Building Persistence Through Failure

The Role of Challenge in Video Games

Craig G. Anderson

Department of Informatics
University of California, Irvine
Irvine, CA, USA
craigga@uci.edu

Kathryn Campbell

Department of Informatics
University of California, Irvine
Irvine, CA, USA
kcampbe2@uci.edu

Constance Steinkuehler

Department of Informatics
University of California, Irvine
Irvine, CA, USA
const@uci.edu

ABSTRACT

Some video games create challenging environments that presume that players will often fail as part of developing the skills and knowledge they need to progress through the game. Psychology has a rich history of studying the ways that individuals react towards failure, including mastery orientation. Mastery oriented individuals are characterized by positive reactions to failure, such as renewed effort, heightened affect, and positive, affirming language. However, the challenging environments of which these video games are comprised have not yet been investigated fully in their potential impact on how players react to failure. In an initial exploration, we surveyed 928 undergraduates at a major university in the Pacific United States on their gameplay experience and attitudes towards challenge and failure. Analyses partially replicate previous findings and show that players who are more attracted to challenge in video games report higher mastery orientation. While this suggests that challenge in video games has some association with positive reactions to failure, further analyses are warranted to understand how challenge in video games influence player reactions and the impact this may have beyond of the game.

KEYWORDS

Mastery Orientation; Failure; Challenge.

CCS CONCEPTS

• Applied computing~Computer games • Software and its engineering~Interactive games • Theory of computation~Convergence and learning in games

1 Introduction

Video games are environments built on challenging content and looming failure [15]. As a player progresses through the game, mechanics are used to frame failure in ways to ensure

minimal frustration and boredom [11,17]. This is imperative to the success of the game, as players who find the game too easy or too hard are less likely to enjoy or complete it [14]. To ensure players are met with an optimal challenge level, developers use mechanics to keep the player progressing and developing their ability despite being faced with challenge and failure at every turn [11]. Framing failure in these ways is similar to strategies psychologists use to promote more positive reactions to failure [5, 7, 8, 9, 10, 19]. Although, some positive failure strategy interventions in videogames have been explored, they have largely focused on games for impact developed for educational purposes. It remains unclear if commercial games developed for entertainment have any influence on a player's reaction to failure. To begin this investigation, we surveyed a major university in the Pacific region of the United States on student's game play experience and attitudes towards challenge and failure.

2 RELATED WORK

Games are inherently built with failure in tandem. Play theorist, DeKoven [3] describes a player's drive towards a well-played game, often including modification of the rules to ensure that all players are challenged and have an opportunity to win or lose. He points out that in playing a game, players do not desire to simply win, but to experience a "well-played game". This requires players to search for the optimal level of challenge, often inviting failure with it. Juul showed that players are not just drawn to winning a game, but that they are also drawn to be challenged to the level that they are likely to fail at it first [15]. Juul argues that although we normally avoid failure, games create a paradox in which we seek failure and require it to have the desired experience. In fact, Juul found that players of an action arcade game reported dissatisfaction from completing the game without failing at it at all [14]. These moments of failure are expected by players and help players navigate through the game environment. This high degree of failure is a result of the need for games to be challenging. Challenge has been shown to be a core feature to game enjoyment [2], and has garnered researchers attention in the past couple of decades [1, 4, 16, 18]. Designers create experiences that are aimed to be "at the outer edge, but within, [the player's] 'regime of competence'" [11]. This environment

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FDG '19, August 26–30, 2019, San Luis Obispo, CA, USA

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ACM ISBN 978-1-4503-7217-6/19/08...\$15.00

<https://doi.org/10.1145/3337722.3337741>

of challenge and failure fosters development of the player's gameplay ability and provides the challenge-driven experience that players desire, provided that the player reacts in a positive manner towards the resulting failure. However, the ways that players react to different game mechanics around failure has yet to be explored.

1.1 Positive Failure Strategies

How we react to failure has been a topic of interest in psychology for decades. In this time, theorists have investigated how an individual perceives failure and how that influences their behavior in the future. Dweck & Reppucci noticed that some individuals react very differently when confronted with failure [6, 9]. Coined as having a "mastery orientation", some individuals use positive, self-focusing language [5], and show heightened affect and increased effort in response to failing a difficult problem [8]. Even when falsely informed that they failed at a task, those with a mastery orientation respond to failure as information that will lead them to solve the problem rather than an assessment of ability or prediction of future attempts [9]. In fact, these individuals don't even seem to think that they've failed; they treat these moments as setbacks and moments of reflection rather than failure [10]. On the other hand, some individuals are characterized as having a helpless mindset. Although they use the same strategies prior to failure, afterwards their strategy use deteriorates, and ineffectual responses increase. Helpless individuals show an absence of progress after failure, report negative self-conditions, negative affect including boredom, aversion, anxiety, decreased performance, and use of ineffective or impossible strategies [5]. Failure completely stops these helpless individuals in their tracks, whereas mastery-oriented individuals are invigorated by failure, renewing their efforts and resolve.

Upon failing, Dweck, Chui, & Hong [7] describe two mindsets related to mastery orientation that make up the implicit theories of intelligence: a growth mindset and a fixed mindset. In a growth mindset, one believes that they are capable of developing if they put in effort. Contrary, in a fixed mindset, one believes that they have a certain level of ability that they cannot change [12]. While a fixed mindset is associated with feelings of anxiety, boredom, and depression upon encountering failure [8], growth mindset is associated with increased value of either success or failure as well as energization in the face of challenge [10].

Weiner [19] describes different ways that an individual reacts to failure through different perspectives while pursuing their goals as achievement needs. An individual can pursue learning goals, aiming to get better at the task they are completing, or they can pursue performance goals, aiming to perform their task at a level that shows they are competent. These strategies can lead to either challenge avoidance or challenge seeking behaviors, respectively. Individuals focused on performance

goals will tend to choose tasks in which they know they will be able to show their competence, while individuals focused on learning goals will tend to choose tasks that give them an opportunity to develop their ability or understanding [19]. Similarly to growth and fixed mindsets, failure is met with devastation by performance goal focused individuals, and persistence by learning goal focused individuals [19].

It's clear that these positive failure strategies have a role to play in the ways that players react to the failure that is so inherent in many games. However, only a few studies have investigated this dynamic, and have largely focused on how intervention strategies can influence gameplay or learning outcomes from games designed for educational purposes. This leaves a wide gap in our understanding how players of commercial video games respond when encountering failure in more engaging games chosen to be played in their free time. This leads to the research question this paper aims to address:

1.2 Research Question

Is there a relationship between commercial gameplay and mastery orientation?

2 Method

As part of a survey to gauge student opinions of games, esports, and academics, we asked students at a major Pacific University in the United States to complete a subsection from Helmreich & Spence's Work and Family Orientation survey on mastery orientation, which was developed to gauge persistence in accomplishing difficult tasks [13]. Students were asked how well they agreed with the following statements on a scale from 1 (strongly disagree), to 5 (strongly agree):

1. I would rather do something at which I feel confident and relaxed than something that is challenging and difficult.
2. When a group I belong to plans an activity, I would rather direct it myself than just help out and have someone else organize it.
3. I would rather learn something easy than something difficult.
4. If I am not good at something, I would rather keep struggling to master it than move on to something I may be good at.
5. Once I undertake a task, I persist.
6. I prefer to work in situations that require a high level of skill.
7. I more often attempt tasks that I am not sure I can do than tasks that I believe I can do.
8. I like to be busy all the time.

Questions 1 and 3 were reverse scored and responses were summed into a mastery score, with a higher number indicating more of a mastery orientation.

Along with their survey data, respondents were asked to release their academic and demographic data from Student Affairs, including classes taken, GPA, year, first-gen status, and low-income status.

2.1 Participants

We invited 3000 of the general study body at a Pacific University in the United States to complete our survey. To ensure we captured a sufficient number of video game enthusiasts, we also invited 2000 more students identified from the campus “game arena” user list. This arena provides students a space where they can pay to play competitive or single-player video games on high-performance gaming computers. As compensation for participation in the survey, students were offered to be included in a raffle for a \$200 USD or one of 460 \$5 USD Amazon gift cards.

Of the 5000 invited, 1019 students responded, 241 of which were recruited from the game arena list. The arena users and the general student sample were found to have similar gender distribution, GPA, and year in school, but have higher rates of playing games, and number of hours playing games per week. After the final data corpus was examined closely, it was cleaned and standardized for analysis and screened for suspect responses. 40 respondents were removed due to missing responses or non-compliance, having more than 5 of 35 questions unanswered (excluding open responses) or providing only “opt out” responses for all questions (i.e. “I don’t have a reason” in response to “Which of the following are reasons for pursuing your current degree?”). A further 51 students declined to authorize the release of their academic data from Student Affairs and were removed from the analyses as we were not able to verify their survey responses for misinformation. This left us with a final count of 928 respondents. To ensure none of the removed data constituted a unique population, we compared their descriptive statistics to the other respondents and found their response rate was lower in all fields uniformly except the ‘opt out’ questions, which was to be expected. This indicated that the removed respondents were not a unique population and were removed from analyses.

Of the 928 respondents, 376 identified as female, 548 identified as male, and 4 did not disclose gender information to Student Affairs. As the number of respondents that stated a gender other than male or female was only 4, we did not include them in gender-wise analyses. Whereas the general student body comprises of 52.85% women, the proportion of women to answer our survey was only 40.08%. To correct this, we weighted our data by gender for any analysis aimed to extend to the student population at the chosen University, while gender-wise analyses were completed with the unweighted data. Mean age of our respondents was 20.72 (SD = 5.96). Of the 928 respondents, 171 were in their first year of classes, 221 were in their second, 250 were in their third, 230 were in their

fourth, 51 were in their 5th year or later, and 7 were in graduate school. Once the data corpus was cleaned and weighted, we conducted a set of analyses to investigate mastery orientation, video game play, opinions towards games, and GPA.

2.2 Analyses

To replicate findings from previous studies, we checked for gender differences in mastery score, as well as the relation between mastery score and GPA. For GPA analysis, respondents’ reported GPA were subtracted from the median GPA reported for their school of study to ensure student GPA was contextualized to their department average:

$$\text{GPA Score} = \text{Median School GPA} - \text{Reported GPA}$$

This GPA Score allowed analysis to account for any differences at the department level. All GPA analysis was conducted on the department-averaged GPA scores.

Following this, we examined if playing games has an association with mastery orientation. Non-parametric tests were employed as mastery score was not normally distributed and inherently ordinal. We used Kruskal-Wallis tests to check for differences in mastery score between those who reported playing video games and those who report that they do not. Two methods of analysis we implemented for the reported average hours of game playing per week against mastery score. One method treated hours as a continuous variable, the second bundled the respondents into hour groups.

Bundles were created by the first three quarters of data; the fourth quarter was split at the 40-hour mark resulting in four groups. This was done to account for an “extreme amount” of gameplay for a university student (table 1). Kendall’s rank correlation and Kruskal-Wallis tests were used to investigate associations between the average number of hours that students play video games per week and their mastery score where appropriate.

<i>Group</i>	<i>Hours Per Week</i>
<i>Low</i>	≤ 1
<i>Average</i>	$1 < x \leq 5$
<i>High</i>	$5 < x \leq 40$
<i>Extreme</i>	$40 < x$

Table 1: Average Hours Playing Games Groups

3 Results

Results are summarized in table 2. A Kruskal-Wallis test comparing mastery score between gender show that men report higher mastery levels (median = 27) than women (median = 26, $p=0.0015$).

Kendall’s rank correlation comparing GPA and mastery score showed no significant relationship ($p=0.0579$) with a $\tau = |0.043|$. However, the moderate p value suggests further exploration may be required.

Kruskal-Wallis test comparing those who reported that they play video games and those who reported that they do not shows no significant difference in mastery score ($p=0.0603$). However, the moderate p value again suggests further exploration may be required.

Kendall's Rank correlation between number of hours playing video games and mastery score yielded a $\tau = |0.04|$, and a p value of 0.1142; suggesting no relationship between hours spent playing and mastery score.

Kruskal-Wallis test comparing mastery score against the bundled hours groups also yielded non-significant results ($p = 0.7008$), suggesting no difference in mastery score behavior across the four groups.

Finally, Kruskal-Wallis test showed that players who reported that challenge is an important part of playing games also report a significantly higher mastery-orientation (median=27) than those who do not (median = 26, $p \approx 0.00$) (figure 1).

Mastery Score Analyses vs	Results
Gender	Kruskal - Wallis: $\chi^2 = 10.113$, $p = 0.0015$
GPA	Kendall's Rank Correlation: $\tau = 0.044 $, $p = 0.0579$
Challenge in Video Games	Kruskal- Wallis: $\chi^2 = 15.459$, $p \approx 0.0$
Hours Playing	Kendall's Rank Correlation: $\tau = 0.04 $, $p = 0.1142$

Table 2: Summary of Analyses

4 Discussion

We partially replicated findings of earlier studies in that men were found to have a higher mastery orientation than women. Although, GPA was not positively associated with mastery orientation as previous literature has shown. However, the test's moderate p value suggests further exploration may be required to better understand this discrepancy found in the relation between mastery orientation as an important factor in student academic success. Persistence is an important factor in how well any student does in their studies, and we can assume that being enrolled in a University program requires some level of persistence. This is to say that the entirety of our sample likely shows higher levels of mastery orientation than those who could not persist in high school or other programs preparatory to postsecondary education. It may be the case that our sample does not capture the full range of mastery orientation responses present in the general population. Deeper investigation into these and other populations may show differences not seen here.

Figure 1: Mastery Score by Preference for Challenge in Games

Despite video games having a close relationship with failure and the ability to persist through it, our analyses do not show a direct significant positive association between generally playing video games and mastery orientation. However, the moderate p value warrants more investigation. Further, those who consider challenge an important factor in video games do show a higher level of mastery orientation than those who do not. This suggests that although simply playing video games might not have any association with persistence in the face of failure, playing games in which challenge is a core feature might. Many game studies view games as a singular unit, not taking into account that there is a plethora of game genres, and that every game is unique. As early as 2006, researchers like Yee have been exploring player motivations, leading to a wider understanding that includes multiple play styles that refocus researchers on how the individual player engages in the individual game [20, 21]. Not all games are created equal, and the mechanics that maintain the level of challenge in some games have not yet been investigated. For example, noted for its difficulty, From Software's *Dark Souls* may attract players that are more capable of persisting through challenging situations and the failure that comes with them, while some players may prefer to play games that do not have pressing challenge levels. Although the difference between the average mastery orientation score of those who believe challenge is an important feature to playing video games is small, it may suggest that those who play challenging games are more equipped to persist when attempting to accomplish difficult tasks that are likely to result in initial failures. However, this

claim requires more investigation; it may be that those with a higher mastery orientation are drawn to these environments that are often full of challenging situations such as difficult video games. This possibility remains open and warrants further research to identify what features in these video games create these challenging environments, how they're maintained, and what relation these environments have with persistence in the face of failure.

Investigation into individual games is also warranted as fail states in one space may be very different than in another; effects may be much more game dependent than is captured in this data or by the methodology used. Further, failure requires that an individual has set a goal at which they do not succeed. Not only do goals vary between games, they can vary within games for different players as well. While one player may consider a character death a failure to achieve their goals, another player may have goals that require player death to complete. For example, a player may be more interested in getting a perfect "Wasted" screenshot in *Grand Theft Auto* and wouldn't consider death a failure in the same way. Here, failure might be the character surviving the event. These scenarios still require persistence when the game, or chosen goals are sufficiently challenging, and require closer inspection to what the game and the player consider to be failure to better understand how they react. Players may also be more motivated when playing one game more than another. Future studies should consider what individual players consider failure to effectively study how they respond to it.

Finally, with game metric collection methodologies, video games provide an environment that is well-suited to study failure in ways that have not yet been explored in psychology research. Current instruments used to measure mastery orientation are limited to self-report survey, roleplaying, and discourse analysis. There are currently no measures that use behavior-driven analyses to determine how an individual reacts to failure, for which game metrics would provide a unique vantage point. More investigation with different methodology could tease out new understandings of how players react to failure at a behavioral level. Behavior-driven data analysis could provide insights that survey methodology does not. This approach would allow for the determination of not only what behaviors are seen in response to failure, but also how they change over time and if any specific game mechanics have a stronger influence.

4.1 Limitations

These preliminary results show some associations between playing video games and mastery orientation but have some limitations present. First, the sample comes from undergraduate students who have been successfully admitted to a program at a major University. As such, it is unlikely that the population holds individuals at the lowest end of the mastery orientation scale. This limits how well the findings can

be applied to the broader population as these findings may not apply to those who have the hardest time being persistent in challenging situations. Further investigation is required to explore this dynamic.

This sample also relies on self-reported data. Answers to mastery orientation questions may be subject to response biases due to social pressure. Finer-grained methodology common to game research would provide a clearer picture, as game metric data is collected in the background of play and is behavior-driven. Future studies investigating player reactions to failure would benefit from this methodological approach.

4.2 Implications

These analyses could have implications for mastery orientation interventions. Dynamic difficulty adjustment, difficulty settings, and other mechanics that promote players continuing after failure show how some games can be designed to adapt their difficulty to player skill level. As such, completing challenging games with mechanics designed to help players persist could provide a basis for an intervention for those who have a difficult time persisting through difficulty and failure. This may require special attention to development of games with the purpose of developing player's ability to persist through challenge and failure and requires more research to conclude.

Further, investigation into how games influence player persistence may inform game design in its own right. Many principles of game design attempt to promote players to persist in the challenging environments that the designers create. Developers rely on players seeing and enjoying as much content as they put into a game, but also aim to ensure players are challenged throughout play. This balance between making a game difficult, but not so difficult it can't be completed is non-trivial and subject to individual skill level. Better understanding how players of all skill levels react to failure in games could allow developers to better create environments that promote player persistence, helping players enjoy more of the game to its conclusion.

5 CONCLUSION

Video games provide players with environments that are designed to push players to the limits of their ability. Failing is common practice in these spaces and holds promise for helping players to develop the strategies that help them deal with failure in better ways. A long line of psychological research has shown that positive failure strategies like mastery orientation are associated with persistence and increased effort through failure and leads to beneficial outcomes such as better grades in school. These analyses present preliminary findings that suggest those who are attracted to playing commercial video games that are designed to be challenging are associated with those players being better equipped to deal with persisting

through challenge and failure. However, it is unclear if playing these games are the cause of adopting a mastery orientation, or if those with a higher mastery orientation are more attracted to play these games. These findings suggest a more complex picture than our analyses can show and open the door for more focused and finer-grained studies. Methodology that capture player behaviors through game metrics are common in games research and may better show how players react to failure in games. They would also allow for the direct observation of mastery responses rather than relying on self-reported pre-post measures. These analyses provide a starting point for a ripe area of research that could have impact on players, interventions, and game design.

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