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Game Types, Game-Related Behaviors and Resilience: Creating a Roadmap for Effective Gamification Design in Higher Education

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GAME TYPES, GAME-RELATED BEHAVIORS AND RESILIENCE: CREATING A ROADMAP FOR EFFECTIVE GAMIFICATION DESIGN IN HIGHER EDUCATION

by

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ABSTRACT

Gamification, or the use of game-based mechanics and thinking in real world applications, is on the rise in educational environments. While various applications seek to increase engagement and motivation for tasks related to student success, research regarding best practices for the design of such systems is lacking. In fact, conflicting outcomes from various gamification studies at the secondary and tertiary education levels suggest that not all gamification designs are effective for increasing student success. Meanwhile, research from the medical field indicates gamification can be used to increase resilience; which has been linked to various student success outcomes including academic performance.

To address this issue, this study surveyed 116 first-year, first semester college students at a mid-sized, private, Catholic university in the Southwestern United States to determine if there were any significant relationships between their gaming behaviors and resilience levels and GPA. In addition to completing the Connor-Davidson resilience inventory (CD-RISC), participants reported their regular gaming habits, including game types, social context, motivation, and frequency and duration of play. Demographics, including sex, ethnicity and permanent residence were also used in the analysis.

Correlational analysis revealed notable relationships between overall resilience, the five factors that made up the resilience inventory, demographics, and gaming behaviors. Specifically, results showed that female students had resilience scores 4.2% lower than males; while regression analysis revealed students attending the university from ‘out-of-state’, scored 6.7% lower than in-state peers. However, playing role-playing games were associated with a 9.6% higher overall resilience level, Computer games were

associated with 6.75-8.0% higher resilience in two of the resilience factors, while multiplayer online games were associated with a 17% higher score for the tenacity factor. Data on motivation and social context was inconclusive, and analysis did not yield substantial conclusions regarding ethnicity. Data shows gaming habits and resilience were not correlated with changes in GPA during the first year of study.

Implications for student success are that certain gaming types, including role-playing, multiplayer online and computer games may be more effective for increasing college student resilience, while gaming and resilience may not lead to higher academic achievement in the first-year of college.

DEDICATION

This dissertation is dedicated to the teachers, mentors, family and friends who believed in me and taught me the value of education.

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CHAPTER ONE

INTRODUCTION

Broadly stated, gamification is the application of game related concepts to non-gaming environments (Salen and Zimmerman, 2004). Gamification takes different forms, often depending on the context of its application, which ranges from retail marketing to medical practices (McGonigal, 2011). Gamification has become increasingly prevalent in many areas of education and training, from the corporate sector to private non-profit education (Kapp, 2012). In fact, a 2014 literature review of gamification and education revealed that 43% of the papers analyzed were focused on higher education. After eliminating those papers focused on job training or education in a non-school setting, the percentage rose to 82.69% signaling that the rise of gamification in education is of particular importance for colleges and universities (Caponetta, Earp, & Ott, 2014).

Kapp (2012) offers the following definition of gamification for an educational context: "Gamification is using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning and solve problems" (Kapp, 2012, p. 10). Common examples of game mechanics including scoring systems, badges, leaderboards, and even taking turns. Game aesthetics in this case refers to visual, auditory and experiential clues that signal to the player that their experience is separate from reality. Having an in-game avatar represent the player is one example (Salen and Zimmerman, 2004). Kapp's (2012) definition will be applied throughout this research given his integration of learning and problem solving as key elements.

The increased use of gamification should come as no surprise given that by 2008 there were 183 million active gamers in the United States, each logging an average of 13

hours of gaming per week (Newzoo, 2015). Beyond the nearly 57% percent of the US population gaming at these levels, there are presently over 3 billion hours of online gaming being logged each week worldwide (McGonigal, 2011).

The draw to game play represents intrinsic motivation, as players participate without external rewards for doing so. A key objective of gamification is to make participation in regular life experiences intrinsically motivating, rather than relying on factors such as prizes or financial compensation as key drivers for behavior (McGonigal, 2011). At the same time, gamification itself is used as a tool to motivate users towards a goal that they are not already driven to achieve. As such, external motivators may still be necessary to incentivize users to engage with the game system.

A survey of existing research on gamification in educational environments reveals multiple gaming types with different intrinsic and extrinsic motivators. These studies report contradicting findings regarding the effectiveness of game-based interventions for student success. The variety of gaming systems ultimately makes it unclear whether or not gamification is effective for increasing student success, and under what conditions.

Promising gamification research has begun to emerge from the medical sector, where recent studies have shown that gamification has helped traumatic brain injury patients to recover faster and more thoroughly by building their resilience (McGonigal, 2015). Resilience is a measure of an individual's ability to overcome obstacles and challenges (Thomsen, 2002). Thus, there is potential that elements of what has worked for helping patients overcome illness may have relevance for helping students to overcome the challenges they face in transitioning into and through college. Existing research suggests that increasing resilience levels leads to higher student persistence,

academic performance and graduation rates (Martin, 2002; McMillan & Reed, 1994; Waxman, Gray & Pardron, 2003).

The increasing prevalence of gaming as a voluntary activity, growing application of gamification in various sectors, and promising results from gamification studies in the medical field creates an opportunity to examine how gaming behavior intersects with student resilience and the potential therein for increasing student success as measured by grade point average (GPA) (McGonigal, 2011 and 2015; Newzoo, 2015; Wazman, Gray & Padron, 2003). In order to better understand the relationship between resilience, academic success, and various types of gaming behavior, this study analyzes the types of games played, duration of play, social context and motivation for play. Outcomes provide insight and focus for the design of effective gamification systems for student resilience and also suggest that gaming and resilience may not correlate with changes in academic performance in the first year of college.

Problem Statement

The primary knowledge problem is that while the use of gamification is on the rise, there is a lack of consistent evidence regarding the effectiveness of different types of game-based interventions for generating desired outcomes. Research on gamification for consumer behavior is not widely available, possibly because retailers use this data internally to increase sales. However, there is an emerging field of research on educational gamification, which to date has produced inconsistent results, due in part to problematic research design.

Many of the existing studies on educational gamification employed systems that relied on extrinsic reward structures and/or mandatory participation. Additionally, the

types of games used, duration and frequency of play, and social context for play varies greatly from study to study (Deterding, 2012; Fabricatore & Lopez, 2014; Kapp, 2012). Ample research does exist on the intrinsic motivations that encourage people to engage in gameplay (Salen & Zimmerman, 2004; McGonigal, 2011). However, this research has not yet been expanded to understand the factors that motivate voluntary engagement; specifically, in gamified systems designed to motivate users to achieve a goal that is not necessarily intrinsically motivating. Existing research studies also employ a variety of measures to assess the effectiveness of these gamification systems, ranging from student enjoyment of the gamification system to academic performance on tests.

In studies conducted by Hanus and Fox (2015) and Titus and Ng'ambi (2014), feedback regarding students' motivation was not examined thoroughly, and only students in the Titus and Ng'ambi study were volunteers, while in the K12 level study conducted by Hanus and Fox students were required to participate.

Nearly all of the existing studies lack control groups for results comparisons. The one exception was the study conducted by Hanus and Fox (2015) in which a gamified class was compared to a similar traditional class on the same subject. In this instance, the gamification model relied heavily on competition and leaderboards and the result was that motivation and academic performance were lower in the gamified classroom. This data conflicts with other studies, which showed that gamified learning increased student engagement, problem solving abilities, participation, performance and enjoyment of classroom experiences (Caponetta, Earp, & Ott, 2014; Deterding, Dixon, Khaled, & Nacke, 2011; Fabricatore & López, 2014). Additionally, these studies utilized a single game design making it impossible to determine if the structure of the game had an impact

on outcomes. Given that Hanus and Fox found a gamified classroom can be detrimental to student success, it is clear that more research is needed to determine how to use gamification effectively to produce positive outcomes that support student success.

To complicate matters further, the vast majority of research studies on gamification in education lacked theoretical backing and justification for the design of the gamified environment. This inconsistency in design makes comparison between studies difficult.

Meanwhile, research on gamification use with traumatic brain injury patients has produced consistently positive results, including decreased recovery time and improved resilience and positivity during recovery (McGonigal, 2015). These studies demonstrate the potential gamification may have in the educational sector, however further research is necessary to determine how the consistent results of the medical field may be translated to other contexts. A significant amount of research already exists regarding student resilience and wellness, with an emphasis on creating predictive analytics to identify struggling students (DeBerard, Spelmans, & Julka, 2004). This research is intended to increase student success by targeting extra support at students who, due to lower resilience, are less likely to persist through academic and personal challenges (DeBerard, Spelmans, & Julka, 2004). While there is benefit to these early alert systems, there is also an opportunity to create an increased emphasis on proactively providing students the resiliency skills necessary to overcome challenges they may encounter.

Several research studies have shown that resilience is linked to student success (Martin, 2002; McMillan & Reed, 1994; Waxman, Gray & Padron, 2003). This suggests that increasing student resilience may lead to improved academic performance, including

higher GPA. The conflicting outcomes in educational gamification research suggest that further study is needed to determine the effectiveness of different approaches to gamification within different contexts. One initial step is to determine if a relationship exists between game-related behaviors, game types and grade point average and if that relationship varies based on the type and duration of the game-related behavior. If so, the next step is to determine if resilience mediates or moderates the relationship between gaming and GPA. Such data provides clues regarding the best practices for the design of gamification models.

Purpose

The purpose of this study was to address the inconsistent design of research studies on gamification in higher education. More narrowly, the purpose was to determine if there are relationships between preexisting game-related behavior and resilience and if higher resilience correlates with higher academic performance. Furthermore, the goal is to assess how these relationships could be used to inform the design of gamification systems that aim to increase resilience among first-year college students, thereby theoretically increasing academic success.

Resilience was tested as both a mediating and moderating variable between gaming and GPA because of the success of resilience based gamification trials with traumatic brain injury patients, and is further supported by the availability of a valid resilience inventory instrument. GPA was selected as a specific academic success indicator due to availability of the data and a great deal of existing research that shows resilience to be tied to a variety of student success measures (Martin, 2002; McMillan & Reed, 1994; Waxman, Gray & Padron, 2003). The study utilized an online survey

instrument to assess gaming behaviors among first-year college students as well as their level of resilience to determine if specific types of games or duration of play are strongly correlated with increased levels of resilience or increased GPA. The intention was to determine if relationships exist between gaming and resilience and between gaming and GPA. Ultimately, using these potential relationships to inform the design of a gamification system that can increase resilience and thereby improve student success.

The survey instrument was designed with two key parts. The first part asked questions related to the type of games respondents play, the frequency of play and the duration of play. These questions featured multiple response categories in an effort to identify all relevant correlations between gameful behavior and resilience. This portion of the survey also included questions related to motivation for play and primary social context for play.

The second portion of the survey asked questions related to resilience; where resilience "is a person's ability to remain steady or to bounce back in spite of adversity… and draw on strengths, both internal and environmental, to over-come challenges" (Thomsen, 2002, p. 9). In order to ensure reliable resilience data, the second portion of the survey asked all participants to complete the Connor-Davidson Resilience Inventory (CD-RISC) questionnaire. The CD-RISC is an empirically tested, reliable instrument for quantitatively measuring an individual's resilience using a series of Likert scale questions. Results of the resilience inventory were compared to questions regarding gaming behavior, most notably the type of games played and the frequency and duration of play to test for statistically significant differences in resilience level relative to gaming habits. Regression models were used to identify significant predictors of changes in

resilience and GPA data, which was provided by the university. GPA data analyzed included first and second semester grades for all participants as well as their cumulative GPA for the first year.

In order to begin to understand best practices for the design and implementation of a gamification system in an educational context, this study analyzed which types of games are most utilized by students and how those game types are related to resilience levels and GPA. Games played were analyzed based on format (computer, mobile, tabletop etc.), social context, and motivation. Bartle's (1996) taxonomy of player types was also used as a framework in creating the motivation variable.

Lastly, demographic data, which was provided by the university's student records, was compared with gaming behavior, resilience levels, and GPA data. Market research from the video game industry suggests that gamer demographics are shifting (NewZoo, 2015). The average age of game players is 35 while 38 is the average age of game buyers. Male gamers are still in the majority at 59%, but the gap is narrowing. Currently, female adult gamers (over the age of 18) now outnumber male gamers 18 and under by nearly 2 to 1 (Lofgren, 2017). For this study, it was important to consider which participants are most drawn to engage in game related behavior on their own, and what types of games they are drawn to. Although historical data on gamer demographics provides some insight, the aforementioned shifting market suggests that the design of future gamification programs may need to change to accommodate new groups of players.

Research Questions

1. Is there a significant positive correlation between playing games and resilience among first-year college students at a medium-sized, private, Catholic, four-year liberal arts institution in the southwestern United States?
    a. To what extent does the relationship between gaming experience and resilience among first-year students differ based on gaming habits, including types of games, duration and frequency of play, social setting and motivation for play?
    b. To what extent is the relationship between gaming experience and resilience among first-year students different for various demographic groups including, sex, ethnicity, and national origin?
2. Do gaming behaviors correlate with changes in academic performance?
    a. If this correlation exists, to what extend does resilience mediate or moderate the relationship?

CHAPTER TWO

LITERATURE REVIEW

In an effort to create a deeper understanding of the potential for gamification in higher education, this chapter will explore the relevant theory in four major categories: gamification and game design; motivation; psychology of fun and play; and student resilience. It will also briefly review existing research and theories regarding the relationship between resilience and academic success measures.

In addition to the key theories, it will also cover research studies on gamification in education and research on gamification for resilience, providing connections to relevant aspects of the four theoretical categories outlined. Research articles selected for consideration were those with an educational context, either in secondary or tertiary settings, and that included references to gamification, or game design for student learning, as well as studies that linked gamification and resilience in non-educational contexts. The primary research question is whether game play is positively correlated to increased student resilience, what factors impact this relationship, and how these relationships inform the design of gamification systems. There is a current gap in this area of study wherein many studies assume a positive correlation exists between the type of game system they are utilizing and increased engagement towards a desired outcome. To provide context for future exploration of this topic, related research on gamification in education, on gamification for student learning, and on gamification for resilience in non-educational contexts has been included alongside theories on intrinsic motivation and student resilience to set the stage for future research in this area.

Student Resilience

As a foundation for exploring the links between gamification and resilience in college students, it is important to define resilience in this context. Resilience "is a person's ability to remain steady or to bounce back in spite of adversity. Resilient people draw on strengths, both internal and environmental, to over-come challenges" (Thomsen, 2002, p. 9). Thus, resilience is an individual's ability to navigate challenges using the resources available to them. Put another way, resilience is the opposite of vulnerability (Bernard, 1991). In examining the resilience of students at any age, it is important to measure the students' ability to use their own skills, as well as those support systems present in their environment, to overcome challenges (Bernard, 1991; Thomsen, 2002). Games provide one avenue for creating challenges and allowing students to practice resilience in a controlled environment.

Existing literature on student success shows consistently that resilience is positively correlated with student success measures including retention, academic performance, social integration and graduation rates (Martin, 2002; McMillan & Reed, 1994; Waxman, Gray & Padron, 2003). As a result, systems which increase student resilience provide a pathway to increasing student success.

Thomsen (2002) argues that increasing emotional intelligence is a central part of developing resilience. The rationale offered is that the amygdala of the brain triggers emotional responses much faster than the rational part of the brain can process information; thus, emotional response can overtake logical thinking. In emergency situations, this can be to our benefit, however in a learning environment the amygdala, if triggered, can disrupt a student's ability to process facts and to reason logically, making learning difficult or impossible (Thomsen, 2002). The emotional intelligence work of

Goleman (1995) emphasizes the importance of creating learning environments that promote a healthy balance of the emotional and rational mind. Drawing on Goleman's work, Thomsen offers a resilience model of a wheel, with six sectors. The first three sectors emphasize ways to "mitigate risk factors in the environment" and the other three seek to "increase resilience in the environment" (p. 107). The model is designed to help elementary and secondary teachers create environments conducive to student resilience but also offers application for college students working to manage their own environments and increase resilience. In addition, it provides a framework for assessing the design of systems that promote student resilience. Table 1 summarizes my adaptation of Thomsen's model.

TABLE 1

Six Sector Resilience Model for Grade School Educators

Environmental Goal	Task	Description
Mitigating Risk Factors	Increase prosocial bonding	Creating welcoming environments where all participants feel valued and demonstrate valuing others.
	Set clear, consistent boundaries	Students must understand limits to acceptable behavior for expressing emotions and for social interaction, as well as performance expectations. This can help reduce emotional stressors from uncertainty and conflict.
	Teach "Life Skills"	In this context, life skills refer to an ability to identify one's emotions, their source and to manage them effectively. Conflict resolution and mediation skills are taught for managing interpersonal conflict.
Build Resiliency	Provide Caring and Support	Validate participant emotions; recognize that emotional baggage is present in the environment and demonstrate care for participants.

	Set and Communicate High Expectations	Subjects must understand that managing emotions is an expectation in their community or classroom. Strategies are provided to do so in order to meet high expectations for performance on tasks, including exams and assignments.
	Provide opportunities for meaningful participation.	Meaningful participation involves using empathy to understand other perspectives. Students who are able to demonstrate empathy have been shown to be more skilled at identifying and managing their own emotions.

Table 1: Adapted from Thomsen (2002) Resilience Wheel Model.

In the study of college student resilience and success many attempts have been made to generate predictive models for identifying at-risk students (DeBerard, Spelmans, & Julka, 2004). In addition to academic performance measures, such as standardized test scores, several studies have also analyzed aspects of Thomsen's (2002) model including social support networks, wellness, and coping strategies as potential influencing factors of student persistence. In a comprehensive analysis of first-year students DeBerard, Spelmans and Julka (2004) found that "health-related quality of life, social support, and maladaptive coping strategies" (p. 66) were useful for predicting student retention, and importantly, these factors increased predictive accuracy compared to analysis using only high school GPA and SAT scores. Though the study was longitudinal, student responses regarding social support, health and coping strategies were collected only once in the first week of classes of the participants' fist year. This data was compared to student retention from the first to the second year of college (DeBerard, Spelmans, & Julka, 2004). Thus, the study did not account for changes in these health, social support, or coping strategies that may have occurred during the first year of college. The authors note that no single predictive factor measured was significantly correlated with retention; but that the combination of factors provided significant correlation with retention (DeBerard,

Spelmans, & Julka, 2004). This finding would indicate that no single sector of Thomsen's model can be used to increase resilience, but rather a combination of factors is needed. The results of the study also suggest that poor coping strategies are a strong predictor of low academic performance, confirming the findings of Brown and Cross (1997); although the authors acknowledge that other studies contradict this finding due in part to the variety of ways in which coping strategies may be defined and measured (DeBerard, Spelmans, & Julka, 2004; Ryland, Riordan, & Brack, 1994). These findings also support the idea that a well-designed resilience based intervention can lead to increased student success and retention.

The influence of social support structures was also shown to be significant in regard to student resilience and persistence (Thomsen, 2002; Chambliss, 2004; DeBerard, Spelmans, & Julka, 2004). Using Thomsen's (2002) model as a framework; combining strategies for increasing prosocial behavior with the development of life-skills related to coping and managing emotions is likely to have a positive impact on student academic success and resilience. The following sections will incorporate gamification research and theory that demonstrate potential links between gameful behavior and resilience strategies.

Gamification and Game Design Theory

Understanding Gamification

In order to assess how gamification and gameful behavior might be related to increased student resilience, an understanding of what gamification is, and how it is utilized effectively must be first established. A variety of definitions for the term gamification are found throughout the literature. Deterding, Dixon, Khaled & Nacke

(2011) synthesized much of the literature to define gamification as the "use of game mechanics in non-gaming contexts" (2011, p. 2). This definition is intentionally broad to cover the vast examples and applications of gamification (Deterding, Dixon, Khaled & Nacke, 2011). Consequently, it leaves opportunity for loose interpretation and application of game concepts. More recent definitions have included the addition of purpose-based components, including engaging others, motivation, and learning (Fabricatore & Lopez, 2014; Korkut, Hil, Jager & Dornberger, 2014). Kapp (2012) offers the following narrowed definition of gamification within the context of education and instruction, which will be utilized as a foundation of understanding here. "Gamification is using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning and solve problems" (Kapp, 2012, p. 10). This definition is preferable given the context and purpose elements with direct connections to problem solving, motivation and learning, which are central to studying the relationship between gameful behavior and student resilience (Fabricatore & Lopez, 2014). Gamification is also seen as a means to "enable players to achieve their goals - and as a consequence the organization achieves its goals" (Burke, 2014, p.6). Thus, goal attainment may be correlated to problem solving and overcoming adversity, which are central to resilience. It is worth noting that defining both individual and organizational goals is often difficult, as is accurately assessing goal completion. As an example, students may have different perspectives on what constitutes academic success; for one it may mean graduating, for another it may mean making the dean's list or achieving a particular GPA. For this reason, it is challenging to measure the effectiveness of gamification without a measureable common objective. However, with a standard means of measuring

resilience, it may be possible to determine if a gamification system can improve a student's ability to navigate the challenges associated with any goal they may wish to pursue.

What games are. To understand gamification, we must define the concept of a game. Salen and Zimmerman (2004) note the difficulty in defining a concept as broad as games, however they offer an analysis of eight different definitions as a means of generating their own, which states, "a game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome." Conflict, in a game context, may refer to competing objectives between players, a conflict between players and the game itself, or any other contest within the rules system (Salen & Zimmerman, 2004). Bernard Suits (2014) offers that a game is "the voluntary attempt to overcome unnecessary obstacles" (p. 43). In this context, the inclusion of conflict, obstacles, and quantifiable outcomes in the definitions serves to differentiate games from other forms of play. Other definitions emphasize the interactivity between players as a key element, though solitaire games are cited as an exception to this concept (Koster, 2005).

Game mechanics. Given a common definition of games, it is possible to further unpack the concept of gamification by defining game mechanics. Kapp (2012) offers that game mechanics include "levels, earning badges, point systems, scores and time constraints" (p. 11). However, gamification is often criticized as a practice that is too greatly focused on extrinsic motivators, such as points, badges and tangible incentives (Deterding, 2012; Kapp, 2012; Niman, 2014). The boundaries of what is included in game mechanics or game elements are blurry at best, as many game elements, such as

rules, objectives, and scoring, exist in other realms as well (Deterding, Dixon, Khaled & Nacke, 2011). For purposes of this literature review game mechanics are defined as the constructs that define player action and interaction, and which separate the game experience from the non-game environment. Kapp's (2012) definition of gamification also identifies game aesthetics and thinking as contributing to the process beyond mechanics. This speaks more to the general principles of game creation. Another approach refers to game elements in terms of the framework that they create in order to facilitate participant decision-making by supplying information and presenting limited options for response (Niman, 2014). Despain (2013) goes further and identifies one hundred principles of game design theory, which cover a spectrum from creating game elements to applying psychology to understand player mindset and engagement. Niman (2014) offers a simpler model for constructing learning experiences, which is referred to as a "choice architecture" and includes risk management, social norms, co-creation, intelligent obstacles, a feedback chain and relative comparisons.

Niman's (2014) choice architecture model has strong roots in the classic game theory work of von Neumann and Morgenstern (1944). Game theory itself deals with probability analysis of decision making in situations with uncertain outcomes. Its name derives from the use of game like scenarios such as *The Prisoner's Dilemma* and *The Tragedy of the Commons* to explain how individuals make decisions when multiple players, and incomplete information, are involved (von Neumann & Morgenstern, 1944). Variations of this work and these decision-making scenarios, are found in games today and offer insights into human behavior when creating gamified systems (Desdain, 2013)

Several of the concepts and principles identified by Despain (2013) and Niman (2014) will be utilized later in this literature review in order to analyze the design of current empirical research studies on gamification in education. These concepts are selected and applied in response to the criticism that gamification is "nothing more than the addition of Points, Badges and Leaderboards... [while] the process of gamifying the learning experience can contain so much more" (Niman, 2014, p. 128). Often, gamification is applied for the purpose of either motivation or instruction (Burke, 2014; Dignan, 2011). It is important to recognize that "tackling a lack of volition or faculty with blunt instruments like rewards and punishments simply ignores the fact that the activities and experiences causing these symptoms aren't any fun" (Dignan, 2011 p.2). Put another way, offering an incentive for completing an unpleasant or mundane task does not alter the experience of completing the task itself, and thus does not have an impact on an individual's intrinsic motivation with regard to that task. A potential outcome is that if the reward is removed, or loses value to the participant, the targeted behavior is likely to decrease or stop completely. At the same time the addition of a game environment may not be sufficient to engage a participant in working towards a goal that they are not already driven to achieve. Thus, the question remains as to what types of game-based elements are most effective for generating desired outcomes and what is necessary to motivate participants to engage with these systems.

Theories of Motivation

According to a number of authors, gamification systems are often too dependent on external rewards or bribes as a means of motivating participants to meet certain organizational goals (Deterding, 2012; Fabricatore & Lopez, 2014; Kapp, 2012). The

potential result is that participants may rely too heavily on extrinsic motivators, "failing to leverage the intrinsic potential that game mechanisms have to enhance engagement and achievement" (Fabricatore & Lopez, 2014, p.110). In an educational setting, effective gamification should promote the development of intrinsic motivation that leads student participants to persist in participating in activities that support their success (Kapp, 2012). However, reward structures may be necessary to achieve initial engagement and prolonged participation when gaming is not purely recreational. In reviewing current and future research on educational gamification, it will be beneficial to understand the concepts of intrinsic and extrinsic motivation as well as psychological and social factors that lead people to engage in gameplay. Existing research designs appear to ignore these concepts, selecting a game system seemingly at random, and applying those mechanisms to learning environments. Understanding the types of games that students are intrinsically motivated to play, and which of those game types are related most to desired outcomes can provide a roadmap for the design of effective gamification systems that will engage participants.

Understanding Extrinsic and Intrinsic Motivation

Most simply stated, motivation is a drive to take action, and is comprised of both the level of intensity and the orientation or source of that motivation (Ryan & Deci, 2000). Orientation of motivation is separated into two primary types: extrinsic and intrinsic.

Extrinsic motivation. Extrinsic motivation exists in circumstances where an individual carries out an action based on its instrumental value. In other words, they complete the action because it serves a purpose of pleasing an authority figure, earning

compensation, reward or benefit, or because completion of the activity has a perceived tangible value (Ryan & Deci, 2000). For example, an individual may complete a work task because it will please their supervisor and contribute towards a promotion, or because it is essential to earning pay and benefits, or even because the employee feels that the skills gained by completing the task will benefit them in their career. All of these reasons are considered forms of instrumental value, and are thus categorized as extrinsic motivators (Ryan & Deci, 2000).

Intrinsic motivation. Contrary to extrinsic motivation, intrinsic motivation exists when an individual engages in an activity due to the inherent satisfaction of participating in the process of completing the task (Ryan & Deci, 2000). A basic example would be an individual who chooses to listen to a favorite song. The time spent listening to the song provides no external reward, but the listener still chooses to direct energy to listening to the song for the internal psychological benefits. Curiosity, playful behavior and a desire to learn have been observed as intrinsic motivators in both humans and animals as these behaviors are carried out without the presence of extrinsic rewards (Dignan, 2011; Ryan & Deci, 2000). Games are generally viewed as intrinsically motivating as they do not offer tangible rewards, yet the data shows that millions of Americans still choose to regularly engage in gameplay (Newzoo, 2015).

Taxonomy of Intrinsic Motivation. When creating a system for the purpose of intrinsic motivation Malone and Lepper (1988) offer a series of guidelines called the taxonomy of intrinsic motivation. The taxonomy is divided into two sections: internal motivations and interpersonal motivations. The internal motivations described in the model can be simplified as challenge, curiosity, control and fantasy (Kapp, 2012).

Challenge involves a game's goals, system feedback about progress, and the uncertainty of success. For a game system to include curiosity it must engage both sensory and cognitive interest. Players must also feel a sense of control, typically created through choices and some power over decision-making and action. Lastly, an intrinsically motivating game should allow the participant to engage in fantasy, in other words it should offer elements that are set apart from day-to-day reality (Malone & Lepper, 1988).

The interpersonal motivations of the taxonomy of intrinsic motivation are grouped into three self-explanatory elements: cooperation with others towards goals, competition against other participants, and recognition of goal attainment by others (Malone & Lepper, 1988). Studies that utilized interpersonal motivators in their game design showed strong, but mixed results. Hanus and Fox (2015) found that competition with peers, in the form an academic leaderboard, resulted in lower academic performance, while Titus and Ng'ambi (2014) found that organizing students into teams (cooperation towards goals) and having them compete against other teams, actually increased learning and engagement. In both studies, academic performance was the primary outcome measure. Additional data regarding the design of the game environment and impact of the gamification system on persistence and resilience may be helpful for understanding the conflicting outcomes. Ultimately, these outcomes suggest that social context may be an important factor to consider when designing an engaging gamification system.

For a gamified design to activate intrinsic motivation, it should theoretically include elements related to as many of the internal and interpersonal taxonomies as possible. Reflecting back to the definition of games provided earlier, there are direct parallels between the taxonomy's element of challenge and Kapp's term "abstract

challenge" (2012, p. 7). Similar connections exist in Salen and Zimmerman's reference to "artificial conflict" (2004, p. 80). However, by definition a game does not necessarily need to engage intrinsic motivation, as evidenced by the absence of several of the other key elements of intrinsic motivation in the accepted definitions of games. It is possible that a gamification system which lacks elements of intrinsic motivation may be unlikely to engage users long enough to cause lasting behavioral change, unless sufficient persistent external rewards are used to motivate participation. Once again, further research is needed to determine which aspects of intrinsic motivation are most effective in gamification systems.

Theories of Fun and Play

The Appeal of Games

Understanding the effectiveness of gamification design also requires an understanding of the psychology related to play behavior. In the seminal work on play behavior, "Homo Ludens*"* play is defined as follows:

> "we might call [play] a free activity standing quite consciously outside "ordinary" life as being "not serious", but at the same time absorbing the player intensely and utterly. It is an activity connected with no material interest, and no profit can be gained by it. It proceeds within its own proper boundaries of time and space according to fixed rules and in an orderly manner. It promotes the formation of social groupings, which tend to surround themselves with secrecy and to stress their difference from the common world by disguise or other means (Huizinga, 1949)."

According to this definition, play is apart from ordinary life and while engaging, it has no potential for measureable gain (Huizinga, 1949). Malone and Lepper (1988)

echoed the separation of play from reality by Huizinga by their use of "fantasy" as a key internal intrinsic motivator. Games, as defined in this paper, do offer a measureable outcome, and when connected to gamification attach that outcome to a larger personal or organizational goal. Initially, this would seem to deviate from the definition of play, and yet Huizinga puts forth that play bears a significance or meaning, but is vague with regard to what that significance may be.

Ellis (1973) examines participation in play behavior through a lens of intrinsic motivation. At the most basic level play is defined as an activity absent of goal or objective; and is therefore motivated purely intrinsically. The challenge with this assumption is in proving pure intrinsic motivation by eliminating all possibilities of extrinsic motivators and further, that it presupposes that play behavior exists separately from all other forms of behavior (Ellis, 1973). There is also the challenge that at least a portion of the responsibility for defining play, particularly in terms of the motivating factors for the behavior, exists with the individual engaging in the behavior. Earning recognition provides an example of this complexity. Malone and Lepper (1988) list recognition as an intrinsic motivator, however some individuals might link recognition to extrinsic rewards such as job promotions, changing the nature of their motivation for seeking recognition from intrinsic to extrinsic. Theory suggests that adults are likely to want to structure their work, and learning environments to approximate their vision of playful behavior, such that the work itself is intrinsically rewarding for them (Ellis, 1973). This may come in the form of interpersonal intrinsic motivators including teamwork, competition with peers and recognition of success. At the same time, in a work environment it is difficult to separate these intrinsic motivators from extrinsic

factors such as salary, increased authority from promotion and other tangible rewards that are linked to recognition of success.

Meaningful Play

Salen and Zimmerman (2004) offer two ways of defining meaningful play: descriptive and evaluative. Descriptive meaningful play exists in the relationship between player actions and the response of the game system; put another way, the significance or meaning of a player's actions is determined by the response of the game system to those actions. In effect, all games function in this way (Salen & Zimmerman, 2004).

Evaluative meaningful play requires stricter criteria than descriptive meaningful play. The definition states, "[evaluative] *meaningful* play occurs when the relationships between actions and outcomes in a game are both *discernable* and *integrated* into the larger context of the game. Creating meaningful play is the goal of successful game design" (Salen & Zimmerman, 2004, p. 34). Discernable relationships exist between player action and system outcome when they are communicated clearly to the player. For an action-response relationship to be integrated into the larger context, a player must also be able to see how the result of their action will influence the larger game experience (Salen & Zimmerman, 2004).

For example, if a student in a gamified classroom setting answers a professor's question, and the professor indicates that the student will be awarded five points which are then marked on a leaderboard, that student has received a discernable system response (earning 5 points) to their action (answering a question correctly). If the student then understands that those points hold a value that contributes to earning a desirable grade at

the end of the course, then the action-response relationship would be integrated into the larger context of a game based experience.

Another way to articulate this concept is through a link between game research and student success research. Both areas stress the need for feedback about student or player progress. This concept is presented in game design theory as feedback loops and in the taxonomy of intrinsic motivation as performance feedback. In the National Study of Student Engagement or NSSE, research data reinforces this concept by showing that frequent faculty feedback is a high-impact practice with regard to student success (Desdain, 2013; Kuh, 2008; Malone & Lepper, 1988; NSSE, 2014). What is most significant to consider for gamification in higher education is that points and badges, which are criticized as extrinsic motivators, may actually create desirable feedback loops if they are meaningfully connected to student achievement (Niman, 2014, Salen & Zimmerman, 2004).

While these authors describe concepts related to designing meaningful play, they fall short of explaining why it is that people engage in playful activity. Dignan (2011) attempts to close the gap by demonstrating how the human brain is in effect a pattern recognition engine, and how effectively designed games challenge this part of our minds to discover those patterns. His work suggests that basic survival instincts drive us to explore, test, understand and internalize the world around us. Play is a form of engaging in this exploration and environment testing (Dignan, 2011; Huizinga 1949). Conceptually, pattern recognition offers a parallel to the concept of curiosity as described by Malone and Lepper (1988). The added connections between play and the taxonomy of

intrinsic motivation might suggest that playful behavior, as defined by a participant, is a product of intrinsically motivating game design.

The concept of flow. Dignan (2011) and Schell (2014) approach the challenge and control elements of Malone & Lepper's (1988) taxonomy in a different way, stressing the importance of "flow" for game designers. Flow is a concept pioneered by Mihalyi Csikszentmihalyi (1991) and it exists when there is a proper balance between challenge and participant skill. Too much challenge will result in anxiety, while insufficient challenge leads to boredom. Proper flow results in a balance between the chemical responses in our brain that drive us to take action or initiative, and those that cause a feeling of pleasure following successful completion of a goal. In other words, if a game can challenge a player consistently, without overwhelming them, it will create a chemical response in the brain that will drive them to continue playing. However, if the cycle is broken the player will either become bored or overwhelmed with the task (Dignan, 2011).

The flow concept also appears in the literature on education and learning, leadership, and psychology. In education and development, it is referred to as the zone of proximal learning (Vygotsky, 1987); or the area of tasks an individual can only do with help that fits between what they can do alone and what they cannot do at all. In the leadership literature, flow appears as the productive zone of disequilibrium in which adaptive change work occurs (Heifetz, 1994). Flow and the zone of proximal learning offer direct parallels to Thomsen's (2002) resilience model, which balances student abilities with a supportive environment to overcome challenges. This connection provides theoretical support for the use of game systems for resilience development.

In this context, intrinsic motivation is related to the level of challenge of the system, as suggested by Malone and Lepper's (1988) taxonomy. However, the concept of flow goes deeper in indicating that the level of challenge must continually increase to meet the development of participant skill that results from overcoming previous challenges (Csikszentmihalyi, 1997). Research has shown that a scaffolding of challenges in game design is effective for increasing engagement and problem-solving ability over time (Eseryel, Law, Ifenthaler, Ge, & Miller, 2014). This is a significant consideration with regard to prescribed game design. This study examines the relationship between existing game behavior and resilience, where students can self-select into gaming environments that match their skill and interest level. When designing gamification as a prescribed intervention it is important to match the flow state to the skill level of the participants to maintain engagement.

Fun and Play as Principles of Effective Game Design

The aforementioned theories indicate that there are standards for developing engaging games and that not all games are created equal. Existing empirical research on gamification in higher education lacks reference to these key constructs, with many studies selecting a game model seemingly at random. This study indicates that by examining the relationship between different gaming behaviors and a desired outcome it becomes possible to identify game types that most effectively utilize these theoretical concepts in the specified learning context. In other words, studying game behaviors and applying research on motivation and fun makes it possible to design effective and engaging gamification systems that relate to a desired outcome e.g. increased resilience.

Related Empirical Research on Gamification

In many ways, gamification is still emerging as both a field of practice and a field of study. Research on gamification as a tool for enhancing student resilience is presently lacking; however, there is literature that deals with the gamification of classroom learning and academic engagement. Promising research also exists on the application of gamification for increasing resilience in non-educational contexts, including studies of individuals with chronic medical conditions. This research offers insight into the way these practices might be applied to students. Furthermore, research generated by the game industry and research related to the psychology of happiness and motivation offer additional insights for this work. At the same time, research design is varied as are the outcomes, leaving lasting questions regarding best practices for designing game-based interventions for student success.

Gamification for Teaching and Learning

As a starting point Fabricatore and López (2014) seem to draw on the work of Dignan (2011), suggesting that the commonality between classroom learning and games is that both are problem-solving activities. Taking this approach, the authors conducted an examination of commercially successful games in which players engaged in problem solving quests, and which ranked in the top-50 for worldwide sales and registered above the top twenty-five percentiles of critical acclaim (Fabricatore & López, 2014). The goal of the analysis was to identify patterns within the design of these games and to apply these patterns to instructional design. The initial portion of the study concluded that "quest structure, strategic open-endedness, non-linear progression, orientation and challenge-based rewards" were the five consistent elements of game design (Fabricatore

& López, 2014, p.110). The identification of quest structure as a key element of games is somewhat problematic given that problem-solving quests were a criterion used to select the games analyzed in the study. Beyond that circular logic, the limited context for selecting games in this study raises questions with regard to the generalizability of these five mechanics as being core to game design. An additional criticism is that these mechanics were applied to the teaching method and structure of both of the college level courses that were analyzed in the study; therefore, there was no control group to compare the outcomes against. The researchers collected data through student journals about their experience and learning in the gamified classroom environment, including responses to several closed-ended Likert scale items. The results indicate that "gamified courses had a positive impact on students" and that the design of the course provided "students with activities that were attractive, meaningful, and valuable from an academic perspective" (Fabricatore & López, 2014, p. 116). The results show promise with regard to applied gamification for teaching and learning, and the use of problem solving and quest structure as a foundation does demonstrate connections to Thomsen's (2002) model for increasing student resilience. At the same time, the scope and design of the study has limitations, most notably a lack of a control group and a lack of a consistent quantifiable performance outcome for students; so while it is clear that students enjoyed the experience, it is unclear if the gamified approach increased student success.

Titus and Ng'ambi (2014) implemented a study at the University of Western Cape in South Africa where students in a sports sciences program were offered an opportunity to participate in game-based learning. The study involved teams of five students collaboratively completing timed quizzes on course content. Points were awarded for the

most correct answers and a leaderboard was used to show team rankings (Titus & Ng'ambi, 2014). Students were both surveyed and interviewed about their experience in the game environment. Results indicate that students found the team-based competitive learning environment preferable to the traditional lecture style they were familiar with (Titus & Ng'ambi, 2014). Compared to other recent studies, the design of the game system in this research is rudimentary, however the results would indicate a positive correlation between participation in game-based learning and student engagement with the subject matter (Titus & Ng'ambi, 2014). A primary weakness of the study is that students who opted not to participate in the game-based model were not included in the research and therefore no control group exists for comparison. In addition, student enjoyment of the game-based model was used as a primary measure of success. Given that students volunteered to participate it is possible that self-selection effects, wherein participants were predisposed to favor game-based learning environments, may have skewed the outcomes. The researchers also acknowledge that the small sample size and gender imbalance (69% of participants were male) may limit the generalizability of their results (Titus & Ng'ambi, 2014). It is also important to recognize that the results of the Titus and Ng'ambi study in South Africa may not be generalizable to the U.S. cultural context of this study.

While these studies suggest that intentional gamification design has a positive impact on student learning, additional studies show mixed results ranging from increased engagement as reported by Fabricatore and Lopez (2014) to decreased academic performance and participation (de-Marcos et. al., 2014; Ejsing-Duun & Karoff, 2014; Hanus & Fox, 2014; Xiang, et. al., 2014). The mixed results of these studies raise the

question of whether there are consistent factors of game design, such as game type, social context, and frequency of play that may affect the effectiveness of gamified learning.

In a purposed educational setting, the question also remains as to whether the idea of meaningful play is contradictory. Games and play, by definition, are fictional, fantasy, or separate from reality in order to be fun and intrinsically motivating (Caillois, 1977; Huizinga, 1949; Malone & Lepper, 1988).

Applying this thinking, a higher education information technology (IT) course in Singapore was taught using a storyline-based game to teach progressive modules. The students were surveyed after each module and asked to assess the effectiveness of the module for teaching the key content, and to rate the level of "fun" of the module (Xiang et. al., 2014). Results show that on average, students using a five-point scale from "strongly disagree" to "strongly agree" rated the statement "I find that this episode is challenging and it helps me to learn" (p. 641) between neutral and agree, while qualitative feedback suggested that the students did in fact find the format helpful for learning (Xiang et. al., 2014). Of all the measures taken, the level of fun was rated lowest overall, with students responding nearly neutrally to the statement "I find that this game episode is fun" (Xiang et. al., 2014, p. 642). Conversely, a Spanish study comparing gamified instruction to both a social media based platform and a traditional e-learning format showed that student attitudes about the course were more positive in both the social media and gamified context than in the traditional e-learning course (de-Marcos, Domínguez, Saenz-de-Navarrete, & Pages, 2014). The research suggests that students may have a preference towards these platforms, however quantitative results regarding student learning showed that the traditional approach was more effective (de-Marcos,

Domínguez, Saenz-de-Navarrete, & Pages, 2014). The disparity in research findings indicates that learning and motivation within gamification systems may be highly dependent on elements of their design.

Drawing on Dignan's concept of the brain as a problem-solving engine, a 2014 study of ninth graders at a school in the Midwestern United States analyzed the relationship between motivation, engagement and problem solving (Eseryel, Law, Ifnethaler, Ge, & Miller, 2014). Using a massive multiplayer online game (MMOG) as an instructional tool, the researchers assessed how the game influenced learner motivation and engagement as well as their ability to frame and solve problems. The results indicate that motivation is a determinant of player engagement, and that all three factors were affected by the design of game tasks (Eseryel, Law, Ifnethaler, Ge, & Miller, 2014). Counter intuitively, data from the study also revealed that engagement increases as motivation and interest decrease. However, the researchers acknowledge that participation in the MMOG was required during class time, which may explain why students with decreasing interest and motivation maintained high engagement levels (Eseryel, Law, Ifnethaler, Ge, & Miller, 2014). At the same time, the study provides similar evidence to Titus and N'gambi (2014) showing that social interaction related to game tasks, whether collaborative or competitive, increases student engagement (Eseryel, Law, Ifnethaler, Ge, & Miller, 2014; Malone & Lepper, 1988). This finding supports the use of the interpersonal elements of the taxonomy of intrinsic motivation in gamification design, reinforcing the idea that a multiplayer online game system may be an effective tool for gamified learning.

Recent research outcomes on student attitudes about gamified course designs and research on high-impact practices suggest that students must have the opportunity to be actively engaged in the academic process, as opposed to passive recipients as is the case in a traditional lecture environment (de-Marcos, Domínguez, Saenz-de-Navarrete, & Pages, 2014; Kuh, 2008; NSSE, 2014; Titus & Ng'ambi, 2014). In the context of a gamified environment, this might suggest that students should play an active role in determining how they will navigate the environment, and that opportunities must exist for them to engage in their own learning, or what Malone and Lepper (1988) refer to as choice. Required participation in a gamification environment reduces player choice, and may offer one explanation as to decreased motivation in the Eseryel, Law, Ifnethaler, Ge & Miller (2014) study. This also supports the notion that extrinsic motivators may still be necessary for student engagement when participation is required, or that game types that offer more choices to players may be more engaging.

Looking back to previously discussed research studies the question is whether the gamification model used was intrinsically or extrinsically motivated. As stated previously, gamification is often criticized for the use of extrinsic motivators in order to develop desired behavior (Niman, 2014). However, recent work suggests that effective gamification can be more than a system of rewards for extrinsic motivation and yet at the same time there are also limits to what it can achieve in terms of making unpleasant experiences fun (Burke, 2014; Dignan, 2011; Niman 2014).

As an example, a Fabricatore and Lopez (2014) study identified challenge and feedback loops (recognition/validation) as positive contributors to an increase in desired game-related behaviors such as group study, thus game systems that provide effective

feedback loops may demonstrate positive relationships with desired outcomes. The correlation between the results and the taxonomy of intrinsic motivation suggests that this manner of intentional design may be effective for increasing participant engagement, without relying on external rewards (Fabricatore & Lopez, 2014). Again, a drawback of this study is that the gamified learning environment was applied to all study participants; as such, the study lacked a control group for comparison (Fabricatore & Lopez, 2014).

Titus and Ng'ambi's (2014) quiz based game included many of the desired intrinsically motivating characteristics. The game itself was challenging for students as indicated by their responses to follow-up surveys (Titus & Ng'ambi, 2014). It should also be noted that students were still graded for their work in the course, which may be viewed as an extrinsic motivator. Malone and Lepper's (1988) taxonomy would also support the combination of collaborative play within each team and competitive play between teams as being generally intrinsically motivating factors. At the same time, the design of the game lacked elements of control, as players were not able to select which questions to answer or choose alternative ways to engage with the game (Titus & Ng'ambi, 2014). The direct connection between game questions and course reading material also created an absence of fantasy as a possible intrinsic motivator (Titus & Ng'ambi, 2014). Despite these drawbacks, the gamification system proved effective for engaging students in the learning process, indicating that social aspects of gaming may be sufficient to overcome other limitations of the game design.

The results of the Titus and Ng'ambi (2014) study as well as those of Hanus and Fox (2015) offer conflicting perspectives on leaderboards as effective motivational tools. Titus and Ng'ambi suggest that the competition between students led to improved study

behavior and performance; however, the study lacked a control group. Hanus and Fox (2015) implemented a gamified design using badges, points and a leaderboard to implement a gamified course. They compared this design to a concurrent traditional course on the same content. Student responses to the "intrinsic motivation inventory" (Ryan, Koestner, & Deci, 1991) indicated that the gamified course decreased intrinsic motivation, and furthermore students in the non-gamified control group earned higher final exam scores than the students in the gamified classroom (Hanus & Fox, 2015). These results seem to contradict those of Titus and Ng'ambi, which favored leaderboards and points as positively motivating and supporting student success. Thus, more questions emerge about the most effective implementation of different game elements, both intrinsic and extrinsic.

This apparent contradiction can be explained by research that shows that competition is only an effective initial motivator, and that frequent scoring, rather than qualitative performance feedback, can be demotivating over time (Deci, Betley, Kahle, Abrams, & Porac, 1981). In fact, leaderboards and similar scoring systems can provide a form of negative recognition for those participants who show less achievement than their peers, leading to participants disengaging with the system (Hanus & Fox, 2015; Malone & Lepper, 1988). This suggests that feedback loops must be carefully designed to motivate continued participation, and that negative feedback, including comparison to higher performing peers, may discourage participation. Conversely, Malone and Lepper's (1988) taxonomy of intrinsic motivation, as well as the student feedback in the Titus and N'gambi (2014) study would suggest that competition can be a very effective intrinsic motivator.

In the literature on game design theory Nicole Lazzaro offers four keys to creating fun in game design, among these is the interpersonal element of game play, which emphasizes “the social experiences of competition, teamwork, as well as opportunity for social bonding and personal recognition that comes from playing with others” (Lazzaro, 2004 p.7). Yet further research is needed to determine if there are specific game structures where competition and teamwork hold value in educational and developmental contexts. One possibility that may warrant examination is that leaderboards and scoring may be more effective when used only at the culmination of a gamified experience, or in scenarios where all participants maintain the possibility to take the lead position throughout the experience. This concept would align with principles of game design that state that for players to remain engaged they must believe that they have a possibility of winning right up until the conclusion of the game (Desdain, 2013; Howell, 2011). A further challenge to competition is that it may lead to decreased interaction and socialization among peers who participate in the competition (Ejsing-Duun & Karoff, 2014). For instance, students in a 2014 gamification study in Denmark indicated that the competitive nature of their gamified classroom led them to feel less connected to peers and several participants expressed a desire to add components to the game that promoted positive social interaction, even if they did not advance the goals of the game itself (Ejsing-Duun & Karoff, 2014). Other considerations include the format of the competition in the game, the type of game environment and how students engage with it.

Based on these findings, it may be possible that competition as an intrinsic motivator has costs with regard to peer-to-peer engagement. This may be particularly salient in social contexts where high academic performance is seen as unpopular among

peers. For this reason, future research on the use of gamification for academic achievement may benefit from a comparison of outcomes between cooperative and competitive game environments. The nature of competitive and cooperative gameplay must also be approached differently when designing games for resilience, as the connections to mental health may bring about different social stigmas. It may also be of benefit to gain a deeper understanding of which social factors students perceive to be the most motivating for participation.

The question remains as to whether gamification, which marries principles from games and play to purposed real life situations, can be both effective and fun when the experience is not fully apart from reality. Research in classroom environments shows mixed results, which may indicate that some game types and behaviors are more effective than others. When combined with theories related to intrinsic motivation, clues begin to emerge about best practices for gamification design. In the following section, studies on gamification for resilience will be similarly analyzed. Initial findings regarding resilience, as well as the strong theoretical ties between resilience and intrinsic game design, will show that resilience may be an effective way to gamify student success.

Gamification for Resilience

Research on brain activity has shown that in the context of gaming, "hard work that we choose makes us happy," (McGonigal, 2011). Sutton-Smith (2014) further elaborates, "The opposite of play isn't work. It's depression" (p. 198). Simply put, games are intrinsically motivating because the inherent challenge of them is structured in a way that counteracts depression. The implication is that gamification for resilience may benefit from adherence to the taxonomy of intrinsic motivation; and furthermore,

researchers may wish to be attentive to participant feedback regarding their level of engagement and enjoyment with regard to the game.

The idea stems from the previously mentioned work on the concept of flow (Csikszentmihalyi, 1991). In a series of studies, Csikszentmihalyi had participants wear pager devices. When paged, the participants recorded the activity they were engaged in, and their relative level of happiness. The overwhelming result was that when participants were engaged in passive activities, such as watching television, they consistently recorded mild levels of depression. In contrast, when engaged in challenging work, specifically work that the participants had chosen, they reported higher levels of happiness (Csikszentmihalyi, 1991 & 1997). In this context, games, defined by Suits (2014) as the "voluntary attempt to overcome unnecessary obstacles" (p. 43), are a powerful tool for engaging participants in intrinsically motivating activities that result in increased feelings of happiness. The remaining question to consider is whether applying game thinking to a necessary life obstacle can increase resilience, specifically positive attitudes regarding those challenges. If so, the deeper question is what types of games and gaming behaviors are most effective. An individual's inherent motivation to overcome those obstacles also warrants consideration, as intrinsic motivation alone may not be sufficient for different contexts and obstacles.

Jane McGonigal (2011) began conducting research on gamification and resilience following her personal experience with recovery from traumatic brain injury. The outcome was the creation of a mobile app called SuperBetter, which provides a gamified experience for increasing resilience ("About SuperBetter," 2017). A study by Roepke et. al (2015) examined the effectiveness of SuperBetter for treating patients with "significant

depression symptoms according to the Center for Epidemiological Studies Depression questionnaire." The randomized control trial study featured three participant groups, one that received a customized version of the app targeted at treating depression, one that used the standard app, which targets self-esteem and resilience, and one control group (Roepke et. al., 2015). The study found that both treatment groups showed significantly greater decreases in depressive symptoms than the control group, and that the specialized version of the SuperBetter mobile app was not significantly more effective than the generic version (Roepke et. al., 2015). These findings suggest that a gamification system, which at least approximately targets depression symptoms, may be effective for helping subjects to improve. It is worth noting that SuperBetter is a largely solitaire gaming experience, and while it encourages players to engage with their support networks, there are no true cooperative or competitive elements the promote interaction with other players. Despite a lack of social elements, the results show that this particular game design and play pattern generated positive results.

The design of these gamification systems must also be analyzed, as some game elements and systems may be more effective in real world applications. The literature suggests that incremental challenges help participants develop competence while holding their interest in the game (Csikszentmihalyi, 1997). In her study of first-year college student resilience, Pizzolato (2004) showed that students who employed cognitive problem analysis that involved breaking a challenge into smaller components and addressing them in order ultimately demonstrated productive self-regulatory and supported coping, rather than avoidance coping. The positive outcomes for students who employed scaffolded problem solving reinforces the work of Csikszentmihalyi and

further supports the benefits of using games types that include scaffolded challenges for gamification (Pizzolato, 2004; Csikszentmihalyi, 1997).

Another way to promote participation in a gamification system is to increase playful elements. Some have suggested that a continuum exists wherein a decrease in external restraints on behavior allows individuals to move away from training, through problem solving towards play (Ellis, 1973). This theory indicates that gaming behaviors which increase in options for engagement will lead to feelings of playfulness, which in turn leads to intrinsic motivation. This concept again mirrors Malone and Lepper's (1988) taxonomy, specifically the importance of participant control and choice in the environment. Again, the implication for practice is that gamification systems must offer options for players with regard to how they engage with the system in order to foster intrinsic motivation, which leads to persistent engagement towards the desired goal. For resilience and intrinsic motivation, it is about using game types that increase player self-authorship; which Pizzolato (2004) has shown to be a critical contributing factor to resilience among first-year college students.

In many of these cases there appear to be assumptions regarding participant motivation to achieve the goal of the system. For this reason it is unclear if the intrinsic motivators inherent within the games, and a flow state of scaffolded challenges were sufficient for maintaining player engagement, and if so which of those elements were most effective. Additional research regarding the types of gaming behaviors that are most effective for achieving desired outcomes as well as which factors drive participants to engage with a specific gamification system are needed.

Measuring Resilience. The Connor-Davidson Resilience Scale (CD-RISC) is a 25-item survey instrument that measures an individual's ability to use their resources to overcome challenges in a positive, and emotionally healthy manner (Davidson & Connor, 2016). Third party testing of the inventory found the test has high reliability with a Cronbach's Alpha of 0.88 (Davidson & Connor, 2016).

The instrument has been applied to a variety of populations in order to create average resilience scores for the general population as well as for specialized populations. Scores on the CD-RISC are between 0 and 100, with 100 representing optimal resilience. Specific populations tested include traditionally aged, first-year undergraduate students. Mean scores for university students were based on 15 different tests conducted in eight countries. Globally, the mean score for undergraduate students is 70.49, while the mean score for undergraduates in the United States is 72.69. The mean score for the general US population is notably higher at 80.4 (Davidson & Connor, 2016). This suggests that resilience for undergraduate students may be below average when compared to the broader population, thus supporting the study of new approaches for increasing student resilience, which has been proven to relate to multiple measures of student success (Martin, 2002; McMillan & Reed, 1994; Waxman, Gray & Padron, 2003). The proven effectiveness of this tool it provides a solid foundation for measuring the relationship between resilience and gameful behavior. Existing data for the target population of American college students also provides a basis for comparison.

There may also be less social stigma for demonstrating high levels of resilience when compared to the issues described in academic studies where standout performance was not socially desirable, particularly in grade schools. On the other hand, given social

stigmas around mental health, low performance on a resilience leaderboard could have significant negative impact on participants (Corrigan, 2004). For this reason, feedback systems that measure individual progress relative to the game environment may be an effective alternative to leaderboards that prioritize peer-to-peer competition (Desdain, 2013; Malone & Lepper, 1988).

Resilience and Academic Success

Several research studies and theories have shown resilience to be a contributing factor for student success (Martin, 2002; McMillan & Reed, 1994; Norris 2014; Waxman, Gray & Padron, 2003). A comprehensive review of this literature by Waxman, Gray and Padron (2003) suggests a self-fulfilling prophecy effect wherein resilient students seek out supportive environments while non-resilient students have often accepted that they will not excel in school. Expanding upon this finding the authors also demonstrated that instructors were able to identify resilient and non-resilient students in their classrooms and were more likely to invest their energy in supporting resilient students.

While the Waxman, Gray and Padron (2003) report seems to indicate that motivation to succeed is a key factor of resilience, Martin (2002) suggests that motivation alone is not enough. Martin's theory offers that even motivated students will encounter hardships and pressures in their academic journey, where resilience is a key tool for continued persistence. A 2014 dissertation by Norris supported this notion. His study showed that within a sample of academically at-risk Hispanic middle school students, the more resilient students were the only ones able to increase and then maintain a higher level of academic performance.

This notion is supported in other studies which showed resilience to be a key contributing factor among at-risk students who achieved academic success despite disadvantages including lower socio-economic status, lack of support networks and other environmental challenges (McMillan & Reed, 1994; Norris, 2014). It is worth noting that while there is consistent research to suggest a link between resilience and academic achievement, there are limitations to these findings. First, many of these studies acknowledge that other factors play a role in student resilience. Most common among these are support networks (Martin, 2002; Norris, 2014). Given that none of the studies reported used a proven resilience measure, like the CD-RISC, it is unclear if the student success improvements resulted from inherent resilience of individual students, or external factors such as support from friends, teachers and family.

Another limitation of this research is that it has focused only on students categorized as 'at-risk' for low academic performance and persistence (McMillan & Reed, 1994, Norris 2014). As a result, it is uncertain how resilience levels impact students who are expected to perform well, and whether these students have a higher average resilience level than at-risk peers.

Summary

The existing empirical research reviewed here looks at gamification for teaching and learning, and gamification for resilience. Presently, research that links gamification to resilience for students is lacking for any age group, let alone for first-year students transitioning into higher education. At the same time, both existing areas of research demonstrate the potential to use gamification as a means of increasing resilience which is

directly linked to student success (Waxman, Gray & Padron, 2003). The varying outcomes of the studies reviewed indicate that best practices for gamification design, including the game types and gaming behaviors targeted, are still emerging and that challenges exist with regard to competition, mandated participation and other aspects of design.

Current research suggests that there is a connection between gamification, intrinsic motivation, play and resilience outside the educational context. At the same time, many existing studies on gamification in higher education lack control groups necessary for causal comparisons; and their focus is on learning rather than student resilience. Studies from the medical fields, however, provide reliable evidence that gamification can be used to enhance resilience for trauma survivors, but the effectiveness of these same approaches with individuals who have not experienced trauma is uncertain.

The studies analyzed in this review offered conflicting results with regard to the effectiveness of competition as an intrinsic motivator, with several studies seemingly disproving this aspect of Malone and Lepper's (1988) taxonomy of intrinsic motivation. Taking the traditional view that games and play are apart from reality (Caillois, 1977; Huizinga, 1949; Salen & Zimmerman, 2004), complications begin to emerge regarding the application of game design theory to purposeful real-world activity. The concept of meaningful play, as defined by Salen and Zimmerman, may offer a means of adapting the work of Malone and Lepper to determine which game types offer intrinsically motivating approaches to gamification in educational environments. Although research suggests that gamification increases student enjoyment in learning environments (de-Marcos, Dominguez, Saenz-de-Navarrete, & Pages, 2014; Titus & Ng'ambi, 2014), studies show

mixed results with regard to student learning and development. The work of happiness psychologists like Csikzentmihalyi (1991 & 1997) suggests that well designed games that offer elective work can increase happiness, battle depression and increase resilience. McGonigal (2011) asserts that games can additionally encourage hard work, reward effort, facilitate cooperation and promote persistence; concepts that draw direct parallels to the espoused learning outcomes of student development for resilience that, in theory, lead to student success. It is also unclear how the effectiveness of intrinsic and extrinsic motivators changes depending on each individuals existing motivation to obtain the desired outcome of the gamification system, or even to play games at all. Thus, it is unclear if well designed gamification systems can overcome a lack of volition on the part of the participant. In addition, the type of game systems, duration and frequency of play, social context and gamer motivation should all be examined further to determine if different game structures are more effective for changing resilience levels and academic performance.

Much of the current work focuses on grades and test scores as a measure of student success to determine the impact of gamification, while research suggests that resilience may be a better indicator of overall student success potential (McMillan & Reed, 1994). As such, determining the relationship between gaming habits, resilience and GPA may serve to identify the most effective game environments for supporting students. Given the inconsistent findings regarding the use of gamification for student success it is necessary to analyze different gaming habits as they related to academic success measures. Furthermore, understanding the impact of resilience on the relationship

between gaming and student success is useful because resilience has been shown to be effective for helping at risk students as well as patients overcoming medical trauma.

A final challenge concerns generalizing existing research to first-year college students as the bulk of existing research on gamification in educational environments has been conducted outside the United States. Given the cultural and systemic differences between American higher education and tertiary education in other parts of the world, further research is needed to determine if gamification may effectively harness student intrinsic motivation to develop resilience in a U.S. context, and whether or not increased resilience leads to greater academic performance for these students. Meanwhile, the research on gamification and resilience conducted in medical fields involved subjects of varying ages and educational levels; so, while the results in this area show promise, they may not translate to the specific population of traditionally aged first-year college students.

CHAPTER THREE

METHODOLOGY

Introduction

Existing research on gamification use in education has not included rationale for the design of the game systems themselves. As such, it is challenging to compare studies that use different game structures and even more difficult to demonstrate the effectiveness in game based interventions for student success. For this reason, this study takes a step back to determine if there is a significant correlation between different types of gaming behaviors and higher levels of resilience; and if resilience moderates or mediates the relationship between gaming behavior and GPA. The objective was to identify the types of games and gaming behaviors that may be most effective for resilience based gamification systems and if these behaviors correlated with higher GPAs. The concept for this study was initiated by a previous research attempt to engage a sample of the same population in a six-week long randomized control trial which used a gamification to attempt to increase student resilience. Participant engagement with the original study was too low to provide significant data for analysis. This outcome led to the new research questions for this study.

To begin to answer those questions, this study aimed to identify correlative relationships between gaming and resilience in order to identify which gaming types and behaviors are practiced by students with higher resilience. The implication is that these practices can be integrated into gamification systems which aim to increase student resilience, where increased resilience has been shown to improve academic performance and persistence towards graduation. To find these key correlations, this study utilized an

online survey tool that combined questions about gaming habits with an instrument that has been proven effective in measuring resilience. All participants completed this instrument, known as the Connor-Davidson Resilience Inventory after answering a series of questions related to the types of games they play, the consistency and duration of play, as well as other factors influencing their gameplay habits. Statistical analysis was used to identify any significant correlation between gaming behaviors and the results of the resilience inventory, taking into account various demographic factors. Additionally, regression models were used to analyze relationships between gaming behaviors and fall semester, spring semester and first-year cumulative GPAs. Based on these findings additional models were created to determine if resilience level, as measured by the CD-RISC either mediated (explained) or moderated (effected the strength of) the relationship between gaming behaviors and GPA.

Full details on the sampling method, communication methods and survey instrument used are provided in the following sections along with a summary of limitations and delimitations associated with this research design. This chapter concludes with a discussion of the analytical techniques used to address each research question.

Sample

The target population for this study was first-year, first-semester college students enrolled in a medium sized, four-year, private, Catholic, liberal arts institution in the Southwestern United States. From within this institution, a 20% random sample of 1310 first-year students was selected using a computerized system, yielding a sample of 263 students. This particular approach was chosen in order to create a manageable sample that would be representative of the total population of students at the institution. Although

contact information was available for the entire population of first-year students at the institution, a smaller sample was preferred to avoid potential survey fatigue that could have been caused by several other studies being conducted with this population in a similar timeframe. Lastly, the sample allowed for more focused personalized communication with participants.

Students received written instructions regarding participation in the study via their university email address. This included an option to opt out of the study, as well as a statement indicating that participation would have no bearing on their academic standing. All students who agreed to participate in the study were required to sign an electronic consent form outlining the purpose of the study, the data to be collected, and an acknowledgement of risks associated with participation. A copy of this consent form was attached to the email invitations sent to all students, and can be found in Appendix A.

Survey Instrument Design

The survey instrument was composed of two main parts. The first section included a series of questions regarding participant gaming habits and preferences. The second portion asked participants to complete the Connor-Davidson resilience inventory.

The study occurred over a three-week period between the Thanksgiving holiday break and the end of the Fall semester of 2018. Research indicates that the experience of the first six-weeks of the semester is most critical for student transition (Astin, 1993). The failed randomized control trial study conducted during that timeframe indicated that students lacked the capacity to engage with research while managing their transition. As such the later portion of the semester was preferred to ensure higher participation. In addition, the dates were selected to avoid overlap with other significant survey based

research being conducted at the same institution. Previous studies on resilience have also shown that a measurable shift in resilience can occur within a six-week treatment period, suggesting that by the end of the semester most students have begun to establish normal routines of behavior (Davidson & Connor, 2016). Conducting the study after students had established some sense of routine was preferred in order to measure normal gaming habits and ensure that resilience measures on the CD-RISC were not skewed by the stresses of transition.

Students received an introductory email at the start of the study; this email can be found in Appendix E. Reminders were sent via email using the online survey system Qualtrics. In total, eight reminders were sent to students who had not completed the full survey at the time of the reminder. The frequency of reminders increased from a space of four days at the start of the study to daily reminders during the final three days of the data collection period. Participants were offered the potential for incentives for their participation in the study. As noted in the introductory email, eight gift cards to Amazon.com in the amount of $25 were awarded randomly to participants who completed the survey. During the final three days of the study two additional $25 gift cards and one $100 gift card were added to the available incentives to increase participation. Following the end of the survey a random number generator was used to identify the eleven recipients of the gift cards, which were distributed electronically using the same email addresses that were used for the study.

Questions on Game-Related Behaviors

The first portion of the survey was designed to assess participant gaming behavior and experience. It was divided into two main parts. The first part included questions

about all types of gaming behavior while the second part asked questions specifically about gamification.

In the first part, six questions were used to measure gaming behavior in five categories: type of games played, frequency of play (number of days when gaming occurred and number of times per day), duration of play sessions, social context of gaming sessions and lastly motivation for play.

Participants were asked to self-identify types of games played in the previous 60 days and were provided with a list of game categories as well as an option to add their own categories. Examples include: Role Playing Games, mobile app games and dexterity games such as darts or pool.

To assess frequency of play participants were asked to estimate how many days they played games in an average 30-day period and on those days how many individual gaming sessions occurred. Duration of play was measured as the average length of time, in hours and minutes, spent playing games per session.

The social context for gaming was also considered, particularly as it relates to elements of cooperation and competition in Malone and Lepper's (1988) taxonomy of intrinsic motivation. More specifically, participants were asked who they gamed with, if anyone, and whether games were played in person or online.

Lastly, participants were given a list of potential motivating factors for engaging in game play. These factors were based on Bartle's (1996) player types as well as elements of Malone and Lepper's (1988) taxonomy. Participants were also provided with an opportunity to write in their own other motivations for their gaming behavior.

Three additional questions were included to determine if participants in this study were familiar with gamification systems, if they could identify any gamification systems in the real world and lastly the extent to which they utilized these systems.

All questions were structured in a closed-ended, with either numerical answers for frequency and duration of play, or multiple choice for questions about social context, types of games played and motivation for play. Furthermore, each set of questions included skip logic options to ensure that students who did not engage in gaming would not be directed to answer irrelevant questions about the frequency of their gaming. A full copy of theses survey questions can be found in Appendix D.

Connor-Davidson Resilience Inventory (CD-RISC). The Connor-Davidson Resilience Scale (CD-RISC) is a tested and validated 25-item survey instrument that measures an individual's ability to use their resources to overcome challenges in a positive, and emotionally healthy manner (Davidson & Connor, 2016). The instrument has been applied to a variety of populations in order to create average resilience scores for the general population as well as for specialized populations. Scores on the CD-RISC are between 0 and 100, with 100 representing optimal resilience.

Extensive validity testing of the CD-RISC has been documented (Davidson & Connor, 2016). Construct validity was examined by comparing scores of various populations to determine if those with anticipated lower levels of resilience did indeed score lower on the instrument. Consistently, participants with psychological disorders, depression, PTSD, and suicidal ideation received lower scores than other participant types. Concurrent validity testing in multiple studies also showed the consistent correlation of CD-RISC scores with other instruments designed to measure resilience,

stress coping, optimism and self-esteem. The CD-RISC scores were shown to correlate as anticipated with these measures. Perhaps most relevant to this study is the demonstrated predictive validity of the CD-RISC. In multiple studies where a treatment was applied to improve resilience, the CD-RISC proved to be an effective instrument for measuring changes in resilience over time, relative to treatment levels (Davidson & Connor, 2016).

Numerous test-retest reliability studies have shown that over short to moderate amounts of time scores on the CD-RISC remain consistent in the absence of outside interventions. Studies of reliability were conducted with various demographic groups and in multiple countries including the United States, China and Japan. In all cases, results demonstrated strong reliability of the instrument (Davidson & Connor, 2016), with Cronbach's Alpha scores ranging from .78 to .91 depending on the type of sample utilized, with an average value of .88 (Davidson & Connor, 2016).

Specific populations tested by the CD-RISC have also included traditionally aged, first-year undergraduate students. Mean scores for university students are based on 15 different tests conducted in eight countries. Globally, the mean score for undergraduate students is 70.49, while the mean score for undergraduates in the United States is 72.69. The mean score for the general U.S. population is notably higher at 80.4 (Davidson & Connor, 2016). This suggests that resilience for undergraduate students may be below average when compared to the broader population, thus supporting the study of new approaches for increasing student resilience.

Connor and Davidson (2003) divided their 25-item resilience instrument into five different factors. Though the creators recommend assessing the CD-RISC as a whole, rather than by factors, several other studies have shown the factor model to be effective

for gaining a deeper understanding of different aspect of resilience (Jørgensen & Seedat, 2008). Figure 1 shows the 25 CD-RISC items grouped by factor. Factor 1 is a combined measure that Connor and Davidson (2003) describe as a combination of "personal competence, high standards and tenacity" (p. 80). It may also be thought of as persistence. Eight items are grouped into Factor 1 making it the largest set, followed by Factor 2. The seven items in Factor 2 create a measure of resilience related to an individual's ability to withstand negative effects and stress and ultimately to benefit from these challenges. According to Connor and Davidson (2003) there is also an element of confidence and self-trust in Factor 2.

Item #	Factor 1 - Competence and Tenacity
10	I give my best effort no matter what the outcome may be.
11	I believe I can achieve my goals, even if there are obstacles.
12	Even when things look hopeless, I don't give up.
16	I am not easily discouraged by failure.
17	I think of myself as a strong person when dealing with life's challenges and difficulties.
23	I like challenges.
24	I work to attain my goals no matter what roadblocks I encounter along the way.
25	I take pride in my achievements.

Item #	Factor 2 - Trusting Instincts, Tolerance and Stress
6	I try to see the humorous side of things when I am faced with problems.
7	Having to cope with stress can make me stronger.
14	Under pressure, I stay focused and think clearly.
15	I prefer to take the lead in solving problems rather than letting others make all the decisions.
18	I can make unpopular or difficult decisions that affect other people, if it is necessary.
19	I am able to handle unpleasant or painful feelings like sadness, fear, and anger.
20	In dealing with life's problems, sometimes you have to act on a hunch without knowing why.

Item #	Factor 3 - Acceptance of Change, Secure relationships

1	I am able to adapt when changes occur.
2	I have at least one close and secure relationship that helps me when I am stressed.
4	I can deal with whatever comes my way.
5	Past successes give me confidence in dealing with new challenges and difficulties.
8	I tend to bounce back after illness, injury, or other hardships.

Item #	Factor 4 – Control
13	During times of stress/crisis, I know where to turn for help.
21	I have a strong sense of purpose in life.
22	I feel in control of my life.

Item #	Factor 5 - Spiritual Influences
3	When there are no clear solutions to my problems sometimes fate or God can help.
9	Good or bad, I believe that most thinks happen for a reason.

Figure 1: Organization of CD-RISC items by Factor

The third factor includes five items and measures both an ability to navigate change and to maintain or utilize secure relationships. The three CD-RISC items in Factor 4 deal with control over one's situation, and the remaining two items in Factor 5 relate to "spiritual influences" (Connor & Davidson, 2003 p.80). Davidson and Connor (2016) warn that due to the low number of inventory items in Factors 4 and 5, the results in these categories may be less robust. At the same time other studies, including the work of Jørgensen and Seedat (2008) confirm the results of the five-factor model.

Permission to use the instrument for this study was obtained from its creator, Jonathan Davidson, along with full documentation of the CD-RISC, and documents outlining the proper use and scoring of responses. A copy of the instrument is found in Appendix B and a copy of the usage terms agreement can be found in Appendix C. The CD-RISC was integrated into the online survey in its original format to ensure consistency with previous implementations. Access to the online survey was limited to

the distribution list of participants and the survey was removed from online access at the end of the survey in accordance with the terms of use from the CD-RISC.

Demographics

For the purpose of this study, additional demographic data was obtained through student records kept by the university. These records are based on student self-reporting at the time of application for admission. Specific categories that were considered include, ethnicity, gender, and nationality. Age was not included as a demographic factor given that the range in ages is very small in the target population at the institution.

Student Success Measures

In order to measure student success, grade point average data was used. The university provided grade point average information for all participants for fall and spring semesters as well as cumulative first-year GPA as noted in student records. This data was collected in the summer following completion of the first-year of study after all spring semester grades were finalized. GPA was chosen for this purpose because of the ability to obtain measures at the mid and end point of the first academic year. Additionally, due to the time constraints of this study other factors, such as graduation rates were not available. Persistence and retention were considered, however out of the total sample of students used, only two students did not complete the full year of study. As a result, there was not enough data available regarding retention to yield meaningful results.

Analysis Methods

The CD-RISC instrument provides a numerical score as a measure of resilience. As such, data collected from this aspect of the study was analyzed using a quantitative

approach. The analysis began with a descriptive look at the sample and their responses to the survey items; this was followed by an inferential analysis that used simple bi-variate correlation techniques, traditional regressions, and stepwise regressions. Particular attention was given to the types of games played, as well as the frequency and duration of gaming sessions.

The open-ended responses that participants used to specify 'other' types of games played were coded quantitatively and were analyzed alongside the provided game type categories. Some responses to the 'other' category represented existing categories already provided as response options. In these instances, responses were coded to match the existing category. Open-ended responses provided regarding motivation for game-related behavior were treated similarly. Those which could be integrated with existing categories were coded accordingly. For responses that could not be included a new code was developed to analyze these responses separately.

Methodology and Research Questions

The purpose of this study is to address the aforementioned research questions. This section of the paper is designed to demonstrate the links between methods and those questions, in order to demonstrate how this approach gathered the data necessary to fill the existing knowledge gap relative to gamification, resilience and higher education.

Research Question One

Is there a significant positive correlation between playing games and resilience among first-year college students at a medium-sized, private, Catholic, four-year liberal arts institution in the southwestern United States?

To create an initial answer to this first question a correlation table was created to analyze the relationship between CD-RISC scores and gaming behaviors. This correlation review was used for overall CD-RISC score, mean average scores in each of the five factors of the CD-RISC, and for individual items within the instrument. All significant relationships were identified and reviewed.

Research question one, part A. To what extent does the relationship between gaming experience and resilience among first-year students differ based on gaming habits, including types of games, duration and frequency of play, social setting and motivation for play?

To answer this question a stepwise regression model was used to identify the significant predictors of change for overall CD-RISC score, individual factor score, and individual items scores.

Research question one, part B. To what extent is the relationship between gaming experience and resilience among first-year students different for various demographic groups including, sex, ethnicity, and national origin?

Similar to part A of research question one, a stepwise regression model was also used to identify significant demographic variables that predicted a change in resiliency scores. Due to low response rates in certain categories only three types of ethnicity, Asian, Hispanic, and White, could be included in the models. Similarly, there were not enough respondents from outside the United States to include non-U.S. residency in the regression model. However, ‘in-state’ and ‘out-of-state’ residency was included, as was sex.

Research Question Two

Question two asks if gaming behaviors correlate with changes in academic performance. Given that no existing theory can be used to create a model to test this question, stepwise regression models were created to test for any significant correlations between gaming behaviors and each of the GPA measures, specifically fall, spring and cumulative GPA, where GPA measures were the dependent variables. Demographic data was also considered within the models.

Research Question two, Part A. If this correlation exists, to what extend does resilience either mediate or moderate the relationship. Having analyzed the relationship between gaming and resilience and between gaming and academic success, as measured by GPA, the remaining question is how, if at all, resilience effects the relationship between gaming and GPA. To test this linear regression models were used testing first to see if resilience explained, or mediated, a relationship between gaming behaviors and GPA. Given the findings, a similar test was conducted to determine if resilience instead impacted the strength of the relationship between gaming and GPA, that is to say whether resilience moderates this relationship.

Limitations and Delimitations

Delimitations

The generalizability of this research to the population of all first-year college students in the United States was limited by the decision to conduct the research with a relatively small sample from one institution. The choice to use such a sample was made based on limited resources, which made conducting the study at multiple sites with a larger sample unrealistic. At the same time, all participants in the sample were selected from the same cohort of students at the same institution, allowing for some consistency when comparing results within the sample. A preferable option would have been to conduct this research across multiple campuses to access a larger sample in more diverse environments. However, given the scope and timeframe of this study, and the exploratory nature of the research, a relatively small initial sample proved to be the most practical option.

Limitations

A possible limitation of the study was that the sample is restricted to students enrolled at a single, private, religiously affiliated campus. Thought it was possible to draw a representative sample to match the full population of first-year students at the institution, limitations of enrollment made it impossible to adjust the demographics to be similarly representative of the larger population of first-year students nationwide.

As with any survey based research instrument there was the potential for participants to rush through the questions, including those of the CD-RISC. This may have included answering questions inaccurately, and skipping questions altogether. While

it was impossible to determine which participants may have marked an inaccurate response to a question, it was possible to address incomplete questions. For the quantitative analysis, missing responses were replaced with an average score for the same question from all other participants. In the event that a participant left more than three questions incomplete, except in cases where skip logic directed the participant to leave questions unanswered, the particular response was discarded as incomplete.

The timeframe of the study also limits the ability to analyze long term effects. While the transitional period of college is critical (Astin, 1993), studying only the effects of gaming behaviors during the first-year of study makes it difficult to predict long term effects that may impact graduation rates and long-term retention.

The final limitation to address is researcher bias and positionality. In this instance, it is important to recognize that, as a game designer and developer, I am a proponent of gaming and its potential to impact human development. For this reason, the existing CD-RISC instrument was chosen as the method of measurement to reduce the influence of researcher bias. At the same time, it is impossible to remove all elements of researcher bias, and thus it is important to recognize this reality, particularly when considering the design and structure of the survey instrument.

CHAPTER FOUR

RESULTS

This first part of this chapter will review the findings of the study, including descriptive statistics and summation of responses that connect to key outcomes. The remainder of the chapter outlines regression analyses that were conducted to provide additional context for the final discussion chapter. The reader is reminded that results from this study only demonstrate correlations between key variables. Due to the nature of this research design it is impossible to prove causation. However, strong correlations between gaming behavior and resilience provide useful information to inform the design of gamification studies that aim to increase student resilience, thereby increasing student success.

As described in the methodology chapter, the online survey was distributed, via university email, to a random sample of 263 first-year students. The full survey can be found in Appendix D, and displays the order of questions as presented to participants. This sample represents 20% of the total class of first-year students at the host institution, which is a private, Catholic, four-year institution in the Southwestern United States. Due to a residency requirement, the majority of students included in the study live in campus housing. All participants fell in traditional age range for first-year students of 17-18 years old.

Of the 263 students who received the invitation to participate in the study, 116 submitted a response. As the following sections will show, response rates varied for different portions of the data. This was due in part to skip logic features of the study that allowed participants with no gaming behavior to skip related questions. Ultimately, 83

students completed all, or all but one, of the questions that were presented to them. An overall mean response was used to fill in the gap for participants with only one missing response, so that these 83 responses could be utilized for regression analysis.

Descriptive Statistics

Respondent Demographics

Demographic information is provided in Table 2, including sex, ethnicity and residency information. Demographic data was self-reported by first-year students upon application for admission to the university and was provided by the institution's admissions office. Table 2 shows demographics for respondents and non-respondents, as well as for the entire class of first-time, first-year students. Categories for demographic data were determined by available data from the University student records collected at the time of application for admission. All terminology for demographic items is consistent with the language used by the university. For example, sex is used instead of gender because this is how the question was phrased to students at the time of their application to the university. Data on sex is limited to responses of female or male as no alternative options were provided to students in the application process. Similarly, ethnicity and residence categories were determined by available data provided by the institution. Residence data refers to the location of the permanent address provided by the student at the time of admission to the university.

Demographic data for the respondents in the sample demonstrates that the sample is relatively reflective of the total population of first-year students at the institution. The ratio of males to females is close, with a slightly higher percentage of females in the sample population.

With regard to ethnicity, the sample had roughly half the relative number of Black students as the population, but a higher concentration of White and Asian students. Residency data in the sample was the area of greatest difference between the sample and the total population, with the sample showing a higher concentration of international students and a significantly lower number of domestic students from outside the State of California.

TABLE 2

Demographic Information for Sample and Population

		Respondents (116)		Non-Respondents (147)		All First-Year Students (1310)	
		#	%	#	%	#	%
Sex	Female	76	65.52	77	52.38	793	60.53
	Male	40	34.48	70	47.62	517	39.47
Ethnicity	International Non-Resident Alien	6	5.17	5	6.49	62	4.73
	American Indian or AK Native	0	0.00	0	0.00	5	0.38
	Asian	16	13.79	8	10.39	110	8.40
	Black	2	1.72	2	2.60	35	2.67
	Hispanic	17	14.66	24	31.17	275	20.99
	Native Hawaiian or Pacific Islander	0	0.00	1	1.30	4	0.31
	Two or More	11	9.48	14	18.18	115	8.78
	Unknown	2	1.72	4	5.19	30	2.29
	White	62	54.31	89	115.58	674	51.45
Residence	US California	59	40.14	75	51.02	713	54.43
	US Non-California	39	26.53	55	37.41	535	40.84
	Non-US	18	12.24	17	11.56	62	4.73

Demographic information Source: Census files from student records system; Office of Admissions

Non-US students within the sample came from a variety of areas including Europe, Asia, Africa and the Middle East. In most cases these students were the only participant from their home country; with the exception of Great Britain and Japan, which each had two students participate in the study. Table 2 shows that the response rates from several demographic groups were not large enough to include in further analysis. Groups with less than 10 responses were included in descriptive statistics and in other, but data for these groups is not broken out and displayed separately for other tables and was not included in correlation and regression analysis. This is because the combined low response rate and small size of the overall sample did not allow for strong inferences to be made using data for these groups. Responses for these participants were included in other applicable groups where the response rate was high enough to yield meaningful outcomes. For example, a response for a Black female student was still included in data analysis for females and in overall sample analysis. Groups that do not have broken out data displayed in tables include: American Indian or AK Native, Black, Native Hawaiian or Pacific Islander, Unknown ethnicity, and International non-resident alien.

Connor-Davidson Resilience Inventory Responses

The final portion of the online survey instrument used in this study featured the 25 item Connor-Davidson Resilience Inventory, which was used with permission from the instruments creators, as outlined by the agreement in Appendix C. Of the 116 students who participated in the study 101 completed the CD-RISC portion of the instrument, while 14 students did not answer any of the CD-RISC items, and one completed only four items out of 25. These incomplete CD-RISC responses were discarded. Of the 101 remaining responses to the CD-RISC there were nine that each had one missing response.

These responses were completed using the mean response value from all other respondents to those items in order to include this data in the study. Six of the unanswered questions were unique. The remaining three missing responses were to the item "When there are no clear solutions to my problems sometimes fate or God can help." The demographics for participants who did, and did not complete the inventory are provided in Table 3.

Table 3 shows the demographic breakdown of the 101 students in the sample who completed the CD-RISC compared to those of the 15 respondents who started the survey but did not complete the CD-RISC.

TABLE 3

Demographic information for respondents and non-respondents to the Connor-Davidson Resilience Inventory (CD-RISC).

		Non-respondents (15)	**Respondents (101)**
Sex	Female	7	69
	Male	8	32
Ethnicity	International Non-Resident Alien	1	5
	Asian	4	12
	Black	0	2
	Hispanic	3	14
	Two or More	0	11
	Unknown	0	2
	White	7	55
Residence	US California	6	53
	US Non-California	5	34
	Total Non-US	4	14

Demographic information Source: Census files from student records system; Office of Admissions

As shown in Table 3, Asians, Males and students from outside of the United States had lower response rates to the CD-RISC than their peers in other demographic groups.

Table 4 lists the number of respondents in each scoring range for the CD-RISC. Students were grouped into score ranges of five, and the results demonstrate a moderately left-skewed distribution with scores clustered around the mean score of 75.9. The scores ranged from 44-100 with a standard deviation of 11.37. Data provided by the CD-RISC shows that typical mean score for undergraduate students in the United States is 72.69 (Davidson & Connor, 2016). The difference in mean scores between the national data suggests that this particular group of students is above average in resilience.

TABLE 4

CD-RISC Scores Arranged by Range

CD-RISC Score	**# of Respondents**	**Percentage**
41-45	1	0.99
46-50	2	1.98
51-55	4	3.96
56-60	3	2.97
61-65	3	2.97
66-70	12	11.88
71-75	24	23.76
76-80	20	19.80
81-85	16	15.84
86-90	6	5.94
91-95	5	4.95
96-100	5	4.95
75.9	Mean Response	

As shown in Figure 2, this was also the CD-RISC item with the lowest average response score, which bears further consideration given that the host institution for this study is a private Catholic university.

Though it is not entirely certain why, it is possible that a number of factors which led to attendance at a highly selective private university may be correlated to higher resilience. The data provided in Table 5 shows the average CD-RISC score separated by sex, ethnicity and residence. As shown Non-resident aliens and males had the highest scores followed by Hispanic students and non-U.S. residents.

TABLE 5

Average Resilience Score from the CD-RISC, by Sex, Ethnicity and Residence

		Average CD-RISC Score
Sex	Female	74.90
	Male	79.13
Ethnicity	Asian	70.00
	Hispanic	78.92
	Two or More	75.55
	White	75.99
Residence	US California	77.01
	US Non-California	73.17

CD-RISC Factors

As described in previous chapters. Connor and Davidson (2003) utilized a five-factor model to divide the CD-RISC into different types of resilience. Figure 1 in Chapter 3 provides an overview of this model. A new variable was created for each of the five factors by calculating the mean average score of all CD-RISC items contained in the

factor. Descriptive statistics for each factor are shown in Table 6 along with the overall CD-RISC score for reference. Only the 83 participants who completed all parts of the survey were included in Table 6 for consistency with data in the regression models detailed later in this chapter, which accounts for differences with the mean values reported earlier which included all 101 students who completed the CD-RISC.

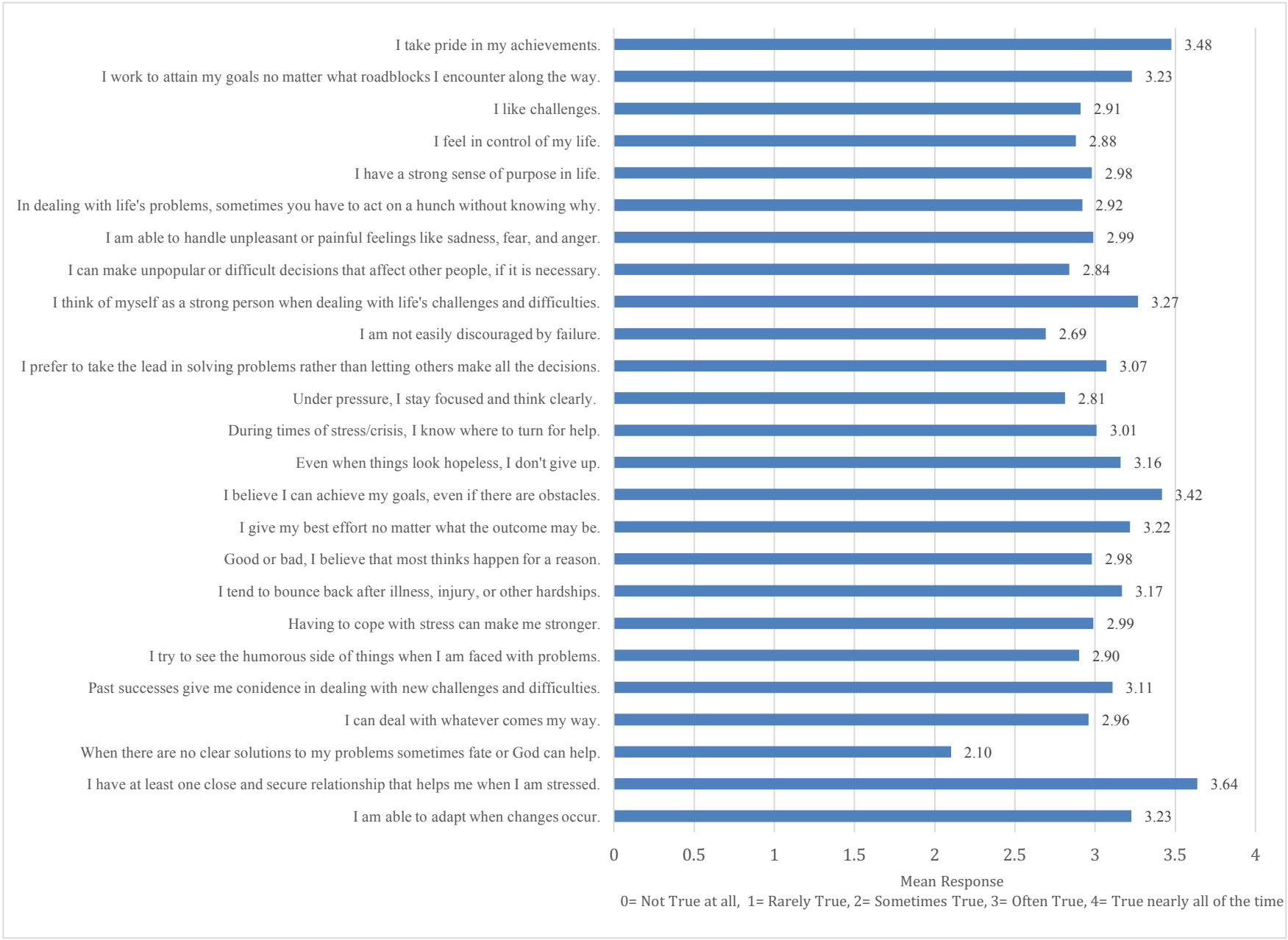

Figure 2: Average Response to Each CD-RISC Item

The score range and standard deviations for each of the five CD-RISC factors are shown below in Table 6. Factor 3 had the highest mean response rate, while Factor 5 had the largest standard deviation.

TABLE 6

CD-RISC Descriptive Statistics by Factor

	N	Minimum	Maximum	Mean	Std. Deviation
Factor 1 - Competence and Tenacity	83	1.63	4	3.15	0.52
Factor 2 - Trusting Instincts, Tolerance and Stress	83	1.71	4	2.91	0.54
Factor 3 - Acceptance of Change, Secure relationships	83	2	4	3.22	0.44
Factor 4 – Control	83	1.33	4	2.93	0.68
Factor 5 - Spiritual Influences	83	0	4	2.51	1.03
Cumulative CD-RISC Score	83	44	100	75.40	10.63

Gaming Behavior

Participants were asked to report on their personal gaming habits and behaviors. Questions covered the type of games played, as well as the frequency and duration of play sessions, social setting and motivation for play, so that this information could be compared to resilience levels. Responses are summarized in this section for all respondents who completed the gaming behavior questions. Additionally, responses are broken out by demographic groups in order to demonstrate variation in the responses between groups.

Game type. Students were first asked to indicate what types of games they had played in the past 60 days to provide a measure of current gaming habits. Additionally,

this question was asked first in order to prompt respondents to consider a variety of different game types and categories to better inform follow-up questions regarding frequency and duration of play sessions.

Respondents were instructed to select all of the game types they had played in the past 60 days using the categories outlined in Table 7. Computer games include any game played on a desktop or laptop computer. A secondary category was included specifically for multiplayer online computer, such as World of Warcraft. Other categories included mobile games played on smart phones or tablets; TV video games played on a console system such as an X-Box or Playstation; tabletop games, including those played with boards, dice and/or cards; and role-playing adventure games, (for example Dungeons and Dragons). Tabletop games and role-playing games were listed as two distinct categories due to differences in their play patterns, specifically turn based structured play in tabletop games compared to more open-ended story based play in role playing games. Dexterity games were defined as games that require physical skill and action; examples include darts and billiards. Lastly, participants were given an option to indicate that they do not play any games and another option to list any games that did not fall within the provided categories.

Table 7 outlines the percentage of respondents who engaged in each gaming type as well as a count of those students. Each category is also broken out by demographic group. As shown in the table, mobile app games were the most popular type of gaming among participants (59.48%), followed by TV video games (46.55%) and tabletop games (44.83%).

Men were more likely to engage in multiplayer online games and video games, while women had higher representation in mobile, tabletop and role-playing games. At the same time, students who indicated that had not played any games in the past 60 days were mostly women (78.95%). Hispanic students demonstrated a fairly equal preference for all gaming types. Meanwhile, mixed-race and White students showed a tendency to play more mobile app, TV video games and tabletop games although White students also showed a preference towards multi-player online games and dexterity games.

Only three students indicated that they played a type of game other than those listed. Among these were two students who listed sports and one who listed lawn games. While these could be grouped with Dexterity games, also referred to as skill and action games, it is notable that students perceived these activities to be separate from the category as described in the survey.

TABLE 7

Types of Games Played by Respondents in the Past 60-days by Sex, Ethnicity and Residence

	n=116	**Computer Games**	**Multiplayer Online Games**	**Mobile App Games**	**TV Video Games**	**Tabletop Games**	**Role Playing Games**	**Dexterity Games**	**None of the Above**	**Other**
	Total	19.83% (23)	25.86% (30)	59.48% (69)	46.55% (54)	44.83% (52)	9.48% (11)	29.31% (34)	16.38% (19)	2.59% (3)
Sex	Female	43.48% (10)	26.67% (8)	68.11% (47)	33.33% (18)	67.31% (35)	63.63% (7)	47.06% (16)	78.95% (15)	33.33% (1)
	Male	56.52%(13)	73.33% (22)	31.88% (22)	66.67% (36)	32.69% (17)	36.36% (4)	52.94% (18)	21.05% (4)	66.67% (2)
Ethnicity	Asian	13.04% (3)	13.33% (4)	13.04% (9)	11.11% (6)	7.69% (4)	18.18% (2)	2.94% (1)	15.79% (3)	0.00% (0)
	Hispanic	21.74% (5)	20.00% (6)	14.49% (10)	16.67% (9)	9.62% (5)	27.27% (3)	17.65% (6)	10.53% (2)	0.00% (0)
	Two or More	8.70% (2)	6.67% (2)	13.04% (9)	12.96% (7)	13.46% (7)	9.09% (1)	11.76% (4)	5.26% (1)	0.00% (0)
	White	52.17% (12)	60.00% (18)	57.97% (40)	55.56% (30)	63.46% (33)	45.45% (5)	61.76% (21)	42.11% (8)	2.59% (3)
Residence	US - California	82.61% (19)	73.33% (22)	56.52% (39)	62.96% (34)	51.92% (27)	54.54% (6)	61.76% (21)	52.63% (10)	0
	US Non-California	17.39% (4)	26.67% (8)	42.03% (29)	33.33% (18)	46.15% (24)	45.45% (5)	35.29% (12)	31.58% (6)	66.67% (2)

Frequency and duration of play. Table 8 provides data on the frequency and duration of game play among different demographic groups within the sample. Students were asked to self-report on how many days out of the past 30 they had played a game. They were also asked to report how many gaming sessions they average on a day when they are playing games. A session was defined as an instance of playing games separated by other activities. Lastly, students were asked how much time, in hours and minutes, each of their gaming sessions typically lasted. This data was used to calculate an estimate of how many minutes each student devoted to game play in the previous 30-day period, which is provided in the rightmost column of Table 8.

Self-reported data about the duration and frequency of play shows that the average participant engages in game play for a mean of approximately 33.25 hours in a 30-day period, or just over an hour per day. However, two averages are reported due to the fact that outliers in each group caused vast differences between the mean and median values. The overall median value suggests that the average student plays games for a total of eight hours in a 30-day period.

In general, male students, Asian students and mixed-race students appear to game most often, while White students logged gaming time just above the overall average. Game time reported by female students was below the overall average in the sample, as were the averages for Hispanics and non-resident aliens. Median game time was consistent regardless of permanent address location, however the mean value for non-U.S. residents was significantly lower (580) than Californian (2062.54) and non-Californian domestic students (2004.85). Given the data in Table 7, it appears that sex is the strongest predictor of the duration and frequency of game play.

One female, Non-U.S. resident, International Non-Resident Alien self-reported that she plays games an average of 25.5 hours per day, given the physical impossibility of this value her response was dropped from these calculations.

The next closest respondent, in terms of total playtime in a 30-day period, was a White, Male, California resident who reported his total gaming time at 300 hours, or 10 hours per day. There were other participants who reported similar gaming behaviors to the male student, and so this data was kept in the calculations.

Motivation for play. Following questions about the frequency and duration of game play sessions, students were also asked to report on their primary motivation for playing games, as shown in the survey in Appendix D. Appendix H provides the results of this multiple-choice questions, listing the percent and count of respondents associated with each preference. Data is also broken out to show the percentage, and count, of students in each demographic group associated with a particular motivation.

TABLE 8

Frequency and Duration of Individual Game Play Sessions by Sex, Ethnicity and Residence

		Average game days out of 30 Mean (median)	Sessions per day when gaming Mean (Median)	Average duration of gaming sessions in Minutes Mean (Median)	Total Minutes spent gaming in a 30-day period Mean (Median)
	All Respondents (n=87)	10.06 (5)	2.54 (2)	67.99 (60)	1994.37 (480)
Sex	Male (n=37)	14.61 (10)	2.83 (2)	95.78 (90)	3338.75 (1800)
	Female (n=50)	6.78 (5)	2.32 (2)	47.96 (30)	1016.64 (425)
Ethnicity	Asian (n=9)	9.11 (5)	1.78 (2)	88.33 (60)	2000 (600)
	Hispanic (n=13)	11.54 (5)	2.62 (2)	60.62 (60)	1296.54 (600)
	Two or More (n=10)	9.4 (5)	4 (2)	71 (30)	2929 (750)
	White (n=51)	10.42 (6)	2.38 (2)	63.26 (60)	2057.24 (600)
Residence	US - California (50)	10.70 (5)	2.14 (2)	69.92 (60)	2062.54 (600)
	US Non-California (34)	9.67 (5)	3.21 (2)	63.03 (30)	2004.85(600)

Recreation and entertainment was the most common motivator overall, accounting for 64.58% of all responses. Recreation and entertainment was also the most common response within each of the demographic groups.

Socialization was the second most common response overall at 17.71%. While this was consistent among all demographic groups it is worth noting that 82.35% of respondents who selected socialization as a primary motivator for game play were female. Regression analyses discussed later in this chapter will show that motivation was not a major contributing variable for predicting high levels of resilience.

Social context. Students were asked to select the "primary social setting" for their gaming sessions from the options provided Appendix I. The data shows that for this sample the majority of gaming involved the respondent playing with friends in person, rather than online or solo gaming. This was true for each demographic category as well.

Female respondents also made up the majority of solo gamers both at home and on mobile platforms, while males were more likely to play games online with friends. None of the 96 students who completed this survey questions indicated that their primary social context for gaming was online gaming with strangers. Regression models revealed that social context was not a primary factor related to resilience, except when considered as an aspect of the game type 'multiplayer online games.'

Gamification Knowledge and Experience

Participants were asked a series of four questions about their experience with gamification. The first questions asked students to rate how familiar they were with the term gamification, while the latter questions asked students to provide information about

the types of gamification they had personally experienced and to what extent they had used these systems.

As shown in the survey in Appendix D, students were given the prompt "Gamification is a relatively new concept. Please tell us how familiar were you with the term 'gamification' prior to participating in this study?" Survey results showed that the majority of students (87.50%) had never heard this term prior to participating in the study, while 7.29% indicated that they had heard the term but could not confidently explain or define it and just over five percent of students felt they could explain the basic concept of gamification.

Respondents were provided with a definition and examples of Gamification. After reading this definition participants were asked if they could think of an example of a gamification system they had used in their life. With a definition for guidance, 76.04% of students felt confident that they could identify a gamification system they had used. A total of just over 20% indicated that they could not identify a gamification system they had tried, 35% of which indicated that they would be interested in trying gamification.

The 73 participants who indicated that they had used a gamification system were also provided with an open-ended response and were asked to name the gamification system they had used. The 49 valid responses provided were grouped into categories using conventional content analysis and descriptive coding. This led to four primary categories of gamification: retail and restaurant rewards systems, fitness programs, language learning programs and lastly a category to capture the eight remaining gamification systems. The eight remaining systems all focused on different types of self-improvement or learning, but did not share more specific links to other categories or to

each other with regards to the type of learning and self-improvement. Fitness gamification systems were the most commonly used with 46.93% of the participants using either just these systems or these systems combined with other forms of gamification.

Consumer reward programs at retail stores and restaurants were the second most commonly used type of gamification system among participants, with 24.49% of students using only these forms of gamification and another 6.12% using retail systems as well as fitness systems. Language learning programs were used by 18.36% of respondents who had used gamification. Four students used self-designed rewards systems for completing chores and homework assignments, three used mobile applications designed to promote problem solving and improve cognitive function and lastly one participant who was part of a gamified employee reward system in their part-time job.

Women were more likely to use more than one gamification system and were also more likely to use fitness based gamification systems. Neither of the two participants who reside outside of the United States reported using gamification systems at all. The 73 participants who indicated using gamification systems were also asked how often they used the gamification system referenced in the previous question. There is no clear trend regarding the frequency of gamification system use. Combining categories reveals that 23.29% of students used their gamification system once a week or less. Adding students who no longer used the gamification system raises this number to 32.88%. Data analysis shows that the frequency and duration of play is relatively consistent regardless of whether the games are purposeful or recreational.

Perceived Impact of Gaming Behavior on Resilience

At the conclusion of the survey all participants were asked five additional questions to assess their perception of the relationship between their gaming habits and resilience. These five items were written to link directly to the questions in the CD-RISC instrument that were believed to have the strongest connection to game play. The questions can be seen in Appendix D. Responses were coded using the following Likert scale: strongly disagree (1), disagree (2), somewhat disagree (3), neither agree nor disagree (4), somewhat agree (5), agree (6), strongly agree (7).

Mean responses to all five questions were closest to a score of four, corresponding to neither agree nor disagree. This indicates that on average participants had a neutral perception regarding the impact of their gaming behaviors on their resilience levels. Individual responses demonstrated a broad range of perspectives, with some students strongly agreeing with all five statements and others strongly disagreeing with all five; while the majority of responses were closer to the neutral response.

Descriptive statistics outlined in this chapter begin to provide some insights into the relationship between demographics, gaming behavior and resilience. However, in order to best understand these relationships additional statistical analysis is required.

Grade Point Averages

Grade data was provided at the end of the academic year for fall and spring semesters as well as a cumulative GPA measure. Fall GPAs for the sample ranged from 2.13 to 4.00 with an average of 3.43 on a 4.00 scale. Spring data was similar with a low GPA of 2.00, a high of 4.00 and an average of 3.40. Cumulative data showed first-year low GPA of 2.56 and a high of 4.00, with an average of 3.39. Based on the finding that the lowest cumulative GPA is higher than the lowest semester GPAs, it can be seen that

students who struggled in one semester appear to have done well in the other term in order to achieve a higher cumulative grade point average. GPA data also revealed that only two students in the sample did not complete both semesters, one took a leave of absence during the fall semester and returned for the spring, while the other left during spring semester and their return for the following fall was uncertain.

Correlational Analysis

A primary goal of this study was to identify connections between demographics, gaming behaviors and resilience. The intention was to provide insight that might help inform the design of gamification systems targeted at student success. This portion of the chapter will use a variety of statistical analyses, including bi-variate correlation and regression models, to identify any connections between gaming behavior, demographics and resilience.

Correlation

As a starting point a correlation table of all variables was created to identify any significant connections at the .05 and .01 levels. The significant outcomes can be found in the tables in Appendices F, G, J, K, and L.

Sex. Sex was found to be a significantly correlated (p=.01) with the number of days spent gaming in an average 30-day period as well as the length of game sessions. In both cases the correlations for males was positive (r = 0.46 and r = 0.50 respectively) and thus equally negative for females (r = -0.46 and r = -0.50). A similar correlative relationship exists between males and multiplayer online games (r = 0.50, p = .01) and TV video games (r = 0.65, p = .01).

Although sex was not significantly correlated to overall CD-RISC scores, there were five items (6, 12, 14, 16, 24) in the resilience inventory that were linked to sex with a p-value of .01 and five more (1, 8, 9, 11, 23) with a p-value of .05. These items are listed in Table 9 along with the Pearson r values for each.

In each case the male participants demonstrated a positive correlative relationship with the CD-RISC item.

Table 9

Significant Pearson r Correlation Coefficients for Sex and CD-RISC Inventory Items

p=.01 for all values

	I try to see the humorous side of things when I am faced with problems.	Even when things look hopeless, I don't give up.	Under pressure, I stay focused and think clearly.	I am not easily discouraged by failure.	I work to attain my goals no matter what roadblocks I encounter along the way.
Male	0.25	0.26	0.35	0.31	0.26
Female	-0.25	-0.26	-0.35	-0.31	-0.26

p=.05 for all values

	I am able to adapt when changes occur.	I tend to bounce back after illness, injury, or other hardships.	Good or bad, I believe that most things happen for a reason.	I believe I can achieve my goals, even if there are obstacles	I like challenges.
Male	0.25	0.20	0.24	0.20	0.22
Female	-0.25	-0.20	-0.24	-0.20	-0.22

Ethnicity. For most of the ethnicity categories recorded by the university the absolute number in the sample was less than ten. As such, categories with less than ten respondents were removed from the analysis as it is difficult to draw meaningful

inferences from such a small sample. As a result, only Asian, Hispanic and White ethnicities were considered in the analysis. Review of the correlation data for ethnicity reveals that there were few significant relationships at the .01 confidence level.

Asian participants demonstrated a negative correlation at the $p = .01$ level to the CD-RISC items "I am not easily discouraged by failure" ($r = -0.31$) and "I like challenges," ($r = -0.33$). For Hispanic participants, the only correlation at this level of significance was to the CD-RISC item "I have a strong sense of purpose," ($r = 0.29$).

There were no correlations at the $p = .01$ level for students who listed their ethnicity as White.

Residence. Response rates from non-US students were too low to provide useful data. However, there were interesting findings when comparing California residents to students from other states. Californians had a connection to computer games with a Pearson r of 0.29 and a p-level of 0.01. Students from the United States outside of California showed a positive correlation with solo mobile gaming ($r = 0.27$, $p = .01$). Regression analysis described later in this chapter will also show that in-state residents had higher resilience scores overall compared with out-of-state peers.

Type of game played. The types of games participants play were correlated with variables in a variety of categories extending beyond the demographics described in the previous section. A consolidated summary of these correlations, with significance at the .05 and 01 levels, is provided in Appendix F. The table displays each of the game types and any correlating variables from each of the following categories: other game types, duration and frequency of play, social context, motivation, Connor-Davidson resilience inventory items, and perceptions of the impact of gaming behavior on resilience. Pearson

r values ranged between -0.31 and 0.52, indicating that although general trends between these variables exist, the relationships are not fully linear.

Several similar types of games were found to be correlated with one another, including multiplayer games, which were linked to computer games ($r = 0.46$, $p = .01$) and video games ($r = 0.42$, $p = .01$). This connection has face validity given that computers and video game consoles both provide platforms for multiplayer online play. At the same time, only multiplayer online and computer game play were correlated ($p = .01$) with the social context of playing games online with friends, with Pearson R values of 0.45 and 0.43 respectively. Both platforms also demonstrated strong negative correlation to playing games in person with friends. ($r = -0.23$ and -0.31).

Computer games. Playing computer games had a positive correlation ($r = 0.46$, $p = .01$) to the number of days spent playing games, suggesting that computer game play was associated with an increased likelihood of frequent play. With regard to social context, computer gaming was significantly correlated to the format for gaming with friends. Specifically, there was a positive relationship ($r = 0.43$, $p = .01$) to gaming with friends online, and a similar negative correlation to gaming with friends in person ($r = -0.31$, $p = .01$).

Computer gaming correlated ($p = .01$ and $p = .05$) with several CD-RISC items from Factor 2, defined as trusting one's instincts, tolerance for adversity and ability to learn from overcoming stressful situations (Connor & Davidson, 2003). Correlated items included "I prefer to take the lead in solving problems rather than letting others make all the decisions" ($r = 0.28$), "having to cope with stress can make me stronger" ($r = 0.26$) and "I can make unpopular decisions that affect other people, if it is necessary" ($r = .30$).

The remaining correlated (p = .05) CD-RISC items for computer gaming have connections to Factor 3. They include, “past successes give me confidence in dealing with new challenges” (r = 0.23) and “I am able to adapt when changes occur” (r = 0.28).

Multiplayer online games. This game type had the most correlative effects across categories. Similar to computer games, playing multiplayer online games was positively correlated to the number of days of game play in an average 30-day period (r = 0.43, p = .01). This group averaged 17.32 days of gaming out of 30 days, compared to the mean of 10.06 days for all participants.

A similar relationship exists between multiplayer online games and the length of each gaming session (r = .50, p = .01), with an average session length of 101.38 minutes for this group, which is 33.39 minutes longer than the mean session length for all participants, however regression analysis shows that duration of play was not a significant factor associated with increased resilience.

There were connections to social context with face validity; specifically, a positive correlation to playing games with friends online (r = 0.45, p = .01) and a negative correlation to playing games in person with friends (r = -0.23, p = .05). As noted previously, none of the participants indicated that they play games online with strangers.

Playing multiplayer online games was strongly correlated with seven different CD-RISC items, more than any other game type. Computer games were the next closest with five correlations. Four of the items correlated with multiplayer games are found in Connor and Davidson’s (2003) first factor including: “even when things look hopeless I don’t give up” (r = 0.25, p = .01), “I am not easily discouraged by failure” (r = 0.38, p =

.01), I take pride in my achievements (r = 0.27, p = .05) and "I work to attain my goals no matter what roadblocks I encounter along the way" (r = 0.23, p = .05).

The remaining CD-RISC items that correlated with playing multiplayer online games were: I try to see the humorous side of things when I am faced with problems (r = 0.23, p = .05) and "under pressure I stay focused and think clearly" (r = 0.29, p = .01), from Factor 2, and "I can deal with whatever comes my way" (r = 0.28, p = .01), from Factor 3.

Multiplayer online game play also had one of the strongest connections to the five questions regarding student perception of the impact of gaming on their resilience. Only role-playing games demonstrated a similar relationship. Four of the five statements posed had a positive correlation between r = 0.26 and r = 0.29 to playing multiplayer online games. Two of these survey items, "playing games has increased my self-confidence," and "achieving success when playing games has improved my outlook when facing challenges in real life," were correlated at the .01 level. The remaining two, "playing games has increased my persistence when working towards my goals" and "playing games has helped me to be less discouraged when facing failure in real life" were correlated at the .05 level.

Mobile app games. Playing mobile application games was significantly positively correlated only to solo game play at home (r = .21, p = .05). This type of gaming also had a negative correlation to playing games with friends in person. (r = -0.26, p = .05). For mobile app gaming, there were no significant connections to other game types, social contexts, motivations for play or resilience related items, indicating that this game type is not related to the desired outcome of increased resilience.

Video games. In addition to the previously noted relationship to multiplayer online games, playing video games also had a positive correlation to playing dexterity games such as darts and billiards ($r = 0.22$, $p = .05$). Video game play also showed a similar relationship to computer games and multiplayer online games with regard to the number of days spent gaming in an average 30-day period ($r = 0.38$, $p = .01$). The positive correlation between video game play and session length (.01) proved to be the strongest between a game type and any other variable with a Pearson r value of 0.52, however as previously noted, session length was not shown to be correlated with increased resilience, indicating that video games may not be as effective as other game types for this application.

Tabletop games. Table top gaming demonstrated a negative correlation with the amount of time spent playing games, both in terms of the number of days spent gaming ($r = -0.23$, $p = .01$) and the total game time in an average 30-day period ($r = -0.22$. $p = .05$). Data also showed that tabletop games were positively correlated with playing games with friends in person ($r = 0.28$, $p = .01$) and socialization as a primary motivation for play ($r = 0.22$, $p= .05$). The only CD-RISC item correlated to tabletop game play was related to managing emotions, specifically 'I am able to handle unpleasant or painful feelings like sadness, fear, and anger' ($r = 0.23$, $p = .05$).

Role-playing games. Traditionally, role playing games (RPGs), like Dungeons & Dragons, involve in-person gaming sessions. Despite this, the only social context correlated to RPGs was 'online with friends' ($r = 0.29$, $p = .01$). This may have been impacted by the growing popularity of web-based platforms that facilitate role-playing games between players in different locations, and platforms that allow users to stream

their games live to an audience (DeVille, 2017; Ellsworth, 2018). Role-playing game play was found to have a positive correlation with challenge/achievement and education/skill development as motivating factors for game play. However, the number of respondents who selected these categories as their primary motivation for play was only five and one respectively, and the correlation coefficients were only 0.21 for Challenge/achievement and 0.29 for education/skill development. With a small sample, and low correlation coefficients it is uncertain if this relationship would remain consistent in the larger population.

The key findings for roleplaying games are found in the regression analysis described later in this chapter, which shows that this game type had the largest correlation with overall resilience as well as a number of CD-RISC factors.

Dexterity games. Correlational analysis of dexterity game play relative to all other variables revealed mild correlations (at the .05 level) and with a Pearson r values between 0 and 0.25. All of these relationships are displayed in Appendix F. Perhaps most notable is that dexterity games were the only gaming type to demonstrate a significant correlation to the overall CD-RISC score ($r = 0.24$, $p = .05$), however this game type was not identified as a significant factor during the regression analysis.

Up to this point, the correlative relationships between demographics, and other variables, and game types and other variables have been reviewed. The following sections will review the remaining notable correlations for duration and frequency of game play, social context of play, and motivation for play.

Duration and frequency of play. Correlations between variables in this category as well as variables not previously covered, including social context, motivation and CD-

RISC can be found in Appendix G. Relationships for these variables and the variable for total time spent gaming in the past 30 days were not included in the table given that the total game time was calculated using this data.

Frequency of play, including the number of days of game play in a 30-day period, and the number of gaming sessions in a day, were positively correlated to all five of the variables related to perceived impact of gaming on resilience. As shown in Appendix G the number of days of gaming a 30-day period correlated to these factors with Pearson r values ranging from 0.33 to 0.45at the p=.01 level. Similar results are found for the correlation between the number of gaming sessions per day and perceived impact variables, though the Pearson r value range is lower (0.24 to 0.34) with p-values ranging from .01 to .05.

Total game time in a 30-day period had similar connections to perceived impact of gaming on resilience, however this relationship did not exist for the variable 'length of gaming session.' This suggests that the connection between total game time and perceived impact stems from the variables related to frequency of play rather than duration.

The number of days involving game play in a 30-day period also correlated positively to eight of the 25 CD-RISC items, which are listed in Appendix G. This was not the case for the number of game sessions in a given day. These findings are consistent with the regression analysis later in the chapter, which shows that the number of days of game play is significantly (p=.04) correlated with higher resilience.

Social context for play. Students were asked to report the primary social context for their gaming sessions. This data was tested for correlation with the variables in each

of the previous sections. The data in Appendix J shows significant correlations between social context variables and the variables for motivation, CD-RISC items and variables for perceived impact of gaming on resilience. Regression analysis revealed that social context for play was not a key factor in the models for CD-RISC score or for the five CD-RISC factors, except when considered as a part of the multiplayer online game type.

Students were only allowed to select the social context that most often fit their gaming behaviors. As a result, inherent negative correlations exist between the different social contexts.

Of the social context variables, "gaming online with friends" was correlated with the most CD-RISC items (four of twenty-five) and the most variables for perceived impact of gaming on resilience (three of five). As noted in previous sections, none of the participants selected 'gaming online with strangers' as their primary social context for play. The combination of these findings indicates that respondents who play multiplayer online games play with friends. As a result, it makes sense that gaming online with friends is positively correlated with several CD-RISC games given that multiplayer online gaming is a key variable in the regression model for CD-RISC Factor 1.

Motivation. In the previous sections, the primary variables were tested for correlation with the variables for primary motivation for gaming. These motivation variables were also tested for correlation to CD-RISC items and perceptions of the impact of gaming on resilience. The significant correlations are detailed in Appendix K. As with the social context variables, correlations between motivation variables were all negative due to the fact that participants could only select one of these options as their primary

motivation for gaming. For each motivation type the number of respondents who selected the option is included.

As seen in Appendix K, and noted previously, very few participants selected motivations other than recreation/entertainment and socialization. As a result, the correlations for other motivation types are not generalizable to a larger population. For the motivation types that had sufficient response rates there were limited correlations. Recreation and entertainment had one negative correlation to the CD-RISC item "I try to see the humorous side of things when I am faced with challenges" ($r = -0.32$, $p = .05$). Socialization as a primary motivation had no correlations to the CD-RISC items or variables for the perceived impact of gaming on resilience. These findings indicate that motivation for play is not related to resilience.

CD-RISC and perceived impact of gaming on resilience. Correlational analysis between the CD-RISC items and the five questions related to perceived impact of gaming on resilience revealed a total of 13 positive correlations ranging from a Pearson r of 0.22 and a p-value of .05 to a Pearson r of 0.37 and a p-value of .01. All 13 relationships are outlined in Appendix L. Only the first perception variable, "playing games has increased my persistence when working towards my goals," was correlated with the overall CD-RISC score ($r = 0.24$, $p = .05$). For the other four perception variables, there were significant correlations ($p = .01$) to the CD-RISC item "I believe I can achieve my goals, even if there are obstacles" with Pearson r values ranging from $r = 0.23$ to $r = 0.37$.

In general, the questions about the perceived impact of gaming on resilience do not have strong correlations to CD-RISC inventory items and overall scores. In other

words, participants who perceived gaming to have a positive impact on their resilience did not necessarily have high resilience as measured by the CD-RISC.

Regression Analyses

Thus far, the correlative relationships between variables have been explored and reported. As such, this portion of Chapter Four will provide an overview of the types of regression analyses that were considered and the significant relationships that were revealed.

Currently, existing research does not provide a theoretical basis for organizing variables for regression models in this area. For this reason, a stepwise regression model was used to generate an initial model of variables relative to overall CD-RISC score. This model used only the variables with significant response rates. Any variables that applied to fewer than 10 responses were removed from consideration for the stepwise regression models. This included the removal of several demographic measures, and although it would be preferable to include these factors in the analysis, the data available was not sufficient to yield any robust inferences. As a result, the only ethnicities included in the regression models were Asian, Hispanic, and White.

The other independent variables included in these models were: sex, California residency, U.S. residency outside of California, all game types, session duration, number of days of gaming in a 30-day period, recreation/entertainment as motivation, and socialization as motivation. Only respondents who completed the entire questionnaire were included to ensure there were no gaps in the data set. This yielded a total sample of 83 students.

The same regression approach was applied using each of the five CD-RISC factors that were initially created by Connor and Davidson (2003) as the dependent variable. Based on these findings a new core model was developed using the most prevalent independent variables from these six (CD-RISC score and five factor) regression models. Results were compared to the original stepwise models and it was found that the original stepwise models had better adjusted R-squared values in four of the six cases. As a result, the modified core model was dropped in favor of the original stepwise models.

To further expand the analysis the same stepwise regression process was also applied to each of the 25 individual CD-RISC items. Regression models for overall CD-RISC scores are based on a combined item score out of 100. Models for each factor are based on an average of all item scores within that factor, representing a range from 0 to 4; which is consistent with the range for individual item regression models.

A summary of each of the stepwise regression models is provided in Appendix M; including the correlation coefficient (r), coefficient of determination (R-squared), adjusted R-squared, which takes into account the number of variables in the model, standard estimate of error, F-statistic and significance levels. As shown in Appendix M all of the p-values in the sig. column are smaller than .05, and F-statistics ranged from a low of 4.00 for item 13 to a high of 13.11 for item 14. Results indicate that the stepwise models provided are effective predictors of these relationships given a sample of 83 participants.

Appendix N details each of the variables included in the 31 regression models, providing the estimated coefficients to demonstrate the impact of each variable on the

CD-RISC scores, as well as the p-value to show significance of each relationship. Table 10 provides a condensed version of Appendix N, highlighting the models for overall CD-RISC score and each of the five factors.

CD-RISC score model. Data in Table 10 shows that for overall CD-RISC scores U.S. students from outside the state of California experience an average score drop of 6.69 percent. Lower resilience for these out-of-state students mirrors retention data for this population as well (Stat Book, 2019) giving face-validity to the finding. The same regression model indicates that playing role-playing games are associated with an average CD-RISC score increase of over 9 percent. The final variable in this model shows that for each day of gaming in a 30-day period a student's resilience score increases by 0.25 percent. Sex, ethnicity, motivation and social context for gaming were not significant variables in this stepwise regression, however these categories appear significant for the five factor models as well as for individual CD-RISC item regression models.

Factor 1 model. The first CD-RISC factor deals with competence and tenacity, or persistence. As noted in the previous section there was a strong correlation between multiplayer online game play and the CD-RISC items in this factor. It follows that the only independent variable in the Factor 1 stepwise model is multiplayer online game play. According to the model, playing this type of game is associated with an increase in the average score for items in this factor by 0.68 points, which is a 17% increase in a four-point scale.

Analysis of the eight individual items contained in factor one shows that multiplayer online game play appeared only in the models for items 16 and 25, with a

larger increase of 0.82 for item 16, “I am not easily discouraged by failure” compared to 0.44 for item 25 “I take pride in my achievements.”

For item 10 there was no significant relationship with the independent variables entered for the stepwise model. In items 12 and 23, where sex appeared as a significant variable in the regression model, being female was associated with a lowered score. As in the overall CD-RISC regression model, the variable for non-Californian U.S. students also related to lower item scores in Factor 1. Role-playing games, which are a central part of the regression model for overall CD-RISC score were not represented at all as a significant variable in the models for Factor 1.

Factor 2 model. The second CD-RISC factor includes seven items and relates to trusting personal instincts, tolerance for stress, as well as the ability to learn from stressful situations. A stepwise regression for the combined Factor 2 variable, which is an average of each item score for all items contained in the factor, yielded two significant independent variables: computer game play and role-playing game play. Each of these variables had a similar effect, increasing average scores for Factor 2 by roughly one third of a point, or an 8% score increase for each variable.

Sex was again a significant variable in two out of seven individual item models, and in both cases, being female was associated with a lower score, -0.54 for item 6, and -0.73 for item 14. Role playing game play was also a significant variable for item 14 “under pressure I stay focused and think clearly” with a coefficient of 0.83. Computer game play was included in the regression models for three of the items related to Factor 2, but for item 18 “I can make unpopular or difficult decisions that affect other people, if

it is necessary" the variable was insignificant. For the other two items, 7 and 15, the estimated coefficients were 0.48 and 0.55 respectively.

This accounts for the overall effect of computer games seen in the Factor 2 regression model. As with the Factor 1 and the overall CD-RISC score regression models U.S. non-California residency was a significant variable associated with lower average item scores for item 18 (-0.49) and item 19 (-0.38). Using item 20 "in dealing with life's problems, sometimes you have to act on a hunch without knowing why" as the dependent variable for a stepwise regression with the same independent variables did not yield any significant relationships.

TABLE 10

Summary of CD-RISC Regression Model Variables, and Their Predicted Relationships

Factor	Item #	Item	Stepwise Regression Model Variables	B	Sig.
CD-RISC	All	Overall Score	US, Non-CA	-6.69	0.00
			Role Playing Games	9.40	0.00
			# of days in 30 spent gaming	0.26	0.04
Factor 1 - Competence and Tenacity	F1	Full Factor 1	Multiplayer Online Games	0.68	0.00
Factor 2 - Trusting Instincts, Tolerance and Stress	F2	Full Factor 2	Computer Games	0.32	0.02
			Role Playing Games	0.34	0.04
Factor 3 - Acceptance of Change, Secure relationships	F3	Full Factor 3	Computer Games	0.27	0.01
			Role Playing Games	0.36	0.01
Factor 4 - Control	F4	Full Factor 4	US, Non-CA	-0.41	0.01
			Role Playing Games	0.47	0.03
Factor 5 - Spiritual Influences	F5	Full Factor 5	Female	0.82	0.00
			US, Non-CA	-0.66	0.00
			Session Duration	0.01	0.04

Factor 3 model. The stepwise regression model for Factor 3, which measures resilience relative to adapting to change and maintaining secure relationships, utilized two preferred game types: computer games and role-playing games. Playing either of these types of games was associated with higher average scores for CD-RISC items in this factor set, as evidenced by the estimated coefficients of 0.27 for computer games and 0.35 for role-playing games. Here the impact of role-playing games again mirrors the finding in the regression model for overall CD-RISC score. Item 8 "I tend to bounce back after illness, injury, or other hardships" did not yield a significant regression model using this stepwise method. Of the remaining four items in Factor 3, role-playing games and computer games were significant only in the regression model for item 1 "I am able to adapt when changes occur." In both cases playing these game types were associated with an increase in average response scores by more than 0.50 points, or more than 12.5%.

The regression model for item 2 "I have at least one close and secure relationship that helps me when I am stressed" indicates that U.S. residents from outside California were less likely to score well in this area, with an estimated coefficient of -0.25. This appears to have face validity given that students in this group are attending an institution away from their permanent address. Given that this study was conducted with students in their first semester at the institution it could be argued that the students have not yet formed secure relationships described in item 2 in their new environment. For item 4, the ability to "deal with whatever comes my way" was associated with an increase in the frequency of game play, with a score adjustment of 0.04 for each additional day of gaming.

Factor 4 model. The fourth factor, which centers on control, contains only three individual items. The stepwise regression model for this factor also uses both the U.S. non-Californian and role-playing game variables found in the overall CD-RISC score stepwise regression model. As with the overall model, domestic students from outside California had lower scores ($\beta = -0.41$) and role-playing game play was linked to increased scores ($\beta = 0.47$). Role-playing game play did not appear in any of the stepwise regression models for the three individual items in Factor 4. However, U.S. non-California residency was the only significant variable for stepwise regression of both items 13 ($\beta = -0.38$) and 22 ($\beta = -0.64$).

Factor 5 model. As previously described, Factor 5 includes only two CD-RISC items and deals with spiritual influences on resilience. The stepwise regression model for Factor 5 utilized three variables: sex, duration of play session and U.S. non-California residency. Unlike with regression models for other factors and items, females had higher scores in this category with an estimated coefficient of 0.82. However, the effect for out-of-state students was similar to other regression models, with an average Factor 5 score drop of -0.66 for students in this group. Session duration appears to be a small effect due to a low estimated coefficient of less than .01, however this variable is measured in minutes of game play per gaming session, so an hour of extra play could result in a factor score increase of 0.30 points.

The stepwise regression model for item 3 did not result in any significant variables. Given that there are only two items in Factor 5 it is apparent why the regression models for item 9 and Factor 5 appear similar, as shown in Appendix N. The primary difference created by combining items 3 and 9 into Factor 5 is that the effect of

solo gaming at home shown in the model for item 9 becomes insignificant for the combined stepwise regression model.

Overall, Table 10 demonstrates consistencies between the regression model for overall CD-RISC score, and the five-factor regression models. At the same time, it highlights unique relationships relative to each of these categories.

An additional series of stepwise regression models was created to assess the relationship between students' perception of the relationship between gaming and resilience relative to actual changes in resilience. This model used the last five questions from the survey in Appendix D, which ask about students' perception of gaming's impact on their resilience, as independent variables, and resilience scores as dependent variables.

The results are shown in Table 11 and indicate that the relationship between actual resilience and perceived resilience is relatively small, when it exists at all. As shown, the only significant models generated were for overall CD-RISC score, Factor 2 and Factor 3. In each case only one of the five perception variables was included in the model. This data indicates that the relationships between gaming behaviors and resilience operate independent of students' perceptions. Thus, students may be unaware that gaming behaviors are linked to increased resilience, and therefore may not understand the potential for gaming behaviors to be linked to increasing student success.

TABLE 11

Summary of Stepwise Regression Models for CD-RISC Scores Relative to Perceived Impact of Gaming on Resilience

Dependent Variable	Stepwise Regression Model Variables	B	Sig.	Adjusted R-Square	Std. Error of the Estimate	F	Sig
CD-RISC	Playing games has increased my persistence when working towards my goals	1.54	0.03	0.04	10.39	4.77	0.03
Factor 1	No significant model						
Factor 2	Playing games has increased my persistence when working towards my goals	0.08	0.03	0.04	0.53	4.75	0.03
Factor 3	Playing games has increased my ability to make decisions under pressure	0.06	0.02	0.05	0.43	5.40	0.02
Factor 4	No significant model						
Factor 5	No significant model						

Gaming Behaviors, Resilience and GPA

With data that indicates a relationship between certain gaming behaviors and higher resilience the question remains as to whether or not those gaming behaviors are correlated with changes in academic success as measured by GPA, and if so what role resilience plays in that relationship.

Gaming and GPA. Using stepwise regression analysis, models were created using each GPA measure as dependent variables. The first set of models tested for relationships between all of the gaming behaviors and GPA. Only findings of p=.05 or

less were considered significant. Based on this standard there were no significant relationships between gaming habits and fall or spring semester GPAs. There was one significant relationship between playing role playing games and cumulative GPA, which showed that this gaming preference predicted a 0.55-point decrease in GPA on a 4.00 scale (p=0.05).

Resilience and GPA. Following the theories that resilience increases student success (Martin, 2002; McMillan & Reed, 1994) an additional set of regression models was used to identify any connections between overall resilience, or the five resilience factors and each of the GPA measures. All of the analysis showed no significant relationships between resilience and GPA at the p=0.05 level. The only finding to come close to this significance level suggested that each point of increase in overall resilience may predict a 0.013-point increase in GPA on a 4.00 scale, however the p-value was relatively high at 0.149.

Mediation and Moderation

Results show that certain game types are correlated with higher resilience; however, resilience is not significantly correlated with GPA in the first year, and gaming habits are not significantly correlated with GPA. This leads to the finding that resilience does not mediate, i.e. explain, the relationship between gaming and GPA. In fact, results suggest that there is not a strong meaningful connection between gaming habits and GPA.

Based on this outcome the final analysis was to test if resilience levels moderated the relationship between gaming behaviors and GPA. In other words, to determine if resilience impact the strength of the relationship between these variables. In order to test this a regression model was built to test the moderating effects of the overall resilience

measure on the relationship between gaming behaviors and GPA. Given that the relationship between role-playing games and cumulative GPA was found to be the only significant correlation, these variables were used for the initial moderation model. The significance value for the resulting model was 0.638, suggesting no moderating effect is occurring. For further assurance, additional models were created to test if resilience moderated the relationship between any of the other gaming variables and the three GPA measures (fall, spring and cumulative). Not one model yielded a significance value less than 0.05. Taken together, this confirms that for this data set, resilience does not appear to mediate or moderate the relationship between gaming behaviors and resilience.

CHAPTER FIVE

DISCUSSION OF FINDINGS AND CONCLUSION

Introduction

The primary purpose of the study was to determine if there is a link between existing game play behavior and student success among first-year, college students; and what role, if any, resilience plays in that relationship. The goal in doing so was address inconsistencies in existing research on educational gamification by providing insights that can inform the design of effective gamification systems for increasing student resilience, given that resilience has been directly linked to a variety of student success measures (Waxman, Gray, & Padron, 2003).

This chapter contains a review of the major findings as they related to the research questions, which were:

1. Is there a significant positive correlation between playing games and resilience among first-year college students at a medium-sized, private, Catholic, four-year liberal arts institution in the southwestern United States?
    a. To what extent does the relationship between gaming experience and resilience among first-year students differ based on gaming habits, including types of games, duration and frequency of play, social setting and motivation for play?
    b. To what extent is the relationship between gaming experience and resilience among first-year students different for various demographic groups including, sex, ethnicity, and national origin?
2. Do gaming behaviors correlate with changes in academic performance?

a. If this correlation exists, to what extend does resilience mediate or moderate the relationship?

In order to address these research questions the chapter will first examine the key relationship between resilience and gaming behaviors, controlling for demographics. In addition, findings from the five questions on student perceptions of gaming and resilience will be used to address research question two.

The chapter will also address some of the limitations of this research and will offer a series of implications for future research in the area of gamification and resilience. Lastly, the discussion will address the connection between this research and some of the issues raised in the literature review about the design of other gamification studies.

Gaming Behavior and Resilience

In order to address the first research question, resilience scores from the CD-RISC were divided into three groups: the overall score, scores for each of the five factors, and scores for each of the 25 individual questions. These 31 measures served as the dependent variables for a series of stepwise regression analyses that looked for significant relationships with demographics and game-related behaviors. The combination of variables present in, as well as absent from, these models provides insight for the design of gamification systems for resilience, which will be discussed in more detail for each of the independent variable categories. As a reminder, the independent variables included in these models were those with a response rate of ten or more participants. This included: sex, ethnicity (Hispanic, White, and Asian), California residency (in-state), U.S. residency outside of California (out-of-state), all game types, session duration, number of

days of gaming in a 30-day period, recreation/entertainment as motivation, and socialization as motivation.

Demographics

Sex. The split of males and females was similar to the split for the total class of first-year, first-semester students, as shown in Table 2. CD-RISC data shows that males had a higher average score of 79.13 out of 100, while females had an average of 74.90, indicating that in general female students have a lower level of resilience. In terms of gaming behavior, male and female participants seemed to prefer different gaming types. Males were more likely to play multiplayer online games and video games, while females played more mobile app games, tabletop games and role-playing games, as shown previously in Table 7. Respondents who indicated that they had not played any games in the past 60 days were mostly female (78.95%). Similarly, males played games more often, averaging 14.61 days of gaming in a 30-day period, with a median of 10 days; while females had a mean of 6.78 days of gaming, and a median of 5 days for the same period. Males also reported longer averaging gaming sessions, with a mean of 95.78 minutes, compared to 47.96 minutes for women. All of this indicates that males may be more likely to engage with game systems frequently and for longer periods of time. This is an interesting finding given that males also demonstrated higher resilience scores overall.

It is important to note that the correlation between increased game time among males and higher resilience levels does not indicate that frequent gaming increases resilience. It is possible that both factors are influenced by other variables. Alternatively,

it may mean that as a result of higher resilience levels, males are more comfortable devoting time to recreational activities, including gaming.

Males in this study were more likely to play with friends online, a behavior that is linked to higher resilience levels. Female participants were more likely to engage with a mobile game system as well as physical face-to-face games, playing in person with friends, which did not correlate with higher resilience. Among the participants who had used gamification systems, women were more likely to use more than one system and were more likely to use fitness based systems. This seems to support the data that women engage more with mobile gaming, which was the primary platform for the gamification systems that students reported using.

Despite differences in the mean CD-RISC score for males and females, sex was not a significant variable in the stepwise regression model for overall CD-RISC score. However, sex did appear within the stepwise regression models for several factors and individual CD-RISC items. Sex was not significant in the regression model for Factor 1, but for item 12, "even when things are hopeless I don't give up," and item 23, "I like challenges," females had average scores that were 0.36 and 0.36 points lower than the males on a 4-point scale according to their estimated coefficients. Results for Factor 2 were similar with no effect from sex in the factor model, but lower scores for females on item 6 "I try to see the humorous side of things when I am faced with problems," ($\beta = -0.54$) and item 14 "under pressure, I stay focused and think clearly" ($\beta = -0.73$).

Factor 5, spiritual influences, is the only area where sex was a positive predictor of resilience for females. Regression models show that females had a mean score that was 0.82 points higher for factor 5 overall, and 0.82 points higher for item 9 "good or bad, I

believe most things happens for a reason." As discussed in the previous chapter, Factor 5 includes only two items, and item 3 was not found to be significantly linked to other variables in the regression model. This explains the strong similarities between the impact of sex on item 9 and factor 5. Sex was not found to be a significant variable in the models for Factors 3 or 4, nor was it significant in the individual item models within these factors.

In summary, regression models for sex as a factor on resilience show that when sex is significant, females typically have lower scores than males. This aligns with the overall CD-RISC scores recorded in this study. Spiritual influences for resilience, in particular item 9, seems to be the exception, with sex accounting for a 0.82 point (20.48%) increase in scores for females. Combined with descriptive and correlative data there are several implications for using gamification for resilience. The first is that females may need additional support in building their resilience while simultaneously being less inclined to game as frequently as their male counterparts. Female preferences for mobile, tabletop, and role-playing games suggest that these may be more effective platforms for gamification systems targeted at female users.

Ethnicity. Due to response rates, only three ethnicities could be included in the stepwise regression models: Asian, Hispanic, and White. The regression models determined that for this sample, these three ethnicities were not significant predictors of overall CD-RISC scores or any of the five factor scores. Regression models for individual CD-RISC items found ethnicity to be significant for five of the twenty-five items.

Three of these items showed that Hispanic ethnicity was a significant predictor of resilience score. The regression model for item 11, "I believe I can achieve my goals,

even if there are obstacles" revealed that being Hispanic was the only significant predictor of score outcome, and that Hispanics had average scores that were 0.51 points higher than non-Hispanics. A similar effect was found for item 21 "I have a strong sense of purpose" in factor four. In the case of item 21 the model predicted mean scores 0.85 points higher than non-Hispanics, again using a 4-point scale. Interestingly, the opposite effect occurred with item 18 "I can make unpopular or difficult decisions that affect other people, if it is necessary." In this case the model predicted that Hispanic students would have scores 0.67 points lower than non-Hispanics.

Asian ethnicity was a significant predictor of resilience only for item 23 "I like challenges," which is a part of Factor 1. In this case the model predicts a score 0.76 points lower for Asian students. As previously stated, the same model for item 23 also included a similar negative predictive effect for female students. Lastly, the model for item 5 "past successes give me confidence in dealing with new challenges and difficulties" included White ethnicity as the only significant predictive variable, indicating scores 0.36 points lower for White students.

Overall these regression models seem to indicate that for this sample there were no major predictive trends for resilience based on ethnicity. Hispanic ethnicity was the most prevalent variable in the stepwise regression models, and even in that case the effects varied from positive to negative depending on the inventory item. A larger and more diverse sample would be needed to determine if there are unseen effects of ethnicity with regard to resilience, particularly for groups not represented in this stepwise model.

Permanent Residence. The key finding in this area is that domestic residency outside the state of California was a significant predictor of resilience in 11 of the 31

stepwise regression models, including the models for overall CD-RISC score, Factor 4 and Factor 5. The stepwise regression model predicts that overall scores for out-of-state students on the CD-RISC are 6.69 points lower than for in-state students on a 100-point scale. Furthermore, in all 11 of those models, students from outside the state of California were associated with lower resilience scores than California residents. Thus, the data shows that out-of-state students have significantly lower resilience than in-state peers. The predicted score shift was largest with a 20.25% drop for item 9 "good or bad, I believe everything happens for a reason." Scores for item 22 "I feel in control of my life" were also 16% lower for out-of-state students. Data suggests that out-of-state students may lack support connections as evidenced by scores that were predicted to be 6.25 percent lower on item 2 *"*I have at least one close and secure relationship that helps me when I am stressed."

These findings are consistent with other research that indicates that out-of-state students have more difficulty adapting to the college environment (Chambliss, 2014) and further supports the notion that out-of-state students may need resilience interventions. The types of games preferred by out-of-state students vary, but show a similar distribution to other residency groups. The same is true for motivation and social context for gaming among out-of-state students. As a result, there is no clear best option for designing game systems that will appeal to this demographic group. However, the data does indicate that some game types may effective predictors of higher resilience*,* as discussed later in this chapter.

Frequency and Duration of Play

The stepwise regression models from this study indicate that the frequency of game play can be an effective predictor of increased resilience. At the same time, the duration of game play sessions appears to be a less significant factor.

The primary frequency variable, which measures the average number of days that participants play games in a 30-day period, appears in the stepwise regression model for overall CD-RISC score as well as the models for two of the individual resilience inventory items. The estimated coefficient for the overall resilience score model appears small at 0.26 for a 100-point scale, however this measures the score increase for each additional day of gaming. This model suggests that if a non-gamer were to start playing a game every day their CD-RISC score would be predicted to increase by 7.65 points, more than enough to cancel the predicted score drop for out-of-state students. Duration of play, and the number of play sessions in a given day of gaming were not significant factors in this regression model, which indicates that a single play session per day of nearly any duration may be effective for predicting increased resilience. At the same time, frequent gaming may be related to increased resilience due to other factors. For example, students who feel more resilient may have less stress and more free time that they can devote to playing games.

The number of days of gaming was also significant in the stepwise regression models for item 4 “I can deal with whatever comes my way” and item 24 “I work to attain my goals no matter what roadblocks I encounter along the way.” In both cases the effect per additional day of gaming was small with estimated coefficients of 0.04 and 0.03 respectively.

The number of gaming sessions per day was not a significant variable in any of the 31 stepwise regression models analyzed in this study. Session duration was only significant in the models for Factor 5 and item 9. As noted previously, these models are closely linked given that the only other item in Factor 5, item 3, had no significant predictors in the stepwise regression model. In both cases the effect of session duration was a resilience score increase of only 0.13% for a 1 minute increase in play time, or an increase of 7.5% for each additional hour of play in a gaming session.

Frequency and duration of play did not show any meaningful correlation to GPA measures, suggesting that playing more or less games does not have a consistent predictable relationship to academic success.

The implication from this data for gamification design and implementation is that engaging students as often as possible may be more effective for increasing resilience than engaging them for more sporadic but longer game play sessions. However, further research is needed to test this relationship for causation rather than simply correlation.

Game Types

The findings of this area provide some of the most useful data for designing effective gamification systems for resilience. Three game types emerged as significant in the stepwise regression modeling: role-playing games, computer games and multiplayer online games. Of these, role-playing games were the most effective for predicting student resilience scores. The regression model for overall CD-RISC score suggests that students who play role-playing games have a resilience level an average of 9.40 points higher than those who do not. This was the largest effect of any variables in this model. This effect is further explained by a related increase in Factor 2 (trusting instinct, stress management)

(β = 0.32), item 14 (β = 0.83), Factor 3 (adapting to change, secure relationships) (β = 0.36), item 1 (β = 0.59) and Factor 4 (control) (β = 0.47). As shown, item 14 "under pressure I stay focused and think clearly" had the strongest relationship to role-playing game play.

Role-playing games generally rely on improvisation and problem solving, which may help to explain the significant positive relationship on that item. Furthermore, the connections between role-playing games and creative problem solving support the work of Ellis (1973) and Malone and Lepper (1988), suggesting that in addition to correlating with higher levels of resilience, this game type is also effective for generating intrinsic motivation.

Role playing game play was not a significant predictor for Factor 1 (tenacity and competence) or Factor 5 (spiritual influences), including the individual items within those factors. Yet Multiplayer online game play, which was not significant in the model for overall CD-RISC score, related strongly to Factor 1, including items 16 "I am not easily discouraged by failure" (β = 0.82) and 25 "I take pride in my accomplishments," (β = 0.44) within the factor. In both cases playing multiplayer online games was predictive of higher resilience scores. The greatest change was for item 16 where scores for respondents who played multiplayer online games were 20.52% higher than those who did not.

Computer game play also had a positive connection to resilience, particularly for Factor 2, including items 7, which deals with overcoming stress, 15 and 18 which deal with leadership roles, and Factor 3, including item 1 adapting to change. For the individual CD-RISC item regression models in which computer game play was

significant there was an average score increase of 0.53 points out of 4, or 13.24%. The combined result of these items led to an average predicted score increase of 8% on Factor 2, trusting instincts and tolerance for stress, and 6.75% for Factor 3 acceptance of change and secure relationships.

The regression model findings relative to game types indicate that role-playing game play has the strongest relationship to resilience, including a highly significant ($p = 0.00$) predicted increase in overall CD-RISC score of 9.40. This relationship is significant enough to counteract predicted deficits for female and out-of-state students. This finding aligns with the resilience model described by Thomsen (2002) and outlined in Table 1, as Thomsen (2002) suggests that activities that increase prosocial bonding, set clear and consistent boundaries and teach "life skills" can manage the environment so that resiliency can increase. Role-playing games create a collaborative story environment where players must work as a team, to achieve clear objectives and learn to manage group conflict as well as overcome in-game obstacles using creative solutions. In other words, role-playing games provide a safe environment for resilience building. For resilience to develop in this type of environment, participants must be provided with care and support, understand high expectations placed on them, and have meaningful participation (Thomsen, 2002). In an ideal role-playing game scenario, a dungeon master sets clear and challenging scenarios for players to encounter, and the players work meaningfully as a team to overcome them. In addition, each player takes on the role of a character in the game and must work to understand and articulate the feelings, actions and motivations of that character. In this way, players arguably learn to recognize and manage their own emotions, further developing their resilience (Thomsen, 2002).

Data also shows that female gamers were more likely to engage in role-playing games. This indicates that an RPG based gamification system for resilience may be especially effective for increasing resilience while simultaneously appealing to a female audience shown to have lower initial resilience. However, multiplayer online game play may also be needed in order to impact resilience related to Factor 1, which includes the most individual scale items and deals with personal competence and persistence (Connor and Davidson, 2003). The positive correlation between resilience and computer gaming is smaller than that of role-playing games but is still worth considering, particularly as it relates to resilience aspects contained in Factors 2 and 3.

Although role-playing games had the largest positive relationship with resilience scores, regression models indicated that frequent gaming sessions may also be associated with increased resilience. Role-playing games require groups to come together either in person or through online platforms and typically have longer playtimes than other types of gaming, such as mobile games. Given that session duration was found to have a relatively insignificant relationship to resilience, RPGs may not be the most efficient method for achieving this outcome. Additional research to test the effect of resilience based RPG systems relative to other game types, including combinations of game types, is recommended to determine if this effect is a correlative or causative effect.

Social Context

Social contexts for gaming deal with who is involved in the game play and the setting for play. Stepwise regression models revealed that social context was not a significant predictor of overall resilience score or for any of the five resilience factors. Regression models did, however, predict higher scores on item 16 “I am not easily

discouraged by failure" (β = 0.47) and item 1 "I am able to adapt when changes occur" (β = 0.35) for students who preferred playing games with friends in person. These results might suggest that gaming with others helps students learn to adapt to changes, perhaps as a result of facing changing strategy of opponents. Alternatively, the effect for item 16 could be indicative that individuals who are less discouraged by failure may be more comfortable gaming face-to-face with others because they are better able to handle losing when others are present.

Playing games alone at home was a significant variable in the stepwise regression models for item 4 "I can deal with whatever comes my way," predicting lower scores in this area (β = -0.52). At the same time, this social context had a positive relationship relative to item 9 "good or bad, I believe most things happen for a reason" (β = 0.56). These contradicting and limited results indicate that solo gaming at home may not be an effective focal point for gamification systems designed to increase student resilience.

Overall, the relationship between social context for gaming and resilience remains somewhat unclear based on data collected in this study. Additional research studies utilizing a consistent game type, but implemented in different social contexts, would be beneficial to determine if there is an optimal social context for gamification.

Motivation

The majority of students selected recreation or entertainment (64.58%) as their primary motivation for gaming, followed by socialization (17.71%). The other response options for motivation types relative to Bartle's (1996) gamer types did not yield enough responses to draw useful conclusions. Only the two motivation types with significant response rates were included in the stepwise regressions, and only one model, for item 6

"I try to see the humorous side of things when I am faced with problems" included a motivation variable. In this instance gaming for recreation predicted a score 0.60 points lower than those whose gaming was motivated by other factors.

Given the limited outcomes relative to motivation it is difficult to determine implications for future research in this area. In retrospect, adjusting motivation variables to match more closely to Malone and Lepper's (1988) taxonomy of intrinsic motivation may have provided a better understanding of what motivates gaming and gamification engagement. Removing "recreation and entertainment" as a category may have also pushed participants to think more deeply about what motivates their gaming behavior, as high response rates for this category might suggest that students are not easily able to articulate their underlying motivation for game play. As it stands, the results of this study would suggest that a student's motivation for play is not an important factor, and that the type of game played and the frequency of play are more significant. However, given the limitation of the study design it is difficult to be certain this is the case.

Applying the Taxonomy of Intrinsic motivation to the game types that emerged in the stepwise regression models does provide additional insights. As previously discussed, Role-playing games, computer games, and multiplayer online games had the strongest correlations with resilience. As a reminder, the taxonomy has two key parts, internal and interpersonal motivation. Internal motivations include challenge, curiosity, control and fantasy (Malone & Lepper, 1988). Role-playing games, which were correlated with the largest predicted increase in resilience, demonstrate all of the key elements of intrinsically motivating play. These games present players with challenges in the form of quests. They allow for curiosity by letting players test different methods of addressing

those challenges, and by allowing them to explore the environment in a way of their choosing. This approach also gives players a strong sense of control. Lastly, by requiring players to act as and speak for their character, role-playing games allow a player to experience elements of fantasy. So, while students did not articulate these motivations for play in their responses, the strong positive correlation between role-playing games and resilience suggests that games which feature intrinsically motivating elements may be effective tools for gamification. The connection between role-playing games, intrinsic motivation, and resilience implies that game systems that promote intrinsically motivating play may also be more effective for creating a gamified environment where positive development can occur.

Perceived Impact of Gaming on Resilience

Students were asked five questions to determine the extent to which they perceived their gaming behavior to be linked to their resilience. These questions are the final five items in the survey detailed in Appendix D. Analysis showed that a perceived positive impact of gaming on resilience was not consistently correlated with higher levels of resilience.

As described in chapter four, a stepwise regression model was creating using the responses to the five perception questions as independent variables. Running this model using total CD-RISC score, and mean scores from each of the five factors as dependent variables revealed only small relationships. For factors 1, 4 and 5 there were no significant predictors among the perception variables in the model.

Analysis revealed that the more frequently students played games the more likely they were to believe their gaming habits had a positive impact on their resilience levels.

This may be a factor of students attempting to justify the time spent playing games by attributing it to a desirable outcome.

In general, these results suggest that students generally did not perceive a strong connection between their gaming behavior and resilience, and that even for those that did the perceptions were not strongly correlated to a higher resilience score.

Gaming Behavior, Resilience and Academic Success

As discussed, certain gaming types, including role-playing, and computer games, correlate with higher levels of resilience. However, none of the gaming behaviors measured in this study showed strong correlations with GPA measures, with the exception of role-playing game play which significantly correlated with lower cumulative GPA. While an assumption might be made that high frequency of game play would detract from studying and academic achievement, the results of this study showed no correlation with GPA and gaming frequency or duration. In other words, differences in gaming behavior do not seem to predict any changes in GPA in the first year of college for this particular sample.

Further analysis showed that changes in resilience also did not correlate with differences in fall, spring or cumulative GPA. This finding is counter to anticipated results based on findings from the medical field that higher resilience leads to higher success rates with recovery (McGonigal, 2015).

Thus, the results of this study show that some game types correlate with increased resilience, but game behaviors and resilience do not seem to predict changes in academic success as measured by GPA. With no meaningful relationship between gaming behaviors and GPA it is perhaps unsurprising that regression models showed that

resilience variables neither mediated nor moderated the relationship between gaming and GPA variables. Put another way, resilience neither explains, nor alters the magnitude of any relationship between gaming behaviors and GPA levels in the first year of college.

Research Questions Revisited

Existing research has suggested a link between student resilience and academic success, the primary research question was whether or not there is a positive correlation between gaming behavior and resilience, and if so what specific aspects of gaming behavior and participant demographics might influence that relationship. Correlation tables and stepwise regression models have revealed that certain gaming behaviors are associated with higher levels of resilience as measured by the CD-RISC. The most significant positive relationship was between resilience and playing role-playing games. As the regression models shows, a preference for role-playing games is associated with a CD-RISC score increase of nearly 10%. This is largely based on a predicted increased score for Factor 2, trusting instinct, tolerance for stress and ability to learn from difficult situations; and Factor 3, acceptance of change and secure relationships. Data also suggests that more frequent gaming is associated with higher resilience scores as well as increasing how much an individual believes their gaming habits are improving their resilience.

Other gaming behaviors had varied impacts, but social setting, motivation for play and duration of gaming session did not appear to have a significant relationship to overall resilience levels. Multiplayer online game play was associated with higher resilience scores within Factor 1, which deals with personal competence and tenacity. Similar to role-playing games, computer game play had a positive impact on resilience scores in

Factors 2 and 3, but the effect was less pronounced. As a result of the smaller correlation levels, computer games did not appear in the stepwise regression model for overall CD-RISC score.

As noted in chapter four, mobile application gaming had no significant connections to other gaming types, motivations, social context or resilience, which suggests that these games may be ineffective for gamification, at least where resilience is concerned. This type of gaming was also not linked to frequent game play, which was shown to be correlated with higher levels of resilience.

Ethnicity data played only a minor role in regression models for individual CD-RISC items. It is difficult to draw significant conclusions from this finding as only three of the ethnicity categories, Asian, Hispanic and White, had significant enough response rates to be included in the stepwise model. For these included ethnicity categories, the relationships to resilience were small and at times, conflicting. Further research, using a larger and more diverse sample, is recommended for additional insights.

Data trends based on sex show that, on average, females had lower resilience scores than males. This finding is explained by the stepwise regression models for individual CD-RISC items 6, 12, 14, and 23. The one exception to this trend was for item 9, within Factor 5, where the model predicts that females score 0.82 points higher than males on a four-point scale.

The largest demographic factor in regression models comes from residency data, which shows that U.S. students from outside the state of California, referred to as out-of-state students, have consistently lower resilience scores overall and within each of the five factors when compared to in-state students. For the overall CD-RISC score, the

regression model predicts that out-of-state students will average scores 6.69 points lower on a 100-point scale with a significance level of 0.00. As shown in Table 18, score drops for CD-RISC factors and individual items range from 0.25 to as high as 0.81 on a four-point scale.

The sample did not yield a high enough response rate from non-U.S. residents to include this variable in the regression models. As with ethnicity, additional research using a larger sample size is recommended to determine if a similar effect occurs for students attending college outside their home country.

Therefore, the summary finding for research question one is that for some variables there is a positive correlative relationship between resilience and gaming behavior. That positive association is most prevalent for computer gamers, role-playing gamers, multiplayer online gamers and the effect increases among individuals who play games more frequently. Additionally, females and students attending college away from their home state are likely to have lower levels of resilience. Although out-of-state students in this study did not appear to favor any particular game type or behavior, females did demonstrate a preference for role-playing games, which are related to higher resilience scores. Females were also found to play games less frequently, suggesting that it may be more challenging to motivate them to participate in a game-based resilience building program.

Research question two asked if gaming behaviors correlated with changes in academic success as measured by GPA, and whether or not resilience impacted this relationship. Data from this study suggests that there may be a correlation wherein students who play role-playing games are predicted to have a cumulative first-year GPA

0.55 points lower than peers who do not play this style of game (p=0.049). No other relationships between gaming behaviors and GPA measures had a significance level of 0.05 or less. It is worth noting that the style of game with the highest positive correlation to resilience also was the only game behavior to correlate with measures of GPA, predicting a lower level of academic achievement. Regression analysis showed that resilience did not moderate or mediate the relationship between role-playing games and cumulative GPA. In fact, analysis showed that resilience measures did not appear to mediate or moderate any of the relationships between gaming variables and GPA measures.

Implications for Future Research

Lessons Learned

One of the initial questions that emerged from the literature review was whether gaming could be used to generate intrinsic motivation in participants when a real world behavioral outcome was the goal of the gaming. This is because gamification seeks to use the engaging aspects of gaming to shift behavioral patterns. Data in this study analyzed existing play behaviors in participants when the play was not linked to a behavioral outcome. As a result, it is unclear if the behaviors exhibited by participants would translate to a prescribed gamification environment if participation was not voluntary. Questions about motivation for game play in the survey in Appendix D were linked to Bartle's (1996) gamer types. In hindsight, it may have been more effective to link these questions to aspects of Malone and Lepper's (1988) taxonomy of intrinsic motivation. Additionally, when asking students about their existing use of gamification systems, it

would have been beneficial to ask questions about what motivated students to engage in these systems, in addition to asking about their motivation for traditional game play.

As the data showed, most students indicated that recreation and entertainment were their primary motives for game play. This would suggest that students play games voluntarily when it is intrinsically motivating for them to do so. However, further research is needed to identify which aspects of game play students find most entertaining or engaging, and if these factors translate to engagement in a gamified environment. Recognizing that participants in this study self-selected their gaming habits, it is also uncertain if gaming behaviors remain positively correlated with resilience when they are prescribed rather than chosen.

All the gamification systems participants indicated using had tangible outcomes that can be classified as extrinsic motivators. Fitness applications lead to better health and tangentially a chance at increased social status based on appearance. Retail rewards programs lead to discounts on food and merchandise, and even language learning programs lead to skill development that can help with job searches as well as recreational travel. Without further data, it is difficult to know for certain what motivated these students to use gamification systems as opposed to simply playing games. As a result, further research is needed in this area. For example, participants could have been presented with the question “what would motivate you to participate in a gamification system designed to build resilience?” followed by a list of choices that represent a variety of both intrinsic and extrinsic motivators.

A different recommended approach would be to study a group of participants that has already chosen to engage with a particular gamification system. Collecting data about

their initial motivation for participation, motivation to persist with the system, and level of engagement with the system over time might provide additional insights regarding the role of intrinsic and extrinsic motivators in gamification.

Another area for improvement is the social context data. Although there seem to be some connections between social contexts and resilience, there were no overwhelming findings that might suggest that one context is better than the others for increasing resilience. One opportunity for this study would have been to ask participants which social context they found most engaging when playing games, rather than which social context was most common in their experience.

Next Steps

As noted in the previous section, additional research regarding player motivations for traditional game play and gamification engagement would provide a deeper understanding of which intrinsic and extrinsic motivators are most effective. Having said that, this study has identified some emergent trends which suggest that role-playing games, computer games, and multiplayer online games are the game types most directly linked to higher resilience levels. It also suggests that more frequent gaming may be associated with higher resilience as well. The implication is that gamification systems that aim to increase first-year college student resilience should focus on these gaming types.

In order to further explore this possibility additional research is needed. For example, a randomized control trial, similar to the one originally conceived for this study, offers one approach towards further testing these findings. By designing a variety of game systems for resilience, one using a role-playing structure, one based on computer,

and one that features a multiplayer online component, it becomes possible to measure the impact of these game types on resilience over time. Including a control group would also help to determine if the game based interventions caused a change in resilience, and if any one of these game types was more effective. Data from this study would suggest that role-playing games would be most effective overall, especially within Factors 2 and 3. Computer games may also be effective in Factors 2 and 3, and multiplayer online games would be predicted to be most effective at increase resilience relative to Factor 1. For this type of study a consistent social context would be needed to isolate the game type variable. Given that multiplayer online gaming is a game type, it is recommended that an RCT design use multiplayer online gaming on computers as well as through a video game console or mobile device, and then a traditional role-playing game, but played over an multiplayer online platform, for example Role20.net. In the event that a particular game type emerges as more effective for increasing resilience, that game type might be modified to include different social contexts, including playing with friends, with strangers, in person, and online. Another consideration would be to try both cooperative and competitive versions of the same type of game system to see if behavioral changes are more or less significant based on the nature of participant relationships within the system.

With regard to academic success, the timeframe of this study was limited to one year. Game design theory suggests that feedback loops and an opportunity to repeatedly attempt challenges are central to purposeful play (Salen and Zimmerman, 2004). In the case of this research, students received GPA feedback only twice, once at the end of each semester. This means that their opportunities to learn from and adapt strategy based on

feedback were limited in the first year. Thus, the resilient students may not have had sufficient opportunity to face and overcome set-backs and challenges in this time frame. It is possible that the effects found in this study would shift over a longer time frame. Additionally, a longitudinal study would provide an opportunity to integrate other student success factors including retention and graduation rates.

A final remaining opportunity is to expand this research to a larger and more diverse sample. Ethnicity data in this study did not reveal any significant and persistent trends in gaming behavior or resilience outcomes, and there was not a high enough response rate to include non-U.S. students in the regression models. A larger data pool may help to demonstrate connections not seen in this sample, in order to better answer the second part of research question one. Furthermore, a larger sample, taken from multiple universities and colleges would serve to increase the generalizability of these findings to a larger population of first-year, first semester college students.

Conclusion

Although there are still many aspects of gamification research that can be explored, this study has served to provide a focus for that research. It is still not fully clear what motivates participants to persist with a gamification system as opposed to a game system. However, data suggests that certain types of games, including multiplayer online, computer and, most significantly, role-playing games, are directly related to higher levels of resilience. This study has also revealed that among first-year, first-semester college students, women may have lower resilience levels than men, and more local students are likely to have higher resilience than students who traveled further to attend college. These finding help provide direction for the design of future gamification

systems aimed to increase resilience, and thereby increase student success, while also suggesting that colleges and universities may want to focus resilience intervention design to appeal to and engage women and out-of-state students. Data also showed that existing recreational gaming behaviors generally do not correlate with various short-run measures of GPA. Additionally, higher resilience levels were not found to be predictive of higher GPA in the first-year of college for this particular sample. Additional research is needed to see if any effects emerge in this area over time. As noted, the size and make-up of the sample, duration of the study and the limitation of only including students from one type of institution, limit the generalizability of these findings

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APPENDIX A

Consent Form

University of San Diego

Institutional Review Board

An Analysis of the Relationship Between Game Play Habits and Resilience Among First-Year College Students

I. Purpose of the research study

Patrick Marino is a student in the School of Leadership and Education Sciences at the University of San Diego. You are invited to participate in a research study he is conducting. This research is being conducted in partial fulfillment of the dissertation requirement for the Leadership Studies PhD program. The purpose of this research study is to determine to what extent engagement with games is related to students' ability to overcome challenges, also known as resilience. While we know games and gamified systems are become more prevalent on college campuses, research about the effectiveness of these systems has yielded inconsistent results.

There is limited research on gamification in educational settings, and no research related to using game-based systems for student resilience. At the same time research from the medical field has shown that games can be used to improve mode, and shorten recovery times for traumatic injury patients. This study aims to draw upon the lessons learned in the medical field to determine if there is a baseline relationship between use of game

systems and increased resilience, which may offer further insight into the usefulness of game based tools for skill development and education.

II. What you will be asked to do

If you decide to be in this study, you will be asked to complete a brief online survey instrument to assess your normal gaming habits as well as your level of resilience. Total participation time to complete the survey is estimated at 10 minutes.

III. Foreseeable risks or discomforts

Sometimes when people are asked to think about their feelings, they feel sad or anxious. If you would like to talk to someone about your feelings at any time, you can call toll-free, 24 hours a day: San Diego Mental Health Hotline at 1-800-479-3339

You may also reach the University of San Diego Counseling Center during normal business hours at 619-260-4655.

IV. Benefits

While there may be no direct benefit to you from participating in this study, the indirect benefit of participating will be knowing that you helped researchers better understand the potential for using game-based systems to increase resilience among college students. Additionally, confidential results from the study will be shared with your university to help inform the development of student success initiatives.

V. Confidentiality

Any information provided and/or identifying records will remain confidential and kept in a locked file and/or password-protected computer file in the researcher's office for a minimum of five years. All data collected from you will be coded with a number or pseudonym (fake name). Your real name will not be used. The results of this research project may be made public and information quoted in professional journals and meetings, but information from this study will only be reported as a group, and not individually.

VI. Compensation

You will receive no compensation for your participation in the study. A small number of participants will be randomly selected to receive gift cards to Amazon.com in the amount of $25 at the close of the study. All participants are eligible for this random drawing, regardless of their level of completion of the survey.

VII. Voluntary Nature of this Research

Participation in this study is entirely voluntary. You do not have to do this, and you can refuse to answer any question or quit at any time. Deciding not to participate or not answering any of the questions will have no effect on any benefits you're entitled to, like your health care, or your employment or grades. You may withdraw from this study at any time without penalty.

VIII. Contact Information

If you have any questions about this research, you may contact either:

1) Patrick Marino

Email: [redacted]@[redacted].[redacted]

Phone: [redacted]-[redacted]-[redacted]

2) Fred Galloway, EdD

Email: [redacted]

Phone: [redacted]

____I have read and understand this form, and consent to the research it describes to me.

____I have received a copy of this consent form for my records.

Signature

Print

APPENDIX B

Connor Davidson Resilience Inventory

Connor-Davidson Resilience Scale 25 (CD-RISC-25) ©

For each item, please mark an "x" in the box below that best indicates how much you agree with the following statements as they apply to you over the last month. If a particular situation has not occurred recently, answer according to how you think you would have felt.

For all questions use the following scale:

(0) Not true at all
(1) Rarely true
(2) Sometimes true
(3) Often true
(4) True nearly all the time

1. I am able to adapt when changes occur.
2. I have at least one close and secure relationship that helps me when I am stressed.
3. When there are no clear solutions to my problems, sometimes fate or God can help.
4. I can deal with whatever comes my way.
5. Past successes give me confidence in dealing with new challenges and difficulties.
6. I try to see the humorous side of things when I am faced with problems.
7. Having to cope with stress can make me stronger.
8. I tend to bounce back after illness, injury, or other hardships.
9. Good or bad, I believe that most things happen for a reason.
10. I give my best effort no matter what the outcome may be.
11. I believe I can achieve my goals, even if there are obstacles.
12. Even when things look hopeless, I don't give up.
13. During times of stress/crisis, I know where to turn for help.
14. Under pressure, I stay focused and think clearly.
15. I prefer to take the lead in solving problems rather than letting others make all the decisions.
16. I am not easily discouraged by failure.
17. I think of myself as a strong person when dealing with life's challenges and difficulties.
18. I can make unpopular or difficult decisions that affect other people, if it is necessary.
19. I am able to handle unpleasant or painful feelings like sadness, fear, and anger.
20. In dealing with life's problems, sometimes you have to act on a hunch without knowing why.
21. I have a strong sense of purpose in life.
22. I feel in control of my life.
23. I like challenges.
24. I work to attain my goals no matter what roadblocks I encounter along the way.

25. I take pride in my achievements.

APPENDIX C

CD-RISC Usage Agreement

APPENDIX D

Dear Patrick:

Thank you for your interest in the Connor-Davidson Resilience Scale (CD-RISC). We are pleased to grant permission for use of the CD-RISC in the project you have described under the following terms of agreement:

1. You agree not to use the CD-RISC for any commercial purpose, or in research or other work performed for a third party, or provide the scale to a third party. If other off-site collaborators are involved with your project, their use of the scale is restricted to the project, and the signatory of this agreement is responsible for ensuring that all collaborators adhere to the terms of this agreement.

2. You may use the CD-RISC in written form, by telephone, or in secure electronic format whereby the scale is protected from unauthorized distribution or the possibility of modification. **In all presentations of the CD-RISC, including electronic versions, the full copyright and terms of use statement must appear with the scale. The scale should not appear in any form where it is accessible to the public, and should be removed from electronic and other sites once the project has been completed.**

3. Further information on the CD-RISC can be found at the www.cd-risc.com website. The scale's content may not be modified, although in some circumstances the formatting may be adapted with permission of either Dr. Connor or Dr. Davidson. If you wish to create a non-English language translation or culturally modified version of the CD-RISC, please let us know and we will provide details of the standard procedures.

4. Three forms of the scale exist: the original 25 item version and two shorter versions of 10 and 2 items respectively. When using the CD-RISC 25, CD-RISC 10 or CD-RISC 2, whether in English or other language, please include the full copyright statement and use restrictions as it appears on the scale.

5. A fee of $ 30 US is payable to Jonathan Davidson at 3068 Baywood Drive, Seabrook Island, SC 29455, USA, either by PayPal (at: mail@cd-risc.com), cheque, bank wire transfer (in US $$), international money order or Western Union.

6. Complete and return this form via email to mail@cd-risc.com.

7. In any publication or report resulting from use of the CD-RISC, you do not publish or partially reproduce items from the CD-RISC without first securing permission from the authors.

If you agree to the terms of this agreement, please email a signed copy to the above email address. Upon receipt of the signed agreement and of payment, we will email a copy of the scale.

For questions regarding use of the CD-RISC, please contact Jonathan Davidson at mail@cd-risc.com. We wish you well in pursuing your goals.

Sincerely yours,

Jonathan R. T. Davidson, M.D.
Kathryn M. Connor, M.D.

[redacted] 10/13/16
Date

PhD Student
Title

University of San Diego
Organization

Survey Questions

Game Related Behavior, Gamification and Resilience

Start of Block: Default Question Block

Purpose of the research study: Patrick Marino is a student in the School of Leadership and Education Sciences at the University of San Diego. You are invited to participate in a research study he is conducting. This research is being conducted in partial fulfillment of the dissertation requirement for the Leadership Studies PhD program. The purpose of this research study is to determine to what extent engagement with games is related to students' ability to overcome challenges, also known as resilience. While we know games and gamified systems are becoming more prevalent on college campuses, research about the effectiveness of these systems has yielded inconsistent results.

A complete copy of the Informed Consent Agreement was included with the email invitation to participate in this study. Before continuing with the survey, please acknowledge that you have received these documents below.

I have read and understand the informed consent form that was included with the invitation email for this study, and consent to the research it describes to me.

I have received a copy of the consent form for my records as an attachment to the invitation email for this study.

Type your full first and last name in the box below to complete the informed consent agreement. As a reminder, all responses to this survey will be kept confidential.

_____

Section 1 of this survey will ask you about your experiences with games. All experience levels provide valuable information for this study. Please answer the following questions to the best of your ability.

In the past 60 days what types of games, if any, have you played? [check all that apply]

- ☐ Computer Games (1)
- ☐ Multiplayer Online Games (9)
- ☐ Mobile App Games (Phone/Tablet) (2)
- ☐ Video Games (Console connected to television, or portable system e.g. GameBoy) (3)
- ☐ Tabletop Games (e.g. board games, card games) (4)
- ☐ Role Playing Games (5)
- ☐ Dexterity Games (pool, darts, shuffleboard) (8)
- ☐ None of the Above/I do not play games (6)
- ☐ Other (7)

Skip To: Q1 If In the past 60 days what types of games, if any, have you played? [check all that apply] = None of the Above/I do not play games

Page Break

Display This Question:

If In the past 60 days what types of games, if any, have you played? [check all that apply] = Other

Based on your response of 'other' to the previous question, please describe the other type of game(s) you have played in the past 60 days:

_____

How many days do you play games in an average 30 day period?

▼ 0 (1) ... 30 (31)

On an average day when you play games, how many gaming sessions do you have? (sessions are defined as gaming separated by other activities)?

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

Less than once per month ()	

On average, how long is each of your individual gaming sessions?

- ○ Hours (1) _____
- ○ Minutes (2) _____

When you play games, what is the **primary** social setting?

- ○ Solo gaming at home (1)
- ○ Solo mobile gaming (2)
- ○ With friends, in person (3)
- ○ With friends, online (4)
- ○ With strangers, online (5)

How would you describe your primary motivation for playing games?

- ○ Recreation/Entertainment (1)
- ○ Socialization (2)
- ○ Problem Solving/Puzzles (3)
- ○ Exploration/Discovery (8)
- ○ Challenge/Achievement (4)
- ○ Competition (5)
- ○ Education/Skill Development (6)
- ○ Other (7)

Display This Question:

If How would you describe your primary motivation for playing games? = Other

Based on your response of 'other' to the previous question, please describe your primary motivation for playing games:

_____

Gamification is a relatively new concept. Please tell us how familiar were you with the term 'gamification' prior to participating in this study?

- ○ I had not heard this term before (1)
- ○ I had heard this term before, but could not confidently explain or define it (2)
- ○ I was familiar with gamification and could explain the basic concept (3)
- ○ I was very familiar with gamification, but had not used gamified systems. (4)
- ○ I was very familiar with gamification and had used gamified systems. (5)

For the purpose of this study we will define Gamification as "using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning and solve problems" (Kapp, 2012, p. 10).

Put more simply, gamification is using engaging aspects of games in non-game environments.

Several Examples of Gamification you may have encountered include: Reward point systems at stores and restaurants Language Learning Apps Credit Card reward systems Exercise Apps and Devices such as FitBit

Based on the provided definition above, can you think of examples of gamification you have used in your life?

- ○ Yes (1)
- ○ No (2)
- ○ No, but would be interested to try gamification systems (3)
- ○ No and would not be interested in a gamification system (8)
- ○ Unsure (9)

Page Break

Display This Question:

If Based on the provided definition above, can you think of examples of gamification you have used i... = Yes

Describe the type of gamification you have used, if possible provide the name of the game/system you have used:

_____

Display This Question:

If Based on the provided definition above, can you think of examples of gamification you have used i... = Yes

How often do you use the gamification program you described in the previous questions?

- 7 or more times per week (1)
- 4-6 times per week (2)
- 2-3 times per week (3)
- Once per week (4)
- Less than once per week (5)
- Never/no longer use (6)

Page Break

This section of the study will ask a series of questions related to resilience, which is the ability to overcome challenges and obstacles in your life.

For each item, please select the option that best indicates how much you agree with the following statements as they apply to you over the last **MONTH**. If a particular situation has not occurred recently, answer according to how you think you would have felt.

	Not true at all (1)	Rarely True (2)	Sometimes true (3)	Often true (4)	True Nearly all the time (5)
I am able to adapt when changes occur. (1)	○	○	○	○	○
I have at least one close and secure relationship that helps me when I am stressed. (2)	○	○	○	○	○
When there are no clear solutions to my problems, sometimes fate or God can help. (3)	○	○	○	○	○
I can deal with whatever comes my way. (4)	○	○	○	○	○
Past successes give me confidence in dealing with new challenges and difficulties. (5)	○	○	○	○	○
I try to see the humorous side of things when I am faced with problems. (6)	○	○	○	○	○
Having to cope with stress can make me stronger. (7)	○	○	○	○	○

I tend to bounce back after illness, injury, or other hardships. (8)	○	○	○	○	○
Good or bad, I believe that most things happen for a reason. (9)	○	○	○	○	○
I give my best effort no matter what the outcome may be. (10)	○	○	○	○	○
I believe I can achieve my goals, even if there are obstacles. (11)	○	○	○	○	○
Even when things look hopeless, I don't give up. (12)	○	○	○	○	○
During times of stress/crisis, I know where to turn for help. (13)	○	○	○	○	○
Under pressure, I stay focused and think clearly. (14)	○	○	○	○	○
I prefer to take the lead in solving problems rather than letting others make all the decisions. (15)	○	○	○	○	○

I am not easily discouraged by failure. (16)	○	○	○	○	○
I think of myself as a strong person when dealing with life's challenges and difficulties. (17)	○	○	○	○	○
I can make unpopular or difficult decisions that affect other people, if it is necessary. (18)	○	○	○	○	○
I am able to handle unpleasant or painful feelings like sadness, fear, and anger. (19)	○	○	○	○	○
In dealing with life's problems, sometimes you have to act on a hunch without knowing why. (20)	○	○	○	○	○
I have a strong sense of purpose in life (21)	○	○	○	○	○
I feel in control of my life. (22)	○	○	○	○	○
I like challenges. (23)	○	○	○	○	○

I work to attain my goals no matter what roadblocks I encounter along the way. (24)	○	○	○	○	○
I take pride in my achievements. (25)	○	○	○	○	○

Display This Question:

If In the past 60 days what types of games, if any, have you played? [check all that apply] != None of the Above/I do not play games

Please consider your experience with gaming while reading and rating the following statements using a scale from strongly agree to strongly disagree.

	Strongly agree (4)	Agree (5)	Somewhat agree (6)	Neither agree nor disagree (7)	Somewhat disagree (8)	Disagree (9)	Strongly disagree (10)
Playing games has increased my persistence when working towards my goals. (1)	○	○	○	○	○	○	○
Playing games has increased my self-confidence. (2)	○	○	○	○	○	○	○
Playing games has increased my ability to make decisions under pressure. (3)	○	○	○	○	○	○	○
Playing games has helped me to be less discouraged when facing failure in real life. (11)	○	○	○	○	○	○	○
Achieving success when playing games has improved my outlook when facing challenges in real life. (12)	○	○	○	○	○	○	○

APPENDIX E

Introductory Email

Dear ${m://FirstName},

My name is Patrick Marino and I am a board game designer and a PhD student of leadership studies at the University of San Diego. I am in the process of completing my dissertation research in partial fulfillment of the PhD program and you have been specifically selected to help with my research! All you have to do is review the information below, and ${l://SurveyLink?d=complete%20this%20survey}!

The goal of my study is to learn more about how we can help students like you develop new skills related to problem solving and overcoming adversity, in other words, to help you increase your resilience. As a former employee of USD's ResLife department and now a full-time game designer, I have designed a ${l://SurveyLink?d=brief%20survey} that will analyze the relationship between gaming habits and resilience levels.

Whether you are an experienced gamer, or never play games, I strongly encourage you to participate, as all perspectives are needed for this study.

I truly hope you will ${l://SurveyLink?d=complete%20the%2010%20minute%20survey} to be a part of this important research. **In addition to helping further this research, participants will also be entered to win one of 8, $25 gift cards to Amazon.com!**

To participate in the study, simply review this informed consent agreement [Informed consent 11 18 18] and complete the survey before December 14th.

Participation is entirely voluntary, and your decision to participate or to opt out of the study will have no bearing on your status as a USD student or GPA. All participants will be required to acknowledge receipt and review of the attached consent form, which provides further details about this research study. For those interested, further details about the study are provided below, and I am happy to answer any and all questions you may have.

Patrick Marino

PhD Student

School of Education and Leadership Sciences

University of San Diego

Further Details:

I am studying the potential for using game-like systems, or gamification, in higher education for the purpose of increasing student resilience. You have been selected as part of a sample of first-year students to participate in this research.

The survey study will be open for a three-week period from 11/26 to 12/14, and each

participant will only need to complete the survey once during this time frame.

Participants in the study will have the option to terminate their participation at any time and without consequence. All data collected for this study will be kept secure, and the anonymity of participants will be protected.

Follow this link to the Survey:

${l://SurveyLink?d=Take the Survey}

Or copy and paste the URL below into your internet browser:

${l://SurveyURL}

Follow the link to opt out of future emails:

${l://OptOutLink?d=Click here to unsubscribe}

APPENDIX F

Correlation Table for Game Type

Correlation Data for Types of Games Played Relative to other Game Play and Resilience Variables

Type of game	Correlating Variable Category	Correlating Variable	Pearson r	p-value
Computer	Types of Games	Multiplayer Online Games	0.46	0.01
	Duration and Frequency of Play	# of days playing games in average 30-days	0.44	0.01
	Social Context	Playing Games with friends in person	-0.31	0.01
		Playing games with friends online	0.43	0.01
	Motivation	Motivation - Problem Solving/Puzzles	0.26	0.05
	CD-RISC Items	I prefer to take the lead in solving problems rather than letting others make all the decisions.	0.28	0.01
		I can make unpopular or difficult decisions that affect other people, if it is necessary	0.30	0.01
		Having to cope with stress can make me stronger.	0.26	0.05
		Past successes give me confidence in dealing with new challenges and difficulties.	0.23	0.05
		I am able to adapt when changes occur	0.28	0.05
Multiplayer Online	Types of Games	Computer Games	0.46	0.01
		Video Games	0.42	0.01
		Dexterity Games	0.25	0.05
	Duration and Frequency of Play	# of days playing games in average 30-days	0.44	0.01
		Session length	0.50	0.01
	Social Context	Playing Games with friends in person	-0.23	0.05
		Playing games with friends online	0.45	0.01
	CD-RISC Items	I can deal with whatever comes my way.	0.28	0.01

		I try to see the humorous side of things when I am faced with problems	0.23	0.05
		Even when things look hopeless I don't give up.	0.25	0.05
		Under pressure I stay focused and think clearly.	0.29	0.01
		I am not easily discouraged by failure.	0.38	0.01
		I work to attain my goals no matter what roadblocks I encounter along the way.	0.23	0.05
		I take pride in my achievements.	0.27	0.05
	Perception of Gaming Impact on Resilience	Playing games has increased my persistence when working towards my goals	0.26	0.05
		Playing games has increased my self-confidence.	0.28	0.01
		Playing games has helped me to be less discouraged when facing failure in real life.	0.26	0.05
		Achieving success when playing games has improved my outlook when facing challenges in real life	0.29	0.01
Mobile App Games	Social Context	Solo gaming at home	0.21	0.05
		With friends in person	-0.26	0.05
Video Games	Types of Games	Multiplayer Online Games	0.42	0.01
		Dexterity Games	0.22	0.05
	Duration and Frequency of Play	# of days playing games in average 30-days	0.38	0.01
		Session length	0.52	0.01
	Social Context	Solo Mobile	-0.23	0.05
	Motivation	Challenge/Achievement	0.21	0.05
	CD-RISC Items	I am able to adapt when changes occur	0.24	0.05
		I am not easily discouraged by failure.	0.38	0.01
		I work to attain my goals no matter what roadblocks I encounter along the way.	0.22	0.05
	Perception of Gaming Impact on Resilience	Achieving success when playing games has improved my outlook when facing challenges in real life	0.22	0.05
	Duration and Frequency of Play	# of days playing games in average 30-days	-0.23	0.05

Tabletop Games		Total game time in the average 30-days	-0.22	0.05
	Social Context	With friends in person	0.28	0.01
	Motivation	Socialization	0.21	0.05
	CD-RISC Items	I am able to handle unpleasant or painful feelings like sadness, fear, and anger.	0.23	0.05
Role Playing Games	Social Context	With friends, online	0.29	0.01
	Motivation	Challenge/Achievement	0.21	0.05
		Education/Skill Development	0.29	0.01
	CD-RISC Items	I am able to adapt when changes occur	0.30	0.01
		Under pressure I stay focused and think clearly.	0.29	0.01
		I take pride in my achievements.	0.24	0.05
	Perception of Gaming Impact on Resilience	Playing games has increased my self-confidence.	0.33	0.01
		Playing games has increased my ability to make decisions under pressure.	0.22	0.05
		Playing games has helped me to be less discouraged when facing failure in real life.	0.27	0.05
		Achieving success when playing games has improved my outlook when facing challenges in real life	0.23	0.05
Dexterity Games	Types of Games	Multiplayer Online Games	0.25	0.05
		Video Games	0.22	0.05
	Duration and Frequency of Play	# of days playing games in average 30-days	0.25	0.05
	Motivation	Challenge/Achievement	0.22	0.05
	CD-RISC Items	Under pressure I stay focused and think clearly.	0.23	0.05
		I am not easily discouraged by failure.	0.23	0.05
		Overall CD-RISC Score	0.24	0.05

APPENDIX G

Correlation Table for Game Play Time

Correlation Data for Frequency and Duration of Play Relative to other Game Play and Resilience Variables

Frequency and Duration of Play Variable	**Correlating Variable Category**	**Correlating Variable**	**Pearson r**	**p-value**
# of Days playing games in an average 30-day period	Frequency and Duration of play	# of Gaming Session per day of gaming	0.48	0.01
	Social Context	With friends in person	-0.38	0.01
		With friends online	0.37	0.01
	Motivation	Challenge/Achievement	0.30	0.01
	CD-RISC	I can deal with whatever comes my way.	0.38	0.01
		Having to cope with stress can make me stronger.	0.27	0.05
		I believe I can achieve my goals, even if there are obstacles	0.25	0.05
		Even when things look hopeless, I don't give up.	0.31	0.05
		I am not easily discouraged by failure	0.30	0.05
		I like challenges	0.28	0.05
		I work to attain my goals no matter what roadblocks I encounter along the way.	0.35	0.01
		I take pride in my achievements	0.25	0.05
	Perception of Gaming Impact on Resilience	Playing games has increased my persistence when working towards my goals.	0.33	0.01
		Playing games has increased my self-confidence.	0.37	0.01
		Playing games has increased my ability to make decisions under pressure.	0.34	0.01
		Playing games has helped me to be less discouraged when facing failure in real life.	0.45	0.01

		Achieving success when playing games has improved my outlook when facing challenges in real life.	0.43	0.01
Number of gaming sessions per day of gaming	Frequency and Duration of play	# of days playing games in an average 30-day period	0.48	0.01
	Motivation	Problem solving/puzzles	0.34	0.01
	Perception of Gaming Impact on Resilience	Playing games has increased my persistence when working towards my goals.	0.34	0.01
		Playing games has increased my self-confidence.	0.24	0.05
		Playing games has increased my ability to make decisions under pressure.	0.31	0.01
		Playing games has helped me to be less discouraged when facing failure in real life.	0.31	0.01
		Achieving success when playing games has improved my outlook when facing challenges in real life.	0.26	0.05
Session Length	Social Context	Solo Mobile Gaming	-0.36	0.05
		With friends online	0.43	0.01
	CD-RISC	Having to cope with stress can make me stronger.	0.43	0.05
		I like challenges	0.40	0.05
Total Game Time in a 30-day period.	Motivation	Competition	0.35	0.01
	CD-RISC	Having to cope with stress can make me stronger.	0.27	0.05
		I can make unpopular or difficult decisions that affect other people if it is necessary.	0.25	0.05
		I work to attain my goals no matter what roadblocks I encounter along the way.	0.23	0.05
	Perception of Gaming Impact on Resilience	Playing games has increased my persistence when working towards my goals.	0.33	0.01
		Playing games has increased my self-confidence.	0.33	0.01
		Playing games has increased my ability to make decisions under pressure.	0.29	0.01

	Playing games has helped me to be less discouraged when facing failure in real life.	0.33	0.01
	Achieving success when playing games has improved my outlook when facing challenges in real life.	0.31	0.01

APPENDIX H

Primary Motivation for Engaging in Game Play

	n=96	Challenge/ Achievement	Competition	Education/ Skill Development	Exploration/ Discovery	Problem Solving/ Puzzles	Recreation/ Entertainment	Socialization	Other
	Total	5.26% (5)	6.25% (6)	1.04% (1)	1.04% (1)	2.08% (2)	64.58% (62)	17.71% (17)	2.08% (2)
Sex	Female	20.00% (1)	66.67% (4)	100% (1)	0.00% (0)	50.00% (1)	59.68% (37)	82.35% (14)	100% (2)
	Male	80.00% (4)	33.33% (2)	0.00% (0)	100% (1)	50.00% (1)	40.32% (25)	17.65% (3)	0.00% (0)
Ethnicity	Asian	0.00% (0)	16.67% (1)	0.00% (0)	0.00% (0)	0.00% (0)	14.52% (9)	17.65% (3)	0.00% (0)
	Hispanic	20.00% (1)	0.00% (0)	100% (1)	0.00% (0)	0.00% (0)	16.13% (10)	17.65% (3)	0.00% (0)
	Two or More	0.00% (0)	0.00% (0)	0.00% (0)	0.00% (0)	0.00% (0)	11.29% (7)	17.65% (3)	0.00% (0)
	White	80.00% (4)	66.67% (4)	0.00% (0)	100% (1)	50.00% (1)	53.23% (33)	41.18% (7)	100% (2)
Residence	US - California	40.00% (2)	50.00% (3)	100% (1)	100% (1)	50.00% (1)	54.84% (34)	64.71% (11)	50.00% (1)
	US Non-California	60.00% (3)	16.67% (1)	0.00% (0)	0.00% (0)	50.00% (1)	41.94% (26)	35.29% (6)	50.00% (1)

APPENDIX I

Social Settings for Game Play, by Sex, Ethnicity and Residence

	n=96	**Solo at Home**	**Solo Mobile**	**With friends, in person**	**With friends, online**	**With strangers, online**
	Total	16.67% (16)	14.58% (14)	53.13% (51)	15.63% (15)	0.00% (0)
Sex	Female	62.5% (10)	78.57% (11)	62.75% (32)	40.00% (6)	0.00% (0)
	Male	37.5% (6)	21.43% (3)	37.25% (19)	60.00% (9)	0.00% (0)
Ethnicity	Asian	12.5% (2)	14.29% (2)	9.80% (5)	26.67% (4)	0.00% (0)
	Hispanic	25% (4)	14.29% (2)	13.73% (7)	13.33% (2)	0.00% (0)
	Two or More	6.25% (1)	7.14% (1)	11.76% (6)	13.33% (2)	0.00% (0)
	White	43.75% (7)	64.29% (9)	56.86% (29)	46.67% (7)	0.00% (0)
Residence	US - California	56.25% (9)	28.57% (4)	62.75% (32)	60.00% (9)	0.00% (0)
	US Non-California	37.5% (6)	71.43% (10)	31.37% (16)	40.00% (6)	0.00% (0)

APPENDIX J

Correlation Table for Social Context of Play

Correlation Data for Social Context of Play Relative to other Motivation and Resilience Variables

Social Context for Play Variable	Correlating Variable Category	Correlating Variable	Pearson r	p-value
Solo at Home	Social Context	With friends in person	-0.48	0.01
	CD-RISC Items	Good or bad I believe that most things happen for a reason.	0.22	0.05
	Perception of Gaming Impact on Resilience	Achieving success when playing games has improved my outlook when facing challenges in real life.	-0.23	0.05
Solo Mobile	Social Context	With friends in person	-0.44	0.01
	Motivation	Other	0.35	0.01
	CD-RISC Items	I am not easily discouraged by failure	-0.24	0.05
		CD-RISC score	-0.23	0.05
With friends in person	Social Context	Solo at home	-0.48	0.01
		Solo mobile	-0.44	0.01
		With friends online	-0.46	0.01
	Motivation	Socialization	0.33	0.01
	CD-RISC Items	CD-RISC score	0.23	0.05
With friends online	Social Context	With friends in person	-0.46	0.01
	CD-RISC Items	I am able to adapt when changes occur.	0.25	0.05
		Having to cope with stress can make me stronger.	0.25	0.05
		Even when things look hopeless, I don't give up.	0.24	0.05
		Under pressure I stay focused and think clearly.	0.24	0.05

Perception of Gaming Impact on Resilience	Playing games has increased my self-confidence.	0.33	0.01
	Playing games has helped me to be less discouraged when facing failure in real life.	0.25	0.05
	Achieving success when playing games has improved my outlook when facing challenges in real life.	0.24	0.05

APPENDIX K

Correlation Table for Motivation

Correlation Data for Motivation for Play Relative to Resilience Variables

Motivation for Play	Correlating Variable Category	Correlating Variable	Pearson r	p-value
Challenge/Achievement (5)	CD-RISC Item	I think of myself as a strong person when dealing with life's challenges and difficulties	-0.23	0.05
	Perception of Gaming Impact on Resilience	Playing games has increased my self-confidence.	0.25	0.05
		Playing games has helped me to be less discouraged when facing failure in real life.	0.26	0.05
Competition (6)	CD-RISC Item	I tend to bounce back after illness, injury or other hardships.	-0.23	0.05
	Perception of Gaming Impact on Resilience	Playing games has increased my persistence when working towards my goals.	0.28	0.05
Education/Skill Development (1)	Perception of Gaming Impact on Resilience	Playing games has increased my persistence when working towards my goals.	-0.22	0.05
Exploration/Discovery (1)	N/A	No significant correlations at the .01 or .05 confidence level		
Problem Solving/Puzzles (2)	CD-RISC Item	In dealing with life's problems, sometimes you have to act on a hunch without knowing why.	-0.24	0.05
		I like challenges.	0.23	0.05
Recreation/Entertainment (62)	CD-RISC Item	I try to see the humorous side of things when I am faced with problems.	-0.32	0.05
Socialization (17)	N/A	No significant correlations at the .01 or .05 confidence level		

APPENDIX L

Correlation Table for Perceived Impact of Gaming on Resilience

Correlation Data for Perceived Impact of Gaming on Resilience Relative to CD-RISC Items

Perceived Impact of Gaming Behavior on Resilience	**CD-RISC Item**	**Pearson r**	**p-value**
Playing games has increased my persistence when working towards my goals.	I am able to adapt when changes occur	0.24	0.05
	I can deal with whatever comes my way.	0.23	0.05
	I try to see the humorous side of things when I am faced with problems.	0.22	0.05
	Under pressure I stay focused and think clearly.	0.24	0.05
	I can make unpopular or difficult decisions that affect other people, if it is necessary.	0.22	0.05
	CD-RISC Score	0.24	0.05
Playing games has increased my self-confidence.	I believe I can achieve my goals, even if there are obstacles.	0.23	0.05
Playing games has increased my ability to make decisions under pressure.	I can deal with whatever comes my way.	0.33	0.01
	I believe I can achieve my goals, even if there are obstacles.	0.37	0.01
Playing games has helped me to be less discouraged when facing failure in real life.	I believe I can achieve my goals, even if there are obstacles.	0.32	0.01
Achieving success when playing games has improved my outlook when facing challenges in real life.	I can deal with whatever comes my way.	0.25	0.05
	Past successes give me confidence in dealing with new challenges and difficulties	0.27	0.05
	I believe I can achieve my goals, even if there are obstacles.	0.32	0.01

APPENDIX M

Regression Model Summaries with ANOVA F-statistics

Factor	Item	Item	R	R-Square	Adjusted R-Square	Std. Error of the Estimate	F	Sig
CD-RISC	All	Overall Score	0.50	0.25	0.22	9.38	8.79	0.00
Factor 1 - Competence and Tenacity	F1	Full Factor 1	0.33	0.11	0.10	0.50	9.72	0.00
	10	I give my best effort no matter what the outcome may be.	No significant relationship between variables					
	11	I believe I can achieve my goals, even if there are obstacles.	0.25	0.06	0.05	0.71	5.24	0.03
	12	Even when things look hopeless, I don't give up.	0.34	0.12	0.09	0.72	5.21	0.01
	16	I am not easily discouraged by failure.	0.46	0.21	0.20	0.78	10.90	0.00
	17	I think of myself as a strong person when dealing with life's challenges and difficulties.	0.32	0.10	0.09	0.72	8.90	0.00
	23	I like challenges.	0.39	0.15	0.13	0.73	7.13	0.00
	24	I work to attain my goals no matter what roadblocks I encounter along the way.	0.31	0.10	0.09	0.69	8.84	0.00
	25	I take pride in my achievements	0.27	0.07	0.06	0.73	6.45	0.01
Factor 2 - Trusting Instincts, Tolerance and Stress	F2	Full Factor 2	0.44	0.20	0.17	0.49	6.45	0.00
	6	I try to see the humorous side of things when I am faced with problems.	0.42	0.18	0.16	0.85	8.72	0.00
	7	Having to cope with stress can make me stronger.	0.26	0.07	0.05	0.78	5.62	0.02
	14	Under pressure, I stay focused and think clearly.	0.50	0.25	0.23	0.77	13.11	0.00
	15	I prefer to take the lead in solving problems rather than letting others make all the decisions.	0.28	0.08	0.07	0.80	7.08	0.01

	18	I can make unpopular or difficult decisions that affect other people, if it is necessary.	0.43	0.19	0.16	0.90	6.02	0.00
	19	I am able to handle unpleasant or painful feelings like sadness, fear, and anger.	0.32	0.10	0.08	0.82	4.51	0.01
	20	In dealing with life's problems, sometimes you have to act on a hunch without knowing why.	No significant relationship between variables					
Factor 3 - Acceptance of Change, Secure relationships	F3	Full Factor 3	0.4	0.16	0.14	0.41	7.60	0.00
	1	I am able to adapt when changes occur.	0.43	0.18	0.15	0.66	5.90	0.00
	2	I have at least one close and secure relationship that helps me when I am stressed.	0.22	0.05	0.04	0.55	4.15	0.05
	4	I can deal with whatever comes my way.	0.43	0.18	0.16	0.68	4.18	0.00
	5	Past successes give me confidence in dealing with new challenges and difficulties.	0.24	0.06	0.05	0.72	5.01	0.03
	8	I tend to bounce back after illness, injury, or other hardships.	No significant relationship between variables					
Factor 4 - Control	F4	Full Factor 4	0.37	0.14	0.11	0.64	6.30	0.00
	13	During times of stress/crisis, I know where to turn for help.	0.22	0.05	0.04	0.83	4.00	0.05
	21	I have a strong sense of purpose in life.	0.33	0.11	0.10	0.87	9.80	0.00
	22	I feel in control of my life.	0.34	0.11	0.10	0.89	10.29	0.00
Factor 5 - Spiritual Influences	F5	Full Factor 5	0.45	0.20	0.17	0.94	6.52	0.00
	3	When there are no clear solutions to my problems sometimes fate or God can help.	No significant relationship between variables					
	9	Good or bad, I believe that most thinks happen for a reason.	0.55	0.30	0.26	0.89	8.25	0.00

APPENDIX N

Summary of CD-RISC Regression Model Variables, and Their Predicted Relationships

Factor	Item #	Item	Stepwise Regression Model Variables	B	Sig.
CD-RISC	All	Overall Score	US, Non-CA	-6.69	0.00
			Role Playing Games	9.40	0.00
			# of days in 30 spent gaming	0.26	0.04
Factor 1 - Competence and Tenacity	F1	Full Factor 1	Multiplayer Online Games	0.68	0.00
	10	I give my best effort no matter what the outcome may be.	N/A	-	-
	11	I believe I can achieve my goals, even if there are obstacles.	Hispanic	0.51	0.03
	12	Even when things look hopeless, I don't give up.	Female	-0.36	0.03
			US, Non-CA	-0.33	0.04
	16	I am not easily discouraged by failure.	Multiplayer Online Games	0.82	0.00
			With Friends in Person	0.47	0.01
	17	I think of myself as a strong person when dealing with life's challenges and difficulties.	US, Non-CA	-0.48	0.00
	23	I like challenges.	Female	-0.36	0.04
			Asian	-0.76	0.01
	24	I work to attain my goals no matter what roadblocks I encounter along the way.	# of days in 30 spent gaming	0.03	0.00
	25	I take pride in my achievements	Multiplayer Online Games	0.44	0.01
Factor 2 - Trusting Instincts, Tolerance and Stress	F2	Full Factor 2	Computer Games	0.32	0.02
			Role Playing Games	0.34	0.04

	6	I try to see the humorous side of things when I am faced with problems.	Female	-0.54	0.01
			Recreation/Entertainment	-0.60	0.00
	7	Having to cope with stress can make me stronger.	Computer Games	0.48	0.02
	14	Under pressure, I stay focused and think clearly.	Female	-0.73	0.00
			Role Playing Games	0.83	0.00
	15	I prefer to take the lead in solving problems rather than letting others make all the decisions.	Computer Games	0.55	0.01
	18	I can make unpopular or difficult decisions that affect other people, if it is necessary.	Hispanic	-0.67	0.02
			US, Non-CA	-0.49	0.03
			Computer Games	0.60	0.18
	19	I am able to handle unpleasant or painful feelings like sadness, fear, and anger.	US, Non-CA	-0.38	0.04
			Tabletop Games	0.45	0.02
	20	In dealing with life's problems, sometimes you have to act on a hunch without knowing why.	N/A	-	-
Factor 3 - Acceptance of Change, Secure relationships	F3	Full Factor 3	Computer Games	0.27	0.01
			Role Playing Games	0.36	0.01
	1	I am able to adapt when changes occur.	Computer Games	0.51	0.01
			Role Playing Games	0.59	0.01
			With Friends in Person	0.35	0.03
	2	I have at least one close and secure relationship that helps me when I am stressed.	US, Non-CA	-0.25	0.05
	4	I can deal with whatever comes my way.	# of days in 30 spent gaming	0.04	0.00
			Solo at home	-0.52	0.03

	5	Past successes give me confidence in dealing with new challenges and difficulties.	White	-0.36	0.03
	8	I tend to bounce back after illness, injury, or other hardships.	N/A	-	-
Factor 4 - Control	F4	Full Factor 4	US, Non-CA	-0.41	0.01
			Role Playing Games	0.47	0.03
	13	During times of stress/crisis, I know where to turn for help.	US, Non-CA	-0.38	0.05
	21	I have a strong sense of purpose in life.	Hispanic	0.85	0.00
	22	I feel in control of my life.	US, Non-CA	-0.64	0.00
Factor 5 - Spiritual Influences	F5	Full Factor 5	Female	0.82	0.00
			US, Non-CA	-0.66	0.00
			Session Duration	0.01	0.04
	3	When there are no clear solutions to my problems sometimes fate or God can help.	N/A	-	-
	9	Good or bad, I believe that most things happen for a reason.	Female	0.82	0.00
			US, Non-CA	-0.81	0.00
			Session Duration	0.01	0.02
			Solo at home	0.56	0.04

Nov 14, 2018 10:32 AM PST

Patrick Marino
Sch of Leadership & Ed Science

Re: Expedited - Initial - IRB-2019-91, An Analysis of the Relationship Between Game Play Habits and Resilience Among First-Year College Students

Dear Patrick Marino:

The Institutional Review Board has rendered the decision below for IRB-2019-91, An Analysis of the Relationship Between Game Play Habits and Resilience Among First-Year College Students.

Decision: Approved

Selected Category: 7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Findings: None

Research Notes:

Internal Notes:

Note: We send IRB correspondence regarding student research to the faculty advisor, who bears the ultimate responsibility for the conduct of the research. We request that the faculty advisor share this correspondence with the student researcher.

The next deadline for submitting project proposals to the Provost's Office for full review is N/A. You may submit a project proposal for expedited or exempt review at any time.

Sincerely,

[redacted]

Dr. Thomas R. Herrinton
Administrator, Institutional Review Board

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