceding review, the following hypotheses are proposed. First, in order to more fully explore the influence of distractions alongside customized feedback, this study reexamines H2 with progress information included in feedback.

Next, feedback indicating high levels of progress should improve performance and increase positive attitudes toward the game.

H5: Progress information that indicates a high level of progress will be more favorably perceived (in terms of increased positive attitudes and improved game performance) than progress information that indicates a lower level of progress.

Interaction effects were also tested. Specifically, the following hypothesis tests how progress information might make the effects of distraction more or less pronounced.

H6: The deleterious effects of distraction on positive attitudes and game performance will be heightened when users receive progress information indicating low progress but not when users receive progress information indicating high progress.

Lastly, this study examines how the effects of progress information and distractions are mediated by attention, motivation, self-esteem and perceived relevance.

H7: The relationship between progress information/distraction and game performance/attitude toward the game will be mediated by attention, motivation, self-esteem, and perceived relevance such that more attention, motivation, self-esteem, and perceived relevance will result in more positive attitudes and more increased performance.

Method

This study examined how customized feedback functioned while users were distracted and received varying levels of progress information. The design implemented was a 2 (distraction: low and high) x 4 (progress information: no progress information, low progress, medium progress, high progress) factorial experiment.

Participants

One hundred thirty-nine (N = 139) participants were recruited from the same pool as the first study. The majority of participants were women (82.00%), Caucasian (83.50%), and between the ages of 19 and 22 years old (95.70%), M = 20.53, SD = 1.10. Participants were evenly distributed across conditions.

Stimulus

The stimulus was the same as in Study 1 with two exceptions. First, all participants received customized feedback.

Second, a manipulation of progress information was included. The operationalization of progress information was based on previous studies on goals and goal pursuit (Fishbach & Dhar, 2005; Huang & Zhang, 2011) as applied to videogames that employ performance summary pages. In the "no progress information" condition participants received no information on their progress toward the game goal (similar to Study 1). In the low, medium, and high progress conditions participants were told they had completed 20%, 50% or 80% of the game goal, respectively. These values were pretested prior to the experiment with 25 participants. Three items based on Fishbach and Dhar (2005) and Huang and Zhang (2011) were used to evaluate *perceived progress*. Items were measured on a 9-point Likert-type scale where 1 represented "strongly disagree" and 9 represented "strongly agree." Sample items included, "I have made a

lot of progress toward the game goal." This scale demonstrated high reliability (α = .92) and there were significant differences between groups, $F(2, 23) = 55.42$, $p < .001$, $\eta^2 = .85$. According to a post hoc analysis using a Bonferroni correction, those receiving high progress information ($M = 8.00$, $SD = 1.00$) perceived more progress toward their goal than those receiving low progress information, ($M = 2.37$, $SD = .92$, $p < .001$) and medium progress information ($M = 4.75$, $SD = 1.16$, $p < .001$). Likewise, those in the low progress condition perceived less progress than those in the medium progress condition ($p < .01$).

Importantly, progress information was displayed based on assigned condition, not based on the players' actual performance. As described previously in Study 1, actual performance was obscured to the player but recorded to a remote server for analysis by the researcher. Regardless, participants were led to believe the manipulated progress information accurately reflected their performance.

Procedure

Participants were randomly assigned to one of the eight conditions. The rest of the procedure was similar to Study 1.

Chief Dependent Variables

Both of the principal dependent variables, game performance and attitude toward the game, were the same as employed in Study 1. The attitude scale demonstrated high reliability (α = .95).

Potential Mechanisms

The perceived relevance, motivation, and attention measures were also the same as in Study 1. Both perceived relevance and motivation displayed high reliability (α = .86 and .90, respectively). The eight-item scale measuring attention demonstrated low reliability (α = .48),

likely for the same reasons detailed above. Consequently, a factor analysis was performed and revealed two items had low factor loadings. Those items were removed when summing the other six items. The remaining items exhibited moderate reliability ($\alpha = .78$).

Self-esteem was added to the analysis. Rosenberg's (1965) 10-item scale was used to assess *self-esteem*. Items were measured on a 7-point Likert-type scale where 1 represented "strongly disagree" and 7 represented "strongly agree." Sample items included, "I feel that I have a number of good qualities" and "I feel I do not have much to be proud of (reverse coded)." The self-esteem scale demonstrated high reliability ($\alpha = .88$).

Control Variables

All of the control variables from Study 1 were included in Study 2.

For a manipulation check, the *perceived progress* scale described in the pretest was used but for the main experiment items were measured on a 7-point Likert-type scale where 1 represented "strongly disagree" and 7 represented "strongly agree." This scale demonstrated high reliability ($\alpha = .89$).

Strategy for Data Analysis

The strategy for Study 2 was the same as Study 1.

Results

A one-way analysis of variance (ANOVA) revealed a statistically significant effect for the progress manipulation, $F(3, 130) = 4.06$, $p < .01$, $\eta^2 = .09$. A follow-up post hoc analysis using a Bonferroni correction indicated that participants in the low progress condition ($M = 2.78$, $SD = 1.46$) perceived significantly less progress than those in the medium progress condition ($M = 3.38$, $SD = 1.35$, $p < .05$) and those in the high progress condition ($M = 3.64$, $SD = 1.59$, $p <$

.05). Those in the medium progress condition had lower perceptions of progress than those in the high progress condition ($p < .05$). The no progress information was omitted from this analysis.

As for the distraction manipulation, 9 participants were unable to accurately recall the digit string. These participants were eliminated from analysis and were not included among the stated 139 participants.

The correlations between dependent variables were tested. Table 6 summarizes the correlations between potential mediators and outcomes. Once again, outcomes (attitude, cash collected and bombs collected) were unrelated, so separate analyses were performed on each outcome. Again, this finding offers evidence that the performance behaviors are unrelated due to their positive/negative descriptions.

In order to assess H2, H5, and H6, one ANCOVA and two ANOVAs were run. The ANCOVA was run with progress information and distraction entered as fully crossed independent factors. Gender, age, race, multitasking ability, game experience and perceived game skill were included as covariates. Attitude toward the game was entered as the outcome. In both ANOVAs, progress information and distraction were entered as fully crossed independent factors. In one, cash collected was entered as the outcome variable and in the other, bombs collected was entered as the outcome variable. All covariates were removed from the ANOVAs because they had no impact on the analyses.

H2 predicted that playing while distracted would result in worse game performance and less positive attitudes toward the game than playing without distraction.

There were no effects of distraction on attitude toward the game according to the ANCOVA, $F(1, 120) = .06$, $p = .81$, $\eta^2 = .00$, low distraction $M = 3.20$, $SD = 1.08$, high distraction $M = 3.06$, $SD = 1.19$. After running the ANOVAs on game performance, there was no significant

difference for bombs collected, $F(3, 131) = .71$, $p = .40$, $\eta^2 = .00$, low distraction $M = -1.44$, $SD = 7.73$, high distraction $M = -.46$, $SD = 6.55$. But there was a significant difference for cash collected, $F(1, 133) = 4.22$, $p = .04$, $\eta^2 = .03$. Importantly, the means were in the opposite direction of what was predicted such that those experiencing low distraction played worse ($M = -6.12$, $SD = 14.55$) than those experiencing high distraction ($M = -1.66$, $SD = 13.24$).

H5 predicted that progress information that indicates a high level of progress would be more favorably perceived (in terms of increased positive attitudes and improved game performance) than progress information that indicates a lower level of progress. The ANCOVA revealed that progress information did have a significant effect on attitude toward the game, $F(3, 133) = 3.14$, $p < .05$, $\eta^2 = .07$. However, a follow-up post hoc analysis using a Bonferroni correction revealed a different pattern from what was predicted. Participants in the "no progress information" condition ($M = 3.64$, $SD = 0.92$) had significantly more positive attitudes toward the videogame than those in the low ($M = 2.98$, $SD = 1.16$, $p < .05$), medium ($M = 2.91$, $SD = 1.16$, $p < .05$) and high ($M = 3.01$, $SD = 1.15$, $p < .05$) progress conditions. The other conditions did not differ significantly.

The ANOVAs revealed there were no main effects on game performance for cash collected or bombs collected (cash collected, $F(3, 133) = 1.35$, $p = .26$, $\eta^2 = .03$, no ($M = -.95$, $SD = 6.05$), low ($M = -.31$, $SD = 5.09$), medium ($M = -2.29$, $SD = 5.43$) and high ($M = .03$, $SD = 5.42$,), or bombs collected $F(3, 131) = 1.26$, $p = .29$, $\eta^2 = .03$, no ($M = -.55$, $SD = 7.44$), low ($M = .50$, $SD = 6.81$), medium ($M = -2.44$, $SD = 6.29$) and high ($M = -1.20$, $SD = 7.91$).

H6 explored interaction effects between progress information and distractions on attitude and game performance. The ANCOVA revealed no significant results, $F(3, 129) = .24$, $p = .87$, $\eta^2 = .01$. Table 7 summarizes the means and standard deviations for H6 as related to attitude.

ANOVAs for game performance revealed no significant interactions for cash collected, $F(3, 131) = 1.41$, $p = .24$, $\eta^2 = .03$, or bombs collected, $F(3, 131) = 1.27$, $p = .29$, $\eta^2 = .03$. Table 8 and Table 9 summarize the means and standard deviations for H6 as related to game performance.

H7 tested how the effects of progress information and distraction on attitude toward the game and game performance were mediated by motivation, attention, perceived relevance, and self-esteem. In order to assess this, a preliminary MANCOVA was employed. Progress information and distraction were entered as independent factors and motivation, attention, perceived relevance, and self-esteem were entered as dependent variables. Gender, age, race, multitasking ability, game experience and perceived game skill were included as covariates. This analysis revealed a multivariate effect of progress information that approached significance, $F(12, 333) = 1.68$, $p < .07$, Wilks' $\Lambda = .86$, $\eta_p^2 = .05$. There were no significant effects for distraction, $F(4, 126) = 1.00$, $p = .42$, Wilks' $\Lambda = .97$, $\eta_p^2 = .03$, and there were no significant interaction effects $F(12, 309) = .95$, $p = .92$, Wilks' $\Lambda = .48$, $\eta_p^2 = .02$.

The ANCOVA results related to progress information associated with this analysis are summarized in Table 10. Progress information only had a significant effect on perceived relevance. Distraction yielded effects on attention, $F(1, 136) = 2.29$, $p < .05$, $\eta^2 = .02$, and self-esteem, $F(1, 137) = 3.64$, $p < .05$, $\eta^2 = .05$). Those in the low distraction condition paid more attention ($M = 4.85$, $SD = 1.14$) and had more self-esteem ($M = 6.00$, $SD = .90$) than those in the high distraction condition (attention: $M = 4.51$, $SD = 1.06$, esteem: $M = 5.76$, $SD = .86$).

The PROCESS macro (Hayes, 2012) was used to test the role of potential mediating variables using the same techniques detailed in H4. However, model 8 was used instead of model 4 to allow for the inclusion of distraction as an independent variable (see Figure 3). Distraction was included despite the non-significant MANCOVA findings in order to fully explore the

previous unexpected findings related to performance. As such, the independent variables were progress information and distraction. The outcome variable was attitude. Gender, age, race, multitasking ability, game experience and perceived game skill were included as covariates. Attention, perceived relevance, and self-esteem were included as potential mediators. Motivation was removed from analysis as it demonstrated no significant results. Results indicated that progress information had a direct effect on attitude (point estimate = -.16, Boot SE = .07, $p < .05$) but there were no indirect effects for any of the mediators. There were no direct or indirect effects of distraction on attitude.

In order to test game performance outcomes, the previously described analysis using the PROCESS macro (Hayes, 2012) was used again with progress information and distraction entered as independent variables. Game performance was entered as the outcome variable and attention, perceived relevance, and self-esteem were entered as mediators (see Figure 4). Again, this analysis was performed twice, once for cash collected and once for bombs collected. There were no direct effects of the independent variables but there was an indirect effect of distractions on cash collected via attention (point estimate = .11, Boot SE = .08, CI [.01, .35]).

In summary, the "no progress information" condition positively impacted attitudes toward the game directly and distraction resulted in more improved performance related to cash collected via attention. These findings were in the opposite direction of what was predicted.

Discussion

Study 2 was implemented to assess the impact of progress information and distraction on game performance and attitude toward the game.

The results of H2 in Study 1 were partially replicated in Study 2 such that distraction, once again, had no impact on attitude toward the game. Distraction, while playing this game, was

not linked to positive attitudes across two studies. Overall, the game did not receive positive evaluations as participants ranked the game as low quality ($M = 2.15$, $SD = 1.08$). As a result, the addition of a distraction may not have been capable of lowering positive attitudes that were already meager.

However, the results in Study 2 differed from those in Study 1 as those experiencing low distraction had a steeper decline in performance from level one to level two than those experiencing high distraction. Of course, this finding was only observed for the "cash collected" measure and not for the "bombs collected" measure. One possible explanation is that high distraction may have distracted from negative cognitions about the game. That is, high distractions may have prevented players from dwelling on aspects of the game they found unsatisfactory and, instead, encouraged them to focus on performing the primary game task. Notably, participants' performance decreased in both conditions but there was less of a decrease for those experiencing high distraction. Thus, the effects of distraction on task performance may actually be inverted when the primary task is not viewed positively.

The fact that this relationship was found for cash collected but not bombs collected implies that players were perhaps more likely to adhere to positive behaviors rather than negative behaviors under conditions of high distraction. When players were highly distracted, they likely did not think much about the game and were more likely to follow the games instructions on "auto-pilot" (Csikszentmihalyi, 1990; Lewis & Linder, 1997). Positive behaviors, like collecting cash in this game, might qualify as "thoughtless tasks" that benefit from distractions and other tasks that require more thought, like behaviors to prevent negative outcomes, do not benefit from distractions.

Analysis for H5 revealed that those in the "no progress information" condition had more favorable attitudes toward the game than those in any of the other progress conditions. Interestingly, feedback literature suggests that clear progress information is superior to a lack of progress information (Connellan & Zemke, 1993, Fleming & Levie, 1993; Kluger & DeNisi, 1996). However, these findings show that "no progress" information might have advantages over clear progress information. This finding is not completely original as it has been noted in other studies (Schunk, 1990; Soman & Shi, 2003) but it does indicate that progress information might elicit positive attitudes differently when it is presented in different contexts. In this case, it is possible that progress information made game play more task-oriented as opposed to entertainment-oriented, which diminished attitudes toward the game. Or it is possible that progress information, regardless of how much or how little progress was displayed, communicated failure to the participant while the "no progress" condition did not.

H5 also revealed that progress information had no main effect on game performance. This further challenges the claim that clear progress information is more effective than the lack of progress information (Connellan & Zemke, 1993, Fleming & Levie, 1993; Kluger & DeNisi, 1996). Again, this highlights the need to explore different types of progress information in different contexts. These considerations could help to explain inconsistent effects of feedback.

H6 revealed no significant interaction effects. There was no interplay between progress information and distraction. This suggests that the impact of progress information and distraction on the outcome variables do not depend on one another.

H7 explored how the effects of progress information and distraction on attitude toward the game and game performance were mediated by motivation, perceived relevance, attention

and self-esteem. Before the mediation effects are discussed, the effects of the independent variables on potential mediators are detailed.

Analysis on potential mediators revealed that progress information only had a significant effect on perceived relevance, not on motivation, attention or self-esteem. Perceived relevance was significantly lower for those in the medium progress condition than those in the no and low progress conditions. Thus, different levels of progress prompt different feelings of relevance. When progress was low, it conveyed to players that they needed to improve. Perhaps progress information indicating low progress was more relevant because it more clearly provided guidance on how to play the game.

The same analysis on potential mediators revealed that distractions had a significant effect on self-esteem and attention. Specifically, those who were less distracted had higher self-esteem and paid more attention to the game.

As for the tests of mediation, progress information had a direct effect on attitude but there were no indirect effects through any of the mediators. This suggests that the impact of progress information on attitude was not explained by motivation, perceived relevance, attention or self-esteem.

In terms of game performance, there were no direct effects of the independent variables on game performance, but there was an indirect effect of distraction on cash collected via attention. In other words, distraction impacted the amount of attention a player committed to the game. That level of attention impacted the performance in terms of cash collected. However, this effect showed that lower attention, not greater attention, enhanced performance. This shows that lack of attention might be beneficial in certain instances.

CHAPTER 4

GENERAL DISCUSSION

To date, feedback research has been hampered by inconsistencies such as varying/conflicting effects, incongruent operational definitions, and a lack of a strong theoretical foundation (Carver & Scheier, 2001; Diclemente et al., 2001; Hattie & Timperlay, 2007; Kluger & DeNisi, 1996; Ramaprasad, 1983). As such, the purpose of this dissertation was to introduce a possible explanation of these inconsistencies by examining the nuances of customized feedback in the domain of videogames.

Theoretical Contributions

Perhaps the most central finding in this study was that customized feedback was superior to other forms of feedback. Customized feedback improved performance and invoked more positive attitudes compared to non-customized feedback and no feedback. Although the importance of individualized content within feedback has been vaguely alluded to in the literature (Glanz et al. 2010; Hattie & Timperley, 2007; Hawkins et al., 2008; Kluger & DeNisi, 1996), this assumption has not received much empirical examination. This dissertation demonstrated that when feedback addressed users as inimitable individuals, as opposed to just offering segmented performance evaluation, it was more effective. In this case, customizing prizes was an effective way to implement tailored feedback.

In terms of customization, this dissertation introduced and tested customization in a new domain, feedback. Prior to this, feedback was relatively untouched by customization but

evidence here shows that feedback is a new and effective method of delivery for customized content. Feedback, by nature, provides an avenue for customized content to be more directly influential on users' attitudes and behaviors. This finding, hopefully, will usher in new strategies for administering customized content.

This dissertation also explored the mechanisms underlying customized feedback. Specifically, attitudes were enhanced because of greater perceptions of relevance and motivation, while performance was improved due to heightened motivation. This shows that feedback was capable of functioning through these mechanisms but only when it was customized.

While Study 1 clearly demonstrated the benefits of customized feedback, the influence of distractions was somewhat tepid. This was surprising as the feedback literature suggests that distractions are a major barrier to the effects of feedback (Drolet & Luce, 2004; Hattie & Timperley, 2007; Kluger & DeNisi, 1996; Lamble et al., 1999; Ward & Mann, 2000). Throughout this dissertation, distractions had no impact on attitude. It is possible that distractions are not linked to attitudes in videogames but it is more probable that attitudes toward the game were not influenced significantly by distraction because participants generally did not have positive attitudes toward the game (so a distraction could not suitably alter that attitude). In terms of game performance, when the effects of distractions were manifested, they were unexpected. Distractions actually enhanced game performance through decreased attention, contrary to predictions based on existing literature (Drolet & Luce, 2004; Lamble et al., 1999; Ward & Mann, 2000). This finding eludes existing theoretical explanation but one speculation may be that certain videogame tasks, like in the game used here, benefit from distraction. Distractions might have reduced negative thoughts about the game and let the player "pass the time" rather than focus on it (Lewis & Linder, 1997). This unexpected finding further explains the

inconsistencies found in feedback research and also warrants future inquiry such that distractions might function in certain types of games differently than they do in other domains.

Expanding on findings in Study 2, progress information impacted attitudes but not game performance. However, the impact of progress information on attitude was not in the expected pattern (Fishbach & Dhar, 2005; Huang & Zhang, 2011). In fact, customized feedback that included progress information diminished positive attitudes toward the game. This finding implies that progress information is not necessarily as critical to the efficacy of feedback as indicated by previous research (Connellan & Zemke, 1993, Fleming & Levie, 1993; Kluger & DeNisi, 1996). In this case, progress information may actually be detrimental in certain domains. While this a decidedly post-hoc explanation, it points to another possible explanation of inconsistent effects of feedback.

Another contribution of this dissertation was the parsing of "positive/negative" behaviors. To date, feedback has been divided based on positive and negative performance evaluations (Carnagey & Anderson, 2005; Carver & Scheier, 2001; Hattie & Timperlay, 2007; Ramaprasad, 1983; Reinecke et al., 2012). Instructions/descriptions of behaviors before feedback has been received have not been afforded the same consideration. This study provided evidence that effects vary based on whether a behavior was described as approaching a positive outcome or avoiding a negative outcome before feedback was received. Furthermore, improvement on positive behaviors was predicted by different factors than improvement on negative behaviors. Positive behaviors were positively predicted by decreased attention brought about by distraction. Negative behaviors were positively predicted by motivation brought about by customized feedback. In turn, this dissertation offers a theoretical contribution regarding conceptualization

and operationalization of performance behaviors as "positive/negative" as well as another systematic explanation for inconsistencies in feedback studies.

In summary, this dissertation examined and found evidence for inconsistencies in feedback literature. Second, it demonstrated how feedback functions and emphasized the importance of individualized content in feedback. Third, it demonstrated an effective form of customization and explored its underlying mechanisms. Fourth, it demonstrated unexpected findings related to progress information and distractions. Lastly, this dissertation provided evidence for treating "positive" and "negative" behaviors differently.

Practical Implications

The findings in this dissertation should inform industry practices. Indeed, it is in the benefit of videogames, like health games, learning games, and commercial games, as well as other new media platforms such as websites for non-profit organizations, to engender positive attitude and elicit desired behaviors. Regardless of the platform, the use of customized feedback is advised.

In a non-game setting, such as a non-profit website soliciting volunteers, customized feedback could be used to improve attitudes toward the cause and perhaps increase volunteer rates. Implementing customized feedback in this context requires a bit more creativity but it is not impossible. The site could provide feedback on current or potential volunteers behaviors on the site. Then, customized feedback could contextualize the organization's goals within player's personal goals. For example, the user might have a weight loss goal and the volunteering behaviors could be frame as good exercise. Or the customized feedback could present the performance such that it shows users their individual impact in their own neighborhoods.

When implementing customized feedback, content producers should focus on motivational elements and content that will increase perceptions of relevance because motivation and perceived relevance mediated the relationship between customized feedback and positive attitudes/performance of behaviors. Motivational strategies could include encouragement, praise, or direction. In order to improve perceptions of relevance, content producers could make feedback resonate with users by including things like user name, friends' names, location, and preferences.

Content producers would also be advised to describe "negative" behaviors instead of "positive" behaviors as effects of customized feedback were only manifested on "negative" behaviors. This means that content producers may consider framing desired behaviors as preventing threats or as something that should be avoided. For example, a website soliciting volunteers might say, "(Name), don't let the families in (user's hometown) go hungry!"

Limitations

As with most experimental studies, there are numerous limitations that deserve to be pointed out.

The sample was comprised of mostly female, undergraduate college students. This group was largely unfamiliar with videogames and some participants complained that the game was difficult to control. This complaint occurred despite the game being deliberately designed to be easy and intuitive to control. The game only required participants to click and drag a mouse—a motion familiar to most people who regularly use personal computers. As a result, this difficulty of control likely speaks more to a lack of familiarity with games than an inability to use a mouse. In light of these characteristics of the sample, it is possible that other samples would react differently to the stimuli.

Furthermore, some participants may have ignored the game's instructions. Other than the researcher monitoring the lab to ensure participants were playing in earnest, there was no other check in place for this.

As for limitations in the stimulus, this study only addressed one method of customization, a very specific type of game, a certain type of progress information, and a short duration of play time. The results from this study might have been different had a different implementation of these factors been used. Given the wide range of games, type of progress information, and types of customization, as well as the lab setting, questions of generalizability can be raised.

Expanding on this, gameplay was stopped to allow participants time to respond to self–report measures in order to sufficiently test for mediation effects. This did not accurately simulate a true game play experience but was minimized by taking measures during a programmed break between levels.

In terms of measures, some participants noted that the self-esteem scale was awkward or uncomfortable. While there were effects for self-esteem, they may have been stronger without these apprehensions. Also, people generally disliked the game. A mood measurement might have been helpful as the game may have served as a negative mood induction. A mood measurement was not initially included because the level of distaste for the game was not anticipated. Lastly, a measure of involvement might have helped explain the unanticipated results for progress information and distractions or perhaps moderated relationships in Study 1.

Suggestions for Future Research

In addition to the suggestions already mentioned above, the findings of this dissertation raise interesting questions and offer viable opportunities for future research,

One speculation is that, compared to feedback that is not individualized, customized feedback conveyed a more heightened sense of meaningful dialogue and hence was rated as more influential. This would be a fruitful area for future research. Of course, it is possible for non-customized feedback to be meaningful to users so long as the feedback resonates with the user in some way. It is worth exploring if users who partake in low involvement tasks generate meaningful dialogue between themselves and the interface when they encounter customized feedback.

Also, the unexpected findings in this dissertation lead to speculation on a series of compelling questions. First, this study did not find strong evidence that attention was critical to effects of feedback despite the fact that the role of attention in feedback is well documented (Glanz et al. 2010; Hattie & Timperley, 2007; Hawkins et al., 2008; Kluger & DeNisi, 1996). In light of this, further exploration of the nuances of attention in feedback would be valuable.

Second, given the unexpected findings related to progress information and distraction, a measure of involvement might help explain some of the results of this dissertation. Broadly, the role of involvement in feedback research should be explored in conjunction with distractions and progress information.

Third, theoretical explanations of the effects (or lack thereof) related to distraction are evasive. The findings regarding distraction and attitude/performance beg the question: would distraction alter attitude and improve performance if the game were more liked by participants? It is possible that the effects found in this study are explained through negative attitudes toward the game. Similarly, why did distraction elicit a significant effect in Study 2 but not in Study 1? One possible explanation is that the feedback in Study 2, by including progress information,

made the cognitive burden of playing the game more strenuous and thus helped bring forth distraction effects. These suppositions merit sustained empirical investigation.

Fourth, the "no progress information" condition improved attitudes contrary to a largely consistent body of literature predicting otherwise. This invites investigation into how progress information functions differently under different conditions.

Lastly, the prize offering in this study was deceitful and incorporated items external to the game. Future research should explore the rewards intrinsic to game play versus extrinsic rewards like the ones used in this study.

Conclusion

In conclusion, this dissertation provides evidence that customized feedback is superior to non-customized feedback and no feedback while also exploring the mechanisms underlying customized feedback. In doing so, this dissertation highlights possible explanations of inconsistencies within feedback literature. The first study directly compared no feedback, non-customized feedback and customized feedback under varying levels of distraction. The second study examined how distractions and varying levels of progress information altered the effects of customized feedback. Significant, yet unexpected, results were found for both progress information and distractions. As such, this dissertation calls for more thorough research on feedback and customization in order to provide a more clear picture of the concepts.

Table 1.
Correlations between dependent measures for Study 1.

Measure	Motivation	Attention	Perceived Relevance	Attitude	Cash	Bombs
Motivation		.33*	.40**	.61**	-.10	.11
Attention			.16	.28*	-.10	-.01
Perceived Relevance				.50**	-.09	.04
Attitude					-.10	.03
Cash Collected						-.03
Bombs Collected						

Note: *p < .05. ** p < .001

Table 2.

Summary of means and standard deviations for H3 with attitude as the outcome variable.

Cognitive Load	Feedback Type		
	No Feedback	Non-Customized	Customized
Low	2.64(1.11)	3.11(1.18)	3.61(.83)
High	2.39(1.05)	2.62(1.04)	3.67(1.02)

Table 3.

Summary of means and standard deviations for H3 for cash collected.

Cognitive Load	Feedback Type		
	No Feedback	Non-Customized	Customized
Low	1.21(5.56)	-3.42(7.82)	-.46(7.34)
High	-.43(6.39)	-1.08(4.85)	-1.39(4.87)

Table 4.

Summary of means and standard deviations for H3 for bombs collected.

Cognitive Load	Feedback Type		
	No Feedback	Non-Customized	Customized
Low	-3.38(8.26)	1.76(9.81)	-1.60(8.61)
High	-.01(7.45)	-2.08(7.00)	.37(6.36)

Table 5.

Summary of means and F values for feedback type on potential mediating variables in Study 1.

Dependent Variables	Feedback Type			*F*	η^2
	No Feedback	Non-Customized	Customized		
Motivation	3.76(1.45)[a]	4.02(1.25)[a]	4.93(1.19)[b]	8.40**	.12
Attention	4.52(.83)	4.59(.68)	4.76(.71)	.81	.02
Perceived Relevance	2.05(.91)[a]	2.55(.92)[a]	3.54(1.03)[b]	19.36**	.30

Note: Higher scores indicate more positive perceptions. Comparisons between means, specified by lowercase superscripts, are horizontal only. Cell means that do not share a letter in their superscripts differ at $p < .05$ according to Bonferroni. *$p < .05$. ** $p < .001$.

Table 6.
Correlations between dependent measures for Study 2.

Measure	Motivation	Attention	Perceived Relevance	Self-Esteem	Attitude	Cash	Bombs
Motivation		.45**	.40**	.15	.54**	-.21*	-.03
Attention			.25*	-.13	.27*	-.15	-.13
Perceived Relevance				-.05	.52**	-.14	-.08
Self-esteem					-.06	.05	-.01
Attitude						-.09	-.08
Cash Collected							.04
Bombs Collected							

Note: *p < .05. ** p < .001

Table 7.

Summary of means and standard deviations for H6 with attitude as the outcome variable.

Cognitive Load	No Progress	Low Progress	Med Progress	High Progress
Low	3.61(.83)	3.18(1.11)	3.01(1.09)	3.03(1.20)
High	3.74(1.01)	2.80(1.20)	2.83(1.23)	2.98(1.13)

Table 8.

Summary of means and standard deviations for H6 with cash collected as the outcome variable.

Cognitive Load	No Progress	Low Progress	Med Progress	High Progress
Low	-1.60(5.56)	-3.42(7.82)	-.46(7.34)	-2.00(4.94)
High	-.43(6.39)	-1.08(4.85)	-1.39(4.87)	2.42(5.09)

Table 9.
Summary of means and standard deviations for H6 with bombs collected as the outcome variable.

Cognitive Load	No Progress	Low Progress	Med Progress	High Progress
Low	-1.60(8.61)	.84(6.61)	-4.88(6.12)	-.45(8.66)
High	.37(6.36)	.20(7.16)	-.50(5.86)	-2.08(7.11)

Table 10.
Summary of means and F values for level of progress on potential mediating variables in Study 2.

Dependent Variables	No Progress	Low Progress	Med Progress	High Progress	*F*	η^2
Motivation	4.93(1.19)	4.49(1.22)	4.67(1.44)	4.44(1.36)	.93	.02
Attention	4.76(.60)	4.73(.68)	4.47(.86)	4.56(.78)	1.25	.03
Perceived Relevance	3.54(1.03)[a]	3.43(1.30)[a]	2.66(1.00)[b]	3.06(1.21)[ab]	4.01*	.08
Self-esteem	5.61(.79)	5.74(.83)	5.91(.91)	5.70(.87)	.74	.02

Note: Higher scores indicate more positive perceptions. Comparisons between means, specified by lowercase superscripts, are horizontal only. Cell means that do not share a letter in their superscripts differ at $p < .05$ according to Bonferroni. *$p < .05$.

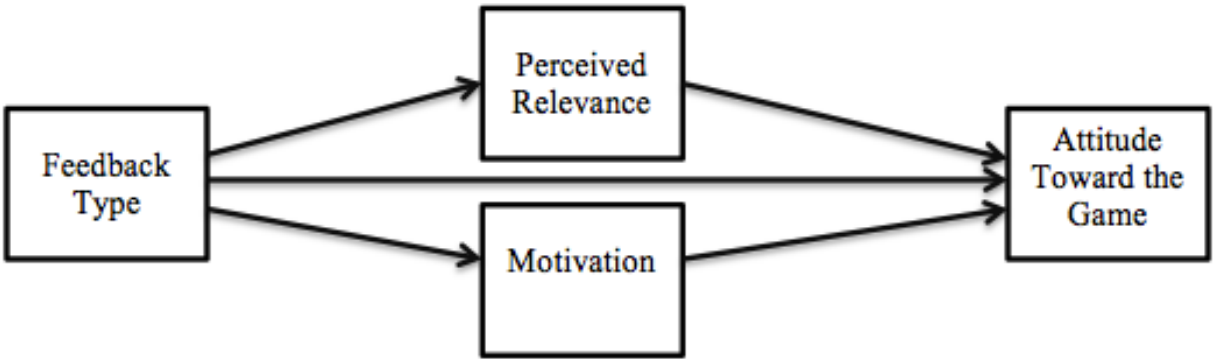


Figure 1. Model tested for H4 with attitude toward the game entered as the outcome.

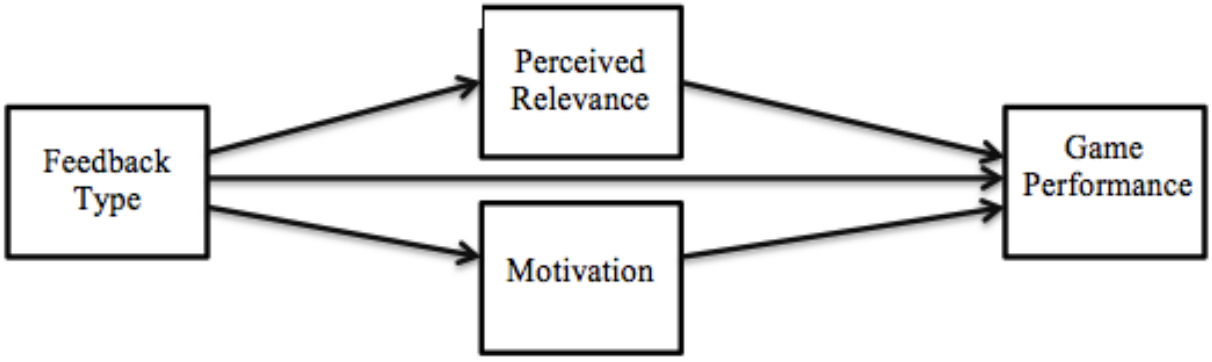


Figure 2. Model tested for H4 with game performance entered as the outcome.

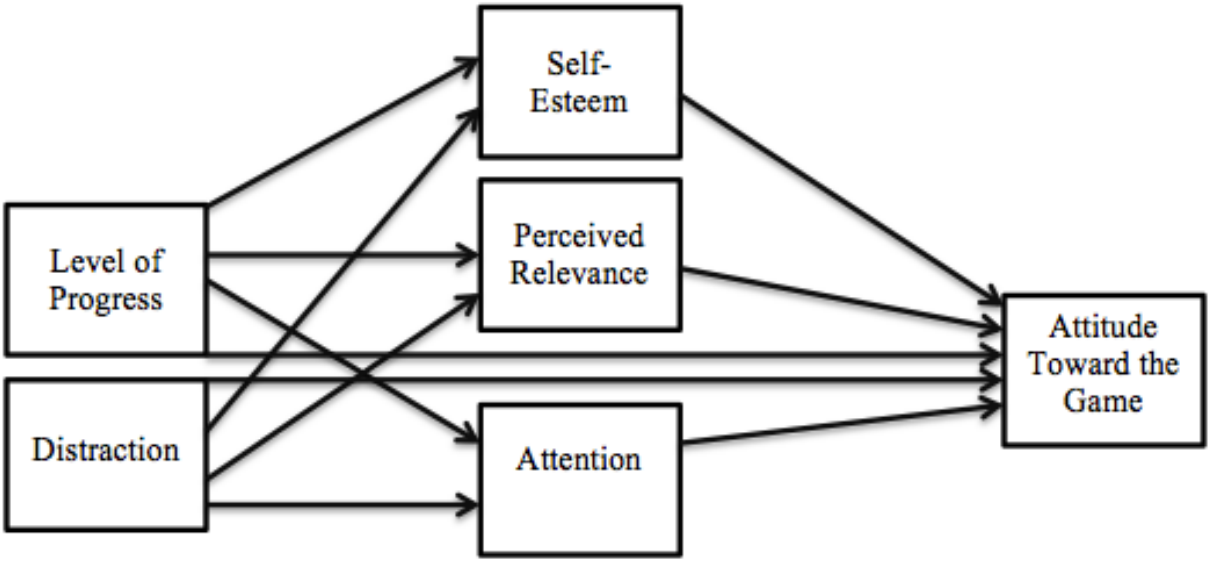


Figure 3. Model tested for H7 with attitude toward the game entered as the outcome.

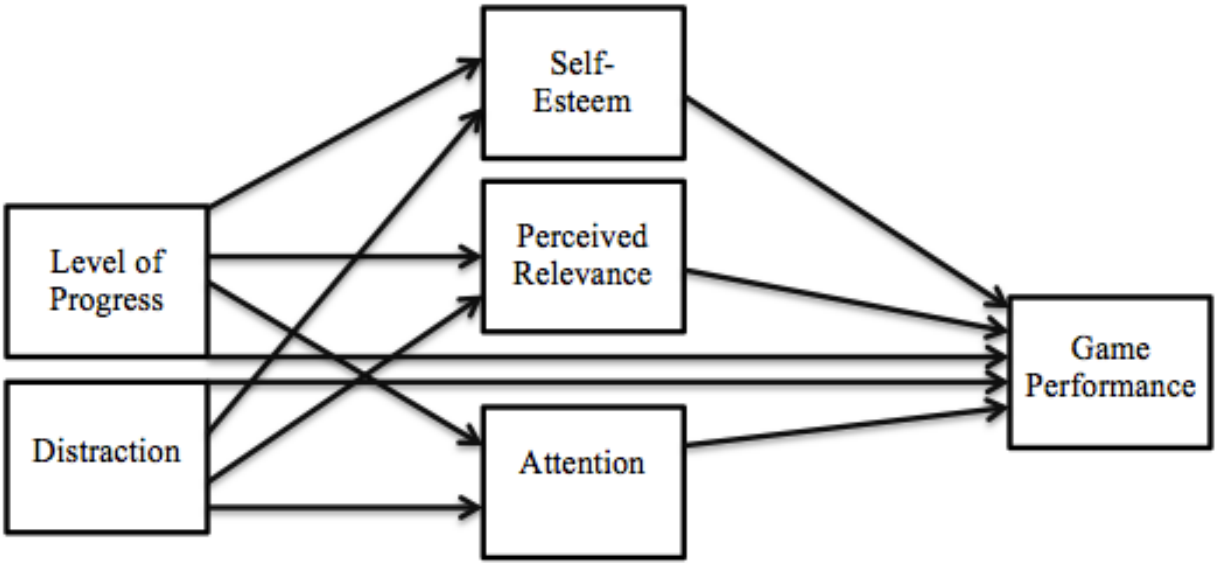


Figure 4. Model tested for H7 with game performance entered as the outcome.

Appendix A

"Your score makes you eligible to win a gift card for tickets to the (favorite sports team).

Your score makes you eligible to win a gift card for tickets to (favorite musician).

Your score makes you eligible to win a gift card for meals at (favorite restaurant).

Your score makes you eligible to win a gift card to (favorite store).

Your score makes you eligible to win a gift card for tickets to see (favorite type of movie).

Your score makes you eligible to win a gift card for (favorite dessert)."

Appendix B

Non-Customized Feedback

"Your score makes you eligible to win a gift card for tickets to a sporting event.

Your score makes you eligible to win a gift card for tickets to a concert.

Your score makes you eligible to win a gift card for meals at a restaurant.

Your score makes you eligible to win a gift card to a local store.

Your score makes you eligible to win a gift card for tickets to see a movie.

Your score makes you eligible to win a gift card for dessert."

Appendix C
Cognitive Load Manipulation

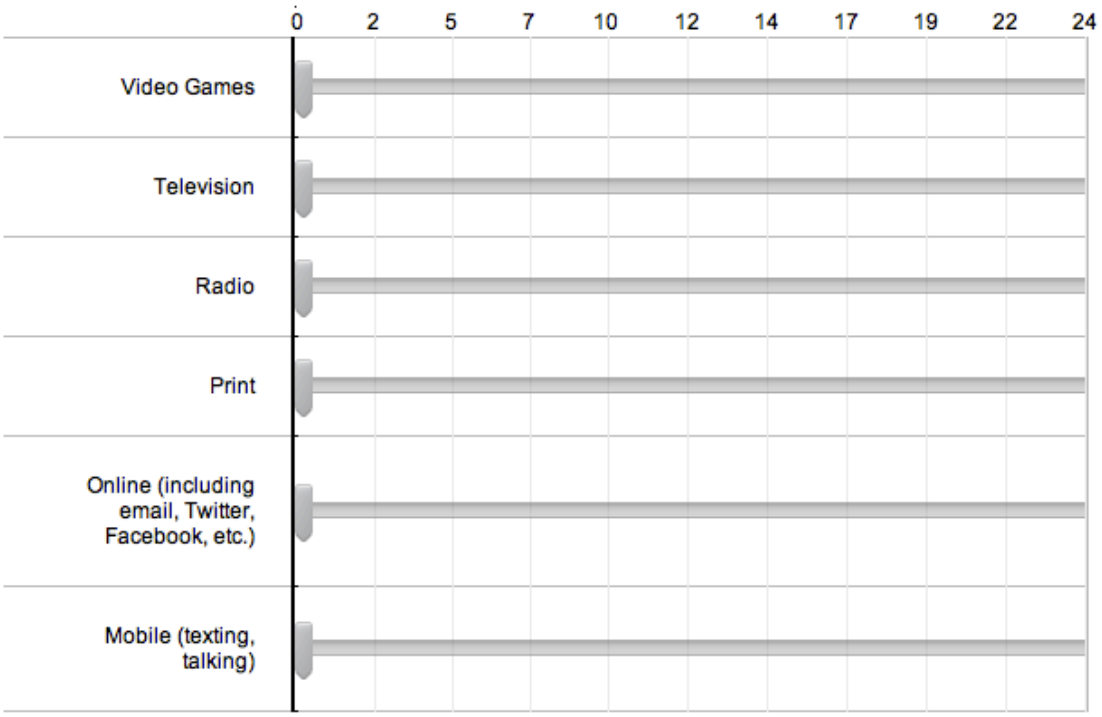
High Load
38732458

Low Load
71

Appendix D
Pre-questionnaire

1. If you could have tickets to see your favorite sports team, what team would you choose?
2. If you could have tickets to any upcoming concert for your favorite band/performer, what tickets would you choose?
3. When going out to eat, what is your favorite restaurant?
4. What is your favorite store (for anything -- clothes, electronics, hobbies, etc.)?
5. What is your favorite movie genre (action, drama, suspense, etc.)?
6. What is your favorite dessert?

How many hours **per day** do you spend using the following types of media:



Where **1 represents "not at all skilled" and 7 represents "highly skilled:"**

	Not at all skilled 1	2	3	4	5	6	Highly skilled 7
How would you rate your video game skill?	○	○	○	○	○	○	○

Please rate your agreement with the following statements where **1 represents strongly disagree and 7 represents strongly agree**.

	Strongly disgree 1	2	3	4	5	6	Strongly agree 7
I like to juggle several activities at the same time.	○	○	○	○	○	○	○
I am comfortable doing several activities at the same time.	○	○	○	○	○	○	○
People should try to do many things at once.	○	○	○	○	○	○	○

What is your gender?

- ○ Male
- ○ Female

What is your age?

What is your race?

- ○ White/Caucasian
- ○ African American
- ○ Hispanic
- ○ Asian
- ○ Native American
- ○ Pacific Islander
- ○ Other

Appendix E

Study 1 Questionnaire

Section 1

Please rate your agreement with the following statements where **1 represents strongly disagree and 7 represents strongly agree**. Circle only one number.

	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
I like challenging sections of the game.	○	○	○	○	○	○	○
I try my best while playing the game.	○	○	○	○	○	○	○
I enjoy trying to improve my score in the game.	○	○	○	○	○	○	○
I am invested in improving my score in the game.	○	○	○	○	○	○	○
My high score in the game is important to me.	○	○	○	○	○	○	○
I would like to keep trying to improve my score.	○	○	○	○	○	○	○

Section 2

Please rate your agreement with the following statements where **1 represents strongly disagree and 7 represents strongly agree**. Circle only one number.

	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
When I'm playing the game, my mind wanders off and I'm easily distracted.	○	○	○	○	○	○	○
When I'm playing the game, I focus on the game, nothing else.	○	○	○	○	○	○	○
I play the game on "automatic pilot" without paying attention to what I'm doing.	○	○	○	○	○	○	○
When I'm playing the game, I focus all my attention on what I'm doing.	○	○	○	○	○	○	○
When I play the game, I am totally wrapped up in it and don't think about anything else.	○	○	○	○	○	○	○
When I play the game, I don't pay attention to the game because I'm daydreaming, worrying, or otherwise distracted.	○	○	○	○	○	○	○
When I'm playing the game, part of my mind is occupied with other topics, such as what I'll be doing later, or things I'd rather be doing.	○	○	○	○	○	○	○
I am completely absorbed in the game when I play, so that all my attention is focused on it.	○	○	○	○	○	○	○

Section 3

Please rate your agreement with the following statements where **1 represents strongly disagree and 7 represents strongly agree**. Circle only one number.

	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
The content in the game says something important to me.	○	○	○	○	○	○	○
The content featured in the game is meaningful for me.	○	○	○	○	○	○	○
The game doesn't have anything to do with me or my life.	○	○	○	○	○	○	○
The game talks about something that concerned me.	○	○	○	○	○	○	○
While playing the game, I thought about how the content is useful to me.	○	○	○	○	○	○	○
The game does not show me anything that makes me want to play it.	○	○	○	○	○	○	○

Section 4

Please rate your agreement with the following statements where **1 represents strongly disagree and 7 represents strongly agree**. Circle only one number.

	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
The feedback in the game is customized according to my preferences.	○	○	○	○	○	○	○
I feel the feedback in the game represents me.	○	○	○	○	○	○	○
The feedback in the game is unique to me.	○	○	○	○	○	○	○

Section 5

Please rate how well each adjective describes the game you played where **1 represents very poorly and 7 represents very well**. Circle only one number.

	Very Poorly 1	2	3	4	5	6	Very Well 7
Appealing	○	○	○	○	○	○	○
Useful	○	○	○	○	○	○	○
Positive	○	○	○	○	○	○	○
Good	○	○	○	○	○	○	○
Favorable	○	○	○	○	○	○	○
Attractive	○	○	○	○	○	○	○
Exciting	○	○	○	○	○	○	○
Pleasant	○	○	○	○	○	○	○
Likeable	○	○	○	○	○	○	○
High quality	○	○	○	○	○	○	○
Interesting	○	○	○	○	○	○	○

Appendix F

Additional Questionnaire Items for Study 2

Please rate your agreement with the following statements where **1 represents strongly disagree and 7 represents strongly agree**. Circle only one number.

	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
I feel that I am a person of worth, at least on an equal plane with others.	○	○	○	○	○	○	○
I feel that I have a number of good qualities.	○	○	○	○	○	○	○
All in all, I am inclined to feel that I am a failure.	○	○	○	○	○	○	○
I am able to do things as well as most other people.	○	○	○	○	○	○	○
I feel I do not have much to be proud of.	○	○	○	○	○	○	○
I take a positive attitude toward myself.	○	○	○	○	○	○	○
On the whole, I am satisfied with myself.	○	○	○	○	○	○	○
I wish I could have more respect for myself.	○	○	○	○	○	○	○
I certainly feel useless at times.	○	○	○	○	○	○	○
At times I think I am no good at all.	○	○	○	○	○	○	○

Please rate your agreement with the following statements where **1 represents strongly disagree and 7 represents strongly agree**. Circle only one number.

	Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7
I am confident that I am capable of reaching the game goal.	○	○	○	○	○	○	○
I have made a lot of progress toward the game goal.	○	○	○	○	○	○	○
Advancing in this game is easily achieved.	○	○	○	○	○	○	○

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