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CHALLENGE ACCEPTED: EXPLORATIONS TOWARD A PLAYER-CENTRIC DEFINITION OF CHALLENGE IN GAMES

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Marjorie Cuerdo

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The Dissertation of Marjorie Cuerdo
is approved:

Dr. Edward Melcer, Chair

Dr. Katherine Isbister

Dr. Elin Carstensdottir

Dr. Paul Cairns

Peter Biehl
Vice Provost and Dean of Graduate Studies

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Abstract

Challenge Accepted: Explorations Toward a Player-Centric Definition of Challenge in Games

by

Marjorie Cuerdo

The tension and drama of player challenges are what drives gameplay. While players often only think about performance when they experience difficulty and failure in games, my work argues that the scope of challenge goes beyond that aspect, including more socioemotional eudaimonic gaming experiences.

I first explored micro and macro views of challenge and failure in games from the performative challenge aspect, as well as how they related to player experience outcomes. I then explored how emotional design patterns related to eudaimonic experiences, such as player reflection. Lastly, I explored how the addition of sociality affects the emotionally challenging player experience.

Through my explorations, this dissertation provides a definition of challenge itself that aims to be more player-centric and inclusive of different types of challenge. Secondly, I contribute some future research directions and recommendations towards how to design for challenging player experiences that are emotionally-impactful and memorable.

Vita

Marjorie "Marj" Cuerdo was born in the U.S. island territory of Saipan, Northern Mariana Islands in 1994. She holds a Bachelor of Arts in Digital Media Studies from the University of Rochester, a Master of Science in Human-Computer Interaction from DePaul University, and a Master of Science in Computational Media from University of California, Santa Cruz.

The research described in this dissertation was performed in the timespan of 2019-2024. It was conducted through the Alternative Learning Technologies and Games (ALT Games) Lab in the Computational Media Department at the Silicon Valley Campus of University of California, Santa Cruz.

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Last but not the least, I want to thank my sister Jonavelle Cuerdo, my partner Taylor Kwon, my cat Snowblizz, and friends for their love and support – my co-players for life.

Please note that I often used the word "we" rather than "I" to describe my works in this dissertation, as they were a collaborative effort.

Chapter 1

Introduction

A challenge is a stimulating task or problem. In the context of games, player challenges have been previously defined as "any task set for the player that is nontrivial to accomplish" and often referred to as the heart of the player experience [3]. Adams (2014) once stated this about challenge:

"Gameplay is challenges and actions that entertain. People enjoy a challenge, as long as they can reasonably expect to accomplish it. People also try a challenge they do not expect to meet if the risk is low and the reward is high. Challenges create tension and drama. At the simplest level, presenting players with a challenge amounts to asking a question: 'Can you do it?' They'll enjoy trying to prove that you can."

That tension and drama drives motivation for gameplay and convinces players to perform actions that they may otherwise not do if they did not feel challenged to do so. Challenge is so critical that the way most people evaluate a game is by determining how difficult it is. This brings about the question: Is challenge rooted in the game or

in the player?

My research initially explores this question by examining difficulty from the granular failure game design perspective by looking at performative challenge closely. This challenge type "addresses the player's physical limitations to interact with the game, i.e. the speed and accuracy with which actions can be performed" [75]. At the start of my endeavors, I hypothesized that challenge was rooted in the game's design.

To dig deeper and better understand challenge design, it was intuitive to first explore how game design components could affect the player experience. Examining this in the context of player failure was fruitful as much of challenge design research related to failure and difficulty.

We developed two taxonomies that explored performative challenge: one that focuses on the granular-level view of failure and retry components in platformer video games (in Chapter 3.1 "'I'll Be Back': Fail and Retry Taxonomy in Platformer Games"), and the other that has a macro-level view on the overall challenge and failure process across game genres and modalities (in Chapter 3.3 "'Try Again?': A Macro-Level Taxonomy of the Challenge and Failure Process in Games"). The former enables us to break down failures into components such as failure conditions and reset locations; while the latter enables us to see, from a wider perspective, the role that challenges play into loops that lead to various failure states. Though performative challenge has been studied extensively, I was inspired to examine it further as I still saw gaps in our understanding of failure itself. Our work is among the only ones that have both developed a failure design taxonomy (in Chapter 3.1 "'I'll Be Back': Fail

and Retry Taxonomy in Platformer Games") and demonstrated its application and relevance through a subsequent player experience study (in Chapter 3.2 "'Die-r Consequences': Player Experience and the Design of Failure through Respawning Mechanics").

Simply put, while I found evidence of effects on other player experience constructs, I also found that the player experience of challenge and failure itself was not as straightforward as experimenting with game design component configurations.

Regardless, much of challenge design research (e.g. dynamic difficulty adjustment) has been studied mostly through this traditional performative challenge lens. Based on findings from our performative challenge research projects, it was clear that I needed to examine challenge from a multi-faceted point of view to be inclusive of psychosocial aspects. I then transitioned to understanding and exploring the design of other challenge types, such as emotional challenge and social challenge.

In developing scales to measure challenge, Denisova et al. [75] and Bowman et al. [31] identified these other types of challenge. The emotional aspect of challenge is something that both works agree on as a major challenge type. Denisova et al. defines emotional challenge as something "which confronts the player with emotionally salient material or the use of strong characters, and a captivating story" [75]. Bowman et al. defines emotional challenge from the "demand" perspective, saying it "is the instigation of an affective response in a player — at the most basic level, emotional demand refers to how much (or how little) the video game made one feel." While both definitions contain aspects that are subjective and could use some clarification (to be discussed further in

Chapter 5), Denisova et al.'s [75] is more specific and is therefore what I applied in my work.

Failure and success are the outcomes that players expect when engaging with performative-driven games. However, outcomes for games that are more psychosocial in nature and focus on affording socioemotional challenge are not as straightforward. Upon exploring emotional challenge research, I found that mixed-affect emotional experiences such as player reflection are commonly desired outcomes. In these games, deriving some kind of meaning from a gaming experience is the goal. These experiences are now known as "eudaimonic gaming experiences", defined as those which "manifest in various forms, e.g. appreciation, meaning, being emotionally moved or challenged, self-reflection, deep social bonds, nostalgia, awe, elevation" [71].

We contribute to emotional challenge research by examining the relationship between player reflection and affective game design patterns (as discussed in Chapter 4.1 "Exploring how Emotional Challenge and Affective Design in Games Relates to Player Reflection"). This work aims to provide better understanding of how to leverage emotional immersion to design for reflective player experiences. As reflection is contextual to players' individual perspectives, conducting this research challenged my initial perception that challenge is rooted primarily in the game. Expanding the view of challenge to include socioemotional aspects demonstrates that the perception of challenge is dependent on the dynamic between a game's design and a player's individual perspectives and intentions.

What I explored last was how the experience of emotional challenge occurred

in the context of social games. Doing this work allowed me to fully embrace the idea that the player experience of challenge is heavily contextual and player-centric, as we now considered the sociality layer, by analyzing multiple players' perspectives and intentions.

The concept of social challenge is one where Denisova et al. [75] and Bowman et al. [31] differ. The former claims that social challenge is a subtype of cognitive challenge and defines it as "[arising] during play against or with human or AI players and relates to the capacity to read an opponent, predicting their moves and making split-second decisions that can aid players in deceiving opponents" [76]. In their perspective, social aspects of play is not a distinct form of challenge and merely enhances other facets of challenge (physical, emotional, and cognitive) [75]. However, Bowman et al. [31] viewed social aspects as that which stands alone and defines it as "related to social interactions and relationships with others, and might be understood in its most basic form as how much (or how little) the video game made one react to and/or aware of other avatars, characters, or people."

We contribute to both social and emotional challenge research by studying how people experience emotional challenge when playing games with others (multiplayer and tandem play gaming experiences), as demonstrated in our study described in Chapter 4.2 "(Anti)Social: Exploring Emotional Challenges in Multiplayer Experiences". This work aims to explore the relationship between social and emotional challenge and identify the interaction dynamics that arise from emotionally challenging social play.

Ultimately, there are gaps in our understanding of player challenge and its types. This dissertation focuses on the first three boxes below in Figure 1.1:

Performative Challenge, Emotional Challenge, and Social Challenge. **Through my explorations, I have determined that we still need to better understand challenge design beyond its impact on player failure experiences to also be inclusive of more complex socioemotional eudaimonic gaming experiences. We need to re-examine the definition of "challenge" in games itself to be more *player-centric* and inclusive of the various forms challenge can take.** I also provide potential future research directions and guidelines for how to design for challenge and its types more effectively.

Figure 1.1: Definitions of the major challenge types from Denisova et al. [75].

As the cognitive challenge type falls somewhere in between the popular and understudied, it was not individually explored and is outside the scope of this dissertation, though there are related aspects of it discussed in the realm of mental/cognitive fatigue and failure in games (discussed in Chapter 3.3 "'Try Again?':

A Macro-Level Taxonomy of the Challenge and Failure Process in Games").

The work presented in this dissertation is based on the following publications:

- Cuerdo, M. & Melcer, E. (2020). "Death and Rebirth in Platformer games". In *Game User Experience And Player-Centered Design*. Springer.

- Cuerdo, M. & Melcer, E. (2020). "'I'll Be Back'": A Taxonomy of Death and Rebirth in Platformer Video Games". In *Extended Abstracts of the 2020 CHI Conference on Human Factors in Computing Systems*, pages 1–13. ACM.

- Cuerdo, M., Mahajan, A. & Melcer, E. (2021). "Die-r Consequences: Player Experience and the Design of Failure through Respawning Mechanics". *In Proceedings of the 2021 IEEE Conference on Games (CoG)*, pages 01–08. IEEE.

- Cuerdo, M. (2022). "Fail and Retry: How Challenge Design in Plat- former Games Relates to Player Experience and Traits". University of California, Santa Cruz.

- Cuerdo, M., Mahajan, A. & Melcer, E. (2023). "Try Again?: A Macro-Level Taxonomy of the Challenge and Failure Process in Games". *In Proceedings of the 2023 IEEE Conference on Games (CoG)*. IEEE.

- Cuerdo, M., Baskaran, D. & Melcer, E. (2024). "Exploring how Emotional Challenge and Affective Design in Games Relates to Player Reflection". *In Proceedings of the 2024 Foundations of Digital Games (FDG)*. ACM.

- Cuerdo, M., Baskaran, D., Yang, T. & Melcer, E. (2024). "(Anti)Social: Exploring Emotional Challenges in Multiplayer Experiences". *In Proceedings of the 2024*

IEEE Conference on Games (CoG). IEEE.

1.1 Research Questions

In the projects described in this dissertation, I tackle the overarching question: **"How does the design of challenge in games affect the player experience?"** by addressing the following research questions in phases:

- RQ1: How do (performative) challenge components relate to failure experiences in games?
- RQ2: What (emotional) game design patterns relate to player reflection?
- RQ3: How does playing a game with others (socially) affect one's emotional experience?

1.2 Relevance and Contributions

Based on the research presented in this dissertation, the following are the core contributions of this work:

- A granular taxonomical design framework for platformer video games that enables categorization of elements of failure experiences through them. This provides design considerations and research questions to ask for future work in the space of performative challenge failure design in platformer video games, which are often used in dynamic difficulty research.

- Demonstration of the applicability of this design framework through a player experience study that evaluated components of the fail and retry taxonomy with functional and psychosocial constructs.

- A macro-level taxonomical design framework for a broader range of video games that enables categorization of both challenge and failure (and lack of failure) components across both digital and physical games. This ultimately provides further design considerations, spaces to explore, and research questions to ask for future work in the broader space of challenge and failure design, such as introducing incremental mini failures, fixed and flexible loops, and fatigue in relation to failure.

- Design recommendations and directions for further study of reflective player experience and emotional challenge research to expand our knowledge of how to effectively create meaningful and memorable emotional gaming experiences.

- An exploration of social and emotional challenge in multiplayer games that resulted in the identification of prosocial and anti-social dynamics. Similarly to the previous performative challenge-focused taxonomies, these dynamics provide design considerations and research questions in the socioemotional challenge and tandem play areas of research.

- Finally, a refinement of the definition of challenge in games that aims to be more player-centric and inclusive of the different types of challenge.

1.3 Dissertation Organization

The rest of this dissertation is structured as follows. In **Chapter 2**, I discuss challenge and how it is measured and evaluated. I also discuss how player challenge is differentiated into performative challenge and its impact on failure experiences and social-emotional challenge and their eudaimonic outcomes. In **Chapter 3**, I discuss my work that addresses performative challenge in games. I first introduce the fail and retry taxonomy that examines performative challenge game design in platformers. I then employ the taxonomy in a study that compares differences in player experience constructs upon modifying a singular component of failure. I then close the chapter by discussing another taxonomy we developed that examines challenge and failure processes from a macro-view to be applied to games outside of platformers across game genres. In **Chapter 4**, this is where my work expands to aspects of challenge beyond the performative towards social and emotional challenge. I first discuss a survey study that explores how emotional game design patterns relate to levels of player reflection. I follow this by discussing another survey study that explores how emotional challenges in multiplayer experiences relate to social challenge and resulted in uncovering prosocial and anti-social interaction dynamics. In **Chapter 5**, I discuss my reworked definition of challenge itself and recommendations for the different challenge types. In **Chapter 6**, I conclude with reflections on the work overall and provide future research directions.

Chapter 2

Background

2.1 Measuring Challenge and the Player Experience

In an effort to define challenge, researchers explored challenge as a collection of affordance models within games [34]. This relied on the cognitivist theory of affordance for games consisting of three core concepts [41]:

- "Real affordances are what is actually possible in an interactive virtual environment.
- Perceived affordances are what players perceive to be possible.
- Feedback is the perceptual information used in the game to advertise the real affordance."

Pinchbeck [191] established a taxonomy of game objects in regards to affordances in games that can be extended to challenges. In order to form a challenge, an obstruction

that prevents the player from progressing is required. The second requirement is a solution to dissolving the obstruction. Brandse [34] argues that the player's journey of performing tasks to finding the solution to challenges is the majority of gameplay.

If challenge is the heart of gameplay, then it makes sense to talk about challenges and flow, as the former can influence the latter. Flow is a concept coined by Csikszentmihalyi [63] that describes when individuals are engaged in an activity that is both challenging and satisfying. Flow is a powerful connection between the player and the experience they are having. Flow consists of eight major components: "(1) a task that can be completed; (2) the ability to concentrate on the task; (3) that concentration is possible because the task has clear goals; (4) that concentration is possible because the task provides immediate feedback; (5) the ability to exercise a sense of control over actions; (6) a deep but effortless involvement that removes awareness of the frustrations of everyday life; (7) concern for self disappears, but sense of self emerges stronger afterwards; and (8) the sense of the duration of time is altered."

When people discuss the concept of flow in games, people often discuss it in terms of challenge levels, i.e. "people are able to maintain a state of flow when a game is neither too easy nor too hard". The belief that flow theory leads to enjoyment in games is based on optimal experience research [61]. These games researchers believe that flow is the key to the success of games and player enjoyment.

Researchers have created validated models to study flow in the context of measuring player enjoyment. One such popular model is one called "GameFlow" by

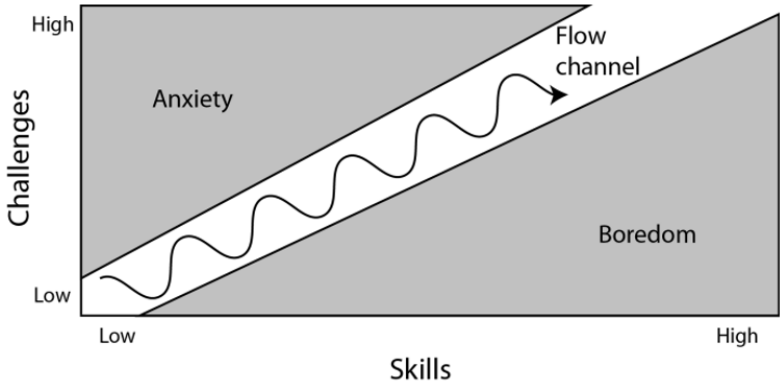

Figure 2.1: The optimal flow channel in between anxiety and boredom.

Sweetser & Wyeth [224], which broke down the structure of flow into eight elements: concentration, challenge, skills, control, clear goals, feedback, immersion, and social interaction. These were also based on heuristics in games usability and user experience literature.

Other player experience researchers believed that the key to player motivation and enjoyment rested in Self-Determination Theory (SDT). SDT is a popular psychological theory of motivation that asserts there are universal intrinsic behavioral needs for human beings: Autonomy, Competence, and Relatedness. SDT had been previously used for recreational contexts, which is why the researchers found it appropriate to use to study player experience. Psychological researchers, Ryan, Rigby & Przybylski [202], hypothesized that games should inherently be motivating and that players experience need fulfillment for the SDT components – autonomy, competence, and relatedness – when playing games. They then created the "Player Experience of Need Satisfaction (PENS)" to measure need satisfaction during play.

Five scale items addressed in-game competence, or the perception that the game provided an adequately/moderately challenging experience. Five scale items addressed in-game autonomy, or the degree that players felt free to do as they pleased. Lastly, three scale items each addressed physical presence, emotional presence, and narrative presence.

While many other player experience scales were developed [39, 117, 120], the more recent scale "Player Experience Inventory" (PXI) was unique in that it allowed games user researchers to connect lower-level game design choices directly to higher-order psychological experiences [2]. The scale was developed through Means-End theory borrowed from the business world, which ties product attributes to desired consequences for users. The player experience is measured both at functional and psychosocial levels. The former refers to "immediate, tangible consequences, experienced as a direct result of game design choices", while the latter refers to emotional experiences. The measured player experience constructs from the PXI are as follows: the functional – ease of control, progress feedback, audiovisual appeal, goals and rules, and challenge – and the psychosocial – mastery (similar to competence from SDT), curiosity, immersion, autonomy (same as that from SDT), and meaning (similar to Relatedness from SDT). With the development of the PXI, it is now possible to gain insight into how game design choices are experienced by players and how they lead to emotional responses through one scale.

It is clear that there is common interest among player experience researchers to include an aspect of challenge as part of their gameplay evaluation. This is again an

indication that player challenges are core to gameplay. It was not until somewhat recently that a scale was developed aimed specifically towards a universal measurement of perceived challenge in digital games standardizing the definition and sub-definitions of challenge across the board; this was appropriately called the "Challenge Originating from Recent Gameplay Interaction Scale (CORGIS)" [75]. With the CORGIS, challenge was no longer a singular entity to measure. There were four types of challenge identifiable through the scale: cognitive challenge, emotional challenge, performative challenge, and decision making challenge. People are more commonly aware of cognitive challenge ("refers to a player's memory, observation, and problem-solving capacities") and performative challenge ("addresses the player's physical limitations to interact with the game"). Emotional challenge and decision making challenge, however, have not been previously measured before the CORGIS. Emotional challenge refers to "[confronting] the player with emotionally salient material or the use of strong characters, and a captivating story", and decision making challenge "arises from having to make choices that were difficult or could lead to regrettable outcomes". Because of its universality, this scale could also be used for more emotionally-driven games that do not necessarily have traditionally challenging segments, such as performative challenges in platformers or cognitive challenges in puzzles. With the CORGIS, it can now be possible to explore how specific types of challenging experiences relate to other types of player experience constructs (such as those in the PXI) like immersion, autonomy, competence, and many others.

Apart from scales, physiological metrics have also been used to measure the

Subscale	Item
Cognitive Challenge	1. Succeeding in the game required much planning 2. I had to memorise a lot of different things when playing the game 3. I had to think several steps ahead when playing the game 4. I had to prepare for the things that the game threw at me 5. Playing the game requires great effort 6. I felt challenged when playing the game 7. I had lots of different things to think about at once in the game 8. The game made me manage several tasks at the same time 9. I had to constantly keep track of what was going on in the game 10. I had to think actively when playing the game 11. Playing the game required me to do my best
Emotional Challenge	1. This game is more than just a game to me 2. The things that happened in the game made me sad 3. I invested much thought into the game 4. I felt a sense of responsibility for characters and events in the game 5. The game made me think about real life issues 6. Playing the game was stimulating 7. I felt a sense of suspense when playing the game 8. The game had moral dilemmas in it where the choice was not obvious 9. The game involved making moral choices that I didn't agree with
Performative Challenge	1. I had to react quickly when playing the game 2. I had to act quickly when playing the game 3. Thinking fast was an important part of the game 4. Quickly responding to things that I saw was an important part of the game 5. I had to make snap decisions when playing the game
Decision Making Challenge	1. There were some decisions in the game that I regretted 2. I wonder how different the outcome in the game would be had I chosen a different option 3. I had to make difficult choices in the game 4. I had to think about possible alternatives for my actions in the game 5. The game made me think hard about my decisions

Figure 2.2: The survey scale items for cognitive, emotional, performative, and decision making challenge from the CORGIS [75].

player experience. Mandryk [160] describes how their team explored using various measures to study the player experience: galvanic skin response (GSR), heart rate (HR), electromyography (EMG) of the face (jaw, forehead, cheek), and respiration. GSR is considered a linear response to arousal and is often used for stress and mental workload indication. HR/HRV, EMG, and respiration are similarly used to measure mental effort and stress. Researchers have even been able to create games that dynamically change their difficulty depending on the current stress level of the player [72]. While physiological metrics have been found to be able to measure aspects

of player experience, there are issues that one must consider before using physiological data. The number one factor is that human beings are all different from one another, so data needs a fair amount of normalization [160]. Sensors are also finicky and not exactly plug-and-play, so it is not as easy to get the correct data nor run player experience experiments using sensors. While biometrics can perform futuristic tasks such as infer a player's emotional state, there is still a good amount of work that needs to be done.

While there are various ways to measure the player experience, one of the most efficient ways to gather data is still through validated scales. They are widely used both in academic and industry games user research circles. While they measure many aspects of the player experience, the experience of challenge appears to be common among most of them, indicating that player challenge is an important aspect to dive deeper into. Fortunately, the CORGIS scale was recently developed to measure such aspects of challenge on a granular level, as it enables us to further explore challenging player experiences.

Now that we have the tools to measure player experience, it is possible to better understand challenge on a deeper level. Measurement scales enable researchers and designers to break down the player experience into segments to see and determine where there are gaps in game design. As flow theory argues that a game should not be too easy nor too hard, the next section addresses ideas such as that regarding game design as it pertains to performative challenge and failure.

2.2 Performative Challenge and Failure Experiences

As mentioned earlier, Jesper Juul [126] argued that the main challenge of escaping failure is a large part of player enjoyment of video games. While this explains why people still enjoy games despite failure being possible at all, it does not exactly account for why some people are drawn to notoriously hard games with high punishments such as permadeath. To address this, we will now investigate the literature surrounding failure and permadeath in games.

2.2.1 Player Failure

Recall that Juul referred to failure as the "pain" of playing video games. The purpose of that pain and that failure is that it makes the eventual win even more enjoyable [124]. They argue that another reason why repeated failure in games is generally accepted is because games enable us to experience negative emotions surrounding failure and then ultimately dismiss them later due to simply arising from a game. Anable [7] has a similar perspective in that video games enable the rehearsal of affective states, such as that experience of shame and relief during failure cycles.

What researchers have found is that players do want to feel responsible for their failures, regardless of how painful the experience is. In fact, that pain is something that players actually seek out rather than avoid, because that responsibility of challenge becomes something that's enjoyable [124, 126]. When players were asked "How do you know if a game is too easy?", 36% of them cited the lack of challenge as the key

factor [124]. Lack of failure equals lack of challenge in games.

Players generally want to experience mastery or feel competence as they play games. According to flow theory [63], this can occur when a player's skill matches the increase of difficulty/challenge in a game. Craig Anderson is a failure researcher, and in one of his studies, he asked players to play a challenging video game, "Cuphead" on their own play space for two weeks recorded [9]. Gameplay was coded for moments of failure and reactions to failure. What they found was that there was a link between the in-game behaviors to the mastery orientation scores of players. This meant that players who scored higher on mastery persisted further than those who scored lower. There is evidence that players who are more attracted to challenging video games have higher mastery orientation scores [10]. Another one of Anderson et al.'s studies [11] demonstrated that a higher number of failures before eventual success predicted greater learning gains. These findings show that there are rewards for those who persist through challenges.

Apart from the appeal of challenges, there is another perspective from feminist and queer theory that argues failure is sought out by some, not for the experience of overcoming failure, but an eagerness to experience failure in itself. The reason for this is generally some dissatisfaction with abiding by the status quo [108, 200]. In fact, they even go as far as addressing masochism to imply that there are players that enjoy the pain-pleasure of failing.

Anable [7] calls the aesthetics of games that experiment with intentional failure as "fumblecore", which includes games such as "Octodad" (2010) and "Gang Beasts"

(2017). In "Octodad", people play as an octopus-like character who masquerades as a normal human suburban dad. The goal in the game is to not draw suspicion to yourself as you move around in the human world, but the game was developed to have an intentionally confusing control scheme. It results in Octodad making wacky movements that are humorous to play with or watch as an observer of the game. These types of failures are welcomed as the goal of gameplay is often not to perfect it and win.

It is obvious that failure is not of just one nature as there are positive and even intentional failures on top of the failures that players typically avoid. Consequently, there are multiple perspectives to study failure from. It is crucial to keep this in mind as we continue our discussions around challenge and player experience.

2.2.2 Permadeath Mechanics

In the previously discussed player experience measurements, challenge would be rated well if the player perceived the in-game challenges to be fair (typically in comparison to the required skill level in the game). A way that is normally used to gauge this is by player experience(s) of failure or player death. McAllister & Ruggill [164] argued that games use the human understanding of death awareness as its deepest mechanic for player motivation. Klastrup [137] says that death in games informs the "everyday grind of life in the world" and that the immediate consequence of death informs how to master when and how to die to make one a better gamer. Melnic & Melnic [172] argues that the pattern of trial and error facilitates the bettering of players and their progression within their storylines, usually because the player can save the

game at any moment and return to that save upon the death of the avatar. Of course, these mechanics differ from game to game.

Many player experience researchers would argue that a high number of death/failure occurrences would equal a bad player experience, if we follow the common consensus among player experience research [170]. However, the rise of popularity of games that feature permadeath-like mechanics such as "Hades" (2018) or "Returnal" (2021) prove otherwise. Permadeath features the permanent in-game death of a playable character [59]. Roguelikes are a genre which has historically featured permadeath as a core game mechanics. Roguelites are a less punishing off-shoot of the former and is more common among modern games today.

Copcic et al. [59] reviewed the literature on permadeath and found that there were two approaches to permadeath in games. The first is a design perspective that sees permadeath mainly as a game mechanic. This is useful to study the traditional forms of challenge such as performative and cognitive challenges and their consequences. The second perspective is more holistic and integrates permadeath with other parts of the game such as the narrative. This perspective enables the inclusion of emotional challenge, as it can make the experience of in-game death more meaningful. It has been found that the sadness evoked during these extremely emotionally moving moments for players were actually enjoyed and appreciated by them [26].

Let us walk through an example of the 2018 video game "Hades" failure and retry cycle to understand how a permadeath-like roguelite operates. It is also a useful example in that death and rebirth in the game is inherently part of the game story. In

“Hades”, the player plays as Zagreus who must crawl and fight through procedurally generated dungeon levels as he repeatedly tries to escape from the Underworld and his father, Hades, to get to the mortal world. The game has a hack and slash combat system, where the player has a health bar they must maintain. While throughout the duration of their run, they may obtain items that heal them, once the bar reaches zero, the infamous “THERE IS NO ESCAPE” (Fig. 1) appears, and the player is reborn back to the start of the game in the Underworld. Any upgrades, such as Boons, are lost upon death. However, since it is a rogue-lite (not “like”), it is possible for the player to purchase permanent upgrades that affect all future runs. Regardless, gameplay is meant to be difficult and punishing.

Figure 2.3: A screen of player death for the game "Hades".

One study had a goal to understand why players enjoyed games with excessive difficulty and permadeath (particularly “Dark Souls III”, 2016) through a survey [189]. What they found was that it was negative events such as struggles with difficulties and avatar death that led to the enjoyable challenging play sessions and mostly positive

experiences. Their findings showed that the strongest predictor of a positive experience was learning and improvement, which supported the notion that learning makes video games fun. The second predictor was achievements and victories, which in the game is typically a victorious boss fight after a series of failed attempts. Petralito [189] argues that players were accepting of the difficult gameplay in the game because they already have an awareness that it requires a devotion of time and commitment to difficult goals. Another study suggested that meaningfulness is the key differentiator between bad and positive experiences with permadeath [42]. The key components to this meaningfulness are that the character's death was properly integrated in the game context, that it had an appropriate cause, and that it is congruent with both the game's imaginary and the player's own narrativizing of their own experience.

It is apparent that there is more to understand about challenge in games than previously thought. Going back to permadeath, the two perspectives surrounding it respectively relates to the two ends of the range of challenge. The game design perspective refers to the end that deals with the performative side of challenge that primarily concerns mechanics and failure experiences. The latter holistic narrative perspective of permadeath deals with the emotional side of challenge that concerns character loss and meaning. Now that we have discussed performative challenge, let us now switch gears into emotional challenge.

2.3 Social-Emotional Challenge and Eudaimonic Player Experiences

"Emotional challenge" was coined by Cole et al. [53] to contrast the common "functional" challenges that are more commonly referenced. To reiterate, emotional challenge in games comes from feelings "evoked in the player which might also have implications for things they thought about outside of the game" from "emotionally salient themes" [75]. While decision-making challenge (derived from emotional challenge) arises from having to "make choices that were difficult or could lead to regrettable outcomes."

Continuing to use permadeath as an example, a player would arguably encounter both emotional and decision-making challenge if they were faced with having to perform an action that would lead to one character or another's permanent death in a game. Bopp et al. [26] found that emotional challenge manifested itself by confronting players with difficult decisions and intense emotions. Emotional challenge evoked a wider range of negative emotions and was appreciated significantly more by players. To further understand the role of emotions in games, I will now discuss the literature surrounding emotions in game design and human-computer interaction.

2.3.1 Emotions in Games

Emotions are core to the aesthetic experience [25]. Though video games are a media form just like film, books, and the like, they are more known for their interactivity

rather than their capabilities to evoke emotion. However, video games are starting to receive more acknowledgement as an "artistic medium that can afford rich emotional experiences" [219]. There are now annual British Academy Games Awards for video games genres for narrative and game beyond entertainment, meaning that more people are acknowledging games for their emotional engagement with their player audience.

A goal of player experience research is to understand what contributes to a good player experience [161]. Since emotions are widely considered to be important to the player experience [119], I argue that emotions are crucial to manage in challenge design as well. According to Bopp [25], the interplay of positive and negative emotions in games is paramount to an enjoyable player experience. Negative emotions, such as frustration, when still working within a game's loop can still contribute to good experiences, similar to our previous discussions on permadeath. A rising area of research in emotionally-moving player experience describes an aesthetic emotional state that is a combination of joy and sadness [175]. To be moved typically involves physical sensations of warmth and/or goosebumps and chills. It is evoked when the meaning conveyed by art matches with the audience's personal values and convictions [144]. Referring back to permadeath, character attachment is considered an important part of being emotionally moved in games [25]. Players often associated character loss with a past life experience or reminded them of loved ones. On the other hand, a phenomenon called transgressive gameplay refers to in-game breaking of established norms and convictions often arising in feelings of shock and disgust [176]. As games are increasingly viewed as art, more complex emotions such as these will be associated to gaming experiences.

It was Rosalind Picard who widely influenced the field of emotions in computers and defined affective computing as "computing that relates to, arises from and deliberately influences emotion" [190]. Since Picard wrote the book, researchers have been exploring the role of emotions across computer science throughout the years. It was in the early 2000s when researchers began to recognize the importance of emotion in developing games, as it plays a key role in the user experience [114].

Hudlicka argues that emotions are commonly defined by their roles, rather than their nature, which goes to show how complex and how limited our knowledge actually is about these phenomena. However, a commonly agreed upon definition is that emotions are "evaluative judgments of the environment, the self and other social agents, in light of the agent's goals and beliefs" [114]. A key characteristic is that emotions are multi-model in nature across four interacting modalities: behavioral/expressive modality, somatic/physiological modality, cognitive/interpretive modality, and experiential/subjective modality. Behavioral refers to facial expressions, speech, gestures, and posture. Somatic examples are blood pressure and heart rate. Experiential is the conscious experience of emotions. Cognitive is most directly associated with evaluation-based definition of emotions and emotion generation.

Hudlicka argues that the three core areas of affective computing directly relevant to affective game design are: emotion sensing and recognition, computational models of emotion, and emotion expression by synthetic agents and robots [114]. Much of affective computing research concerns the former, as it realizes the interactivity loop by tailoring game responses to player emotions. The fact that

emotions are multi-modal in nature allow them to be sensed computationally through multiple ways, as mentioned in the biometrics section "Measuring the Player Experience" in this literature review. There are options for galvanic skin response (GSR), heart-rate monitors, EEG, head motion, and facial recognition systems that can detect game-relevant player states, such as engagement and boredom [160].

Computational models of emotion enable the dynamic generation of appropriate affective behavior from game characters [114]. While there is danger of landing in the uncanny valley, advancements on this research front allow for adaptable and more believable behavior, rather than the scripted. The realism can only be as believable as the level of emotion expression achieved by the game characters, therefore, research on expression is just as crucial to increasing engagement during gameplay.

2.3.2 Eudaimonia, Reflection, and Meaning

In addition to more realistic emotional engagement via game avatars and their behavior, it is arguably even more important to design a game narrative that immerses players. One method to accomplish this type of emotional challenge is to have player autonomy or giving the player significant choices. Recall that emotional challenge involves players being reminded of the world outside of the game. To evoke that reflective thought process, the game needs to have strong sensitive themes to trigger those emotions. Players need to face difficult choices in gameplay in order to have something to reflect on [71]. To further understand this phenomenon, let us

discuss reflection.

Reflection is "a serious thought or consideration" and has been of interest to the human-computer interaction and related communities [93]. Reflection is particularly paid attention to in the context of learning, especially regarding self-reflection and reflection about the intentions and beliefs of others [234]. Von Wright [234] argued that the development of the concept of the self is what leads to the advanced level of reflection called self-reflection. "Self-reflection implies observing and putting an interpretation on one's own actions, for instance, considering one's own intentions and motives as objects of thought" [234]. That awareness allows deeper reflective processes to take place, such as emotionally connecting to and being able to articulate reasons for being emotionally moved by a piece of art.

Barstch et al. [17] studied emotionally-moving experiences in the context of films to understand reflective experiences in media. They determined "being moved" by the verbal labeling of the experience, affective factors including negative valence, moderate arousal, and mixed affect. They conducted an experiment using two versions of a short film that opposed in emotional intensity, i.e. one less emotionally intense than the other. As they had hypothesized, the more emotionally intense version elicited more reflective thoughts and predicted the overall positive experience of the film. Similarly, Bartsch & Hartmann [16] later found that cognitive and affective challenges posed by media content resulted in stronger appreciation of the movie and heightened suspense. This supported the notion that appreciation is linked to cognitive challenge and personal growth.

As games have evolved to include more emotionally challenging experiences, there is a growing body of research that refers to “eudaimonic experiences” in games and media [71]. Eudaimonia can be thought of as in opposition to the "hedonic" traditional focus on enjoyment in media consumption. So to consume media for eudaimonia would involve experiencing more serious phenomena such as meaning, appreciation, self-transcendence, reflection, nostalgia, and so on. These outcomes are common through games that induce emotional challenge in players.

Daneels et al. [71] sought to understand how different concepts are used in games research to represent eudaimonia and found four broad patterns through a review. The first was that appreciation is a eudaimonic outcome of playing games. The second was that studies used the words/phrases “meaningful”, “emotionally moving/challenging” and “self-reflective experiences” to refer to similar things. The third was that games uniquely afforded social connectedness, and the fourth pattern was that studies also discussed other eudaimonia-related concepts, such as nostalgia, well-being, and elevation.

An example of one of the observed studies in Daneels et al.’s review is “A Game That Makes You Question...” Exploring the Role of Reflection for the Player Experience by Mekler et al. [167]. The study aimed to understand the level of reflection players performed at during their gaming experience and when they actually did so. They used Fleck and Fitzpatrick’s “levels of reflection” framework [93] to identify what types of reflection players reported. The five levels of reflection were: description, reflective description, dialogical reflection, transformative reflection, and

critical reflection. Description meant stating events without further elaboration or explanation; not reflective. Reflective description goes a step beyond by including reasons for action but still in a reportive way with limited analysis and no change of perspective. Dialogical reflection probes for relationships between pieces of knowledge, evidence of cycles of interpreting and questioning, and consideration of other points of view. Transformative reflection is revisiting knowledge with intent to re-organize or do something differently, leading to a change in practice or understanding. Lastly, critical reflection takes social and ethical issues into consideration. What Mekler et al. [167] found was that players appreciated reflection for what it was, beyond moment-to-moment gameplay. However, they found that players mostly engaged in reflective description and dialogic reflection, with almost no instance of higher levels of reflection. Regardless, players reflected during and around play about gameplay, game design, their own gaming practices, and relating games to other aspects of their lives.

To further understand what type of moments players reflect on that are transformational, Whitby et al. asked their participants: "Sometimes, we experience or see moments one way, and then something happens that suddenly challenges that perspective. Can you recall any similar moment during playing a video game that challenged your perspective?" As they were focused on transformative reflection, there were two types to look out for: endo-transformative and exo-transformative. Endo-transformative reflection referred to moments when participants experienced reflection limited to the game played, such as changing how the player perceived an in-game character. On the other hand, exo-transformative reflection referred to

moments participants experienced reflection that affected their beliefs or actions outside of gameplay. What Whitby et al. [241] found was that the causes of perspective challenging moments were narrative, game systems, combination of game systems and narrative, player expectation, and external source.

Narrative was the most common cause of perspective challenging moments, in which the player had no agency over the game state. The two sub-categories are narrative reveals and emotionally challenging topics. These moments either prompted players to rethink their opinions or recall similar personal events. While these moments were the most common, it is in the intersection of narrative and game systems where players can feel more directly tied to events in the game. In this intersection, player action directly interacts with the game's themes, story, or characters. In other words, players have autonomy and their choices matter and weigh heavily in gameplay. Players ended up reflecting more extensively on their choices because of how emotionally significant certain decisions were in the game. They also found that the recalled perspective-challenging moments were characterized as enjoyable, thought-provoking and leaving lasting impressions.

Overall, it is clear that the game story and mechanics affect the emotional challenge that influences player actions leading to reflective gaming experiences. Consequently, I argue that reflection is useful to design for when attempting to afford emotional challenges for players. Reflection triggers the deeper emotional thought processes that challenge players to think beyond the conceptual confines of the game and relate the themes to either their life and/or the outside world at large, which

makes for a more meaningful media experience. The pattern that we have observed in the literature is that oftentimes, it is the use of "positive discomfort" in gameplay, or uncomfortable moments that are meaningfully interwoven into the narrative to stimulate reflection for players [123].

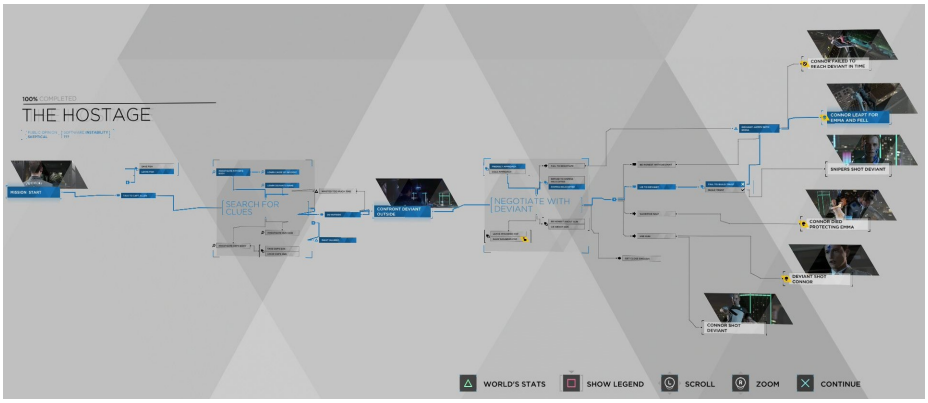

Figure 2.4: A decision tree mapping of player decisions and outcomes in the game "Detroit: Become Human"

An example of a game that heavily incorporates emotional challenge in gameplay is "Detroit: Become Human" (2018). It utilizes the switching of perspectives to follow the journey of three androids who are wrestling with their own versions of battles with sentience. The player has control over the characters through third-person perspective and can explore their environment freely. What they decide to interact with or not has varying effects on the story, so it is up to the player to discern what is important to them. The story then branches out dependent on such choices along with quicktime events and dialogue decisions. This combination of pressure on the player adds weight and intensity to player actions, thus increasing the engagement with emotional challenge in the game. Combined with the potential

permanent loss of characters in the game, the investment in player decision-making is of vital importance. As far as reflection goes, the game does allow for replayability once you have finished the game. Each main section/chapter of the game ends with a flowchart (as depicted above), of narrative paths that the player has taken and also those avoided. Viewing this allows players to reflect on the decisions they have made, as well as the popularity of their choices, as a percentage breakdown of the possibilities is often displayed.

2.3.3 The Sociality Layer

Recall that the third pattern found in recent work to characterize eudaimonic gaming experiences was that games offer unique forms of social connectedness, such as through bonding with fellow players or even in-game characters [71,194]. This is crucial insight because much of emotional challenge research has focused on the single-player emotional experience, despite early theories like Self-Determination Theory (or SDT) that argue relatedness is an important factor towards an enjoyable gaming experience [202].

Possler et al. [194] used the ANSA framework to examine eudaimonic gaming experiences further. The ANSA model argues that agency, narrative, sociality, and aesthetics are most relevant to gaming experiences [140]. In the context of eudaimonia research, the role of "the sociality layer" was often found unexpectedly. For example, Elson et al. [88] found that the context or social dynamics around gaming experiences left long-lasting impressions on players.

The Video Game Demand Scale (VGDS) [31] defined social demand as "related to social interactions and relationships with others... and might be understood in its most basic form as how much (or how little) the video game made one react to and/or aware of other avatars, characters, or people". However, apart from the more positive prosocial outcomes, Schell [206] claims that *social skills* also involves more emotionally complex dynamics such reading an opponent, fooling an opponent, and coordinating with others. Another perspective says that it "arises during play against or with human or AI players and relates to the capacity to read an opponent, predicting their moves and making split-second decisions that can aid players in deceiving opponents" [76]. Denisova et al. [75] called this "social challenge", but also categorized it as a subtype of cognitive challenge.

Chapter 3

Performative Challenge

To first understand challenge in games, my initial approach was to explore an area of challenge that had a lot of previous work behind it. In this case, the area of performative challenge felt natural to first explore. If one were to talk about challenge in games, it is often conflated with difficulty, or the traditional sense of it, in which how hard a game was to complete in terms of beating levels and bosses through timely and/or strategic pressing of buttons was the key to success.

As I initially hypothesized that challenge was primarily rooted in a game's design, I wanted to explore how games are generally designed to induce challenge. Therefore, this body of work strived to answer my first research question: **"What is the relationship between (performative) challenge components and failure experiences in games?"** They explored both the micro (granular) and macro (broader) views of challenge and failure in games, as well as how they related to the player experience.

3.1 "I'll Be Back": Fail and Retry Taxonomy in Platformer Games

The handling of failure or in-game death in video games is a rich, underexplored space with significant implications for the player experience. Therefore, we developed the Fail and Retry Taxonomy to examine the granular components of player failure in games.

3.1.1 Background

Failure in video games, often represented through death, is a central element of the player experience [125]. For instance, failure is well documented to have substantial positive and negative impacts on game enjoyment [127]. It is also intrinsically linked to challenge, and consequently a major factor in the experience of game flow [139]. While there have been various approaches to examining and manipulating this critical aspect of the gaming experience—e.g., dynamic difficulty adjustment [73, 115], difficulty design [239], and challenge design [33] and modeling [220]—research understanding failure explicitly as it relates to handling in-game death is surprisingly limited. We propose that how video games actually deal with in-game death is a rich, underexplored space with significant implications for player experience and related techniques such as dynamic difficulty adjustment. With that in mind, we created of a taxonomy of player death and rebirth in platformer games to better understand the current design space.

Platformers are a video game genre where players typically control a game character to jump and climb between platforms while avoiding obstacles. We chose this as our genre of focus since platformer games are generally designed around constant player death and respawning in pursuit of a goal. They are also notorious for being difficult, with many such games leading to the creation of the term "Nintendo hard"—referring colloquially to the extreme difficulty of games (particularly platformers) from the Nintendo Entertainment System era [91]. Notably, the fairness of difficulty in Nintendo hard games has been called into question in recent years [150], highlighting that such designs can sometimes serve more to infuriate players through frequent unfair death rather than provide an appropriate challenge. A taxonomy of player death in this space provides a tool to systematically compare death and respawning mechanics across games—helping to elucidate which mechanics evoke positive and negative player experiences, enhance or inhibit game flow, and provide sufficient challenge or create a feeling of unfairness.

3.1.2 Related Work

3.1.2.1 Game Taxonomies and Frameworks

Although they are used rather interchangeably in the literature, there are some notable differences between taxonomies and frameworks. Taxonomies provide a means to organize and classify concepts while frameworks are composed of a number of concepts and the interrelations between them [12]. There can even be overlap between the two in the form of taxonomical design frameworks (e.g., [92,169]), which treat a set

of taxonomical terms as orthogonal dimensions in a design space—resulting in a matrix that provides structure for classification and comparison of designs [198].

In terms of games, there have been a substantial number of taxonomies and frameworks ranging from general classifications of games themselves [1, 89, 236] to various aspects of games—such as core mechanics [208], bugs [151], player modeling [216], and external factors [159]—to (most commonly) specific genres of games. E.g., serious games [156, 196], games for dementia [50, 165], exertion games [177], affective games [146], idle games [5], and games and simulations [136] to name a few. Of particular relevance to this work is the framework created by Smith et al. [218] for analyzing 2D platformer levels. Their framework consists of *components* in the form of platforms, obstacles, movement aids, collectible items, and triggers; as well as *structural representation* for how the components fit together. We utilize many of these concepts in our coding scheme and taxonomy, however their framework ultimately focuses on rhythm and pacing to evoke challenge, rather than player death.

3.1.2.2 In-Game Death

Players are ultimately humans, and therefore, the player experience is tied to the human experience [173]. With respect to death, a notable fascination exists regarding the relationship between players' perception of in-game death and actual death. Some have argued that in-game death trivializes the seriousness of actual death [97]. However, others believe that the inherent interactive nature of games is powerful in expressing meaningful facets of the human experience of life and

death [49, 109, 201]. Players in particular can be impacted by death in games when they are attached to characters (their avatars or NPCs) at some emotional level or self-identify with the goals or events in the game [24, 173, 201, 207]. For instance, when players are immersed in gameplay, the risk of death produces anxiety and encourages more careful decision-making, but can also evoke strong emotions from players—resulting in enjoyment and positive player experience despite the frustration that comes with the territory [24].

Death is also an intrinsic part of gameplay [178] and the player experience [138], with notoriously difficult level design in platformers resulting in frequent occurrences of player death [91]. These instances of in-game death generally impede player progress, e.g., through the loss of inventory items, achievements, or game functionality [24]. At even greater extremes, in-game death can completely reset player progress such as through the popular high-risk death mechanic, permadeath—i.e., the permanent in-game death of a playable character (c.f., [60])—which forces the player to restart the entire game upon dying. Notably, these repetitive deaths have been found to increasingly reduce player enjoyment, as each death occurrence compounds as an evaluation of the insufficiency of a player's skills [112]. While the ability to have save states in some platformers has alleviated this difficulty and altered player strategy, the majority of platformer games still operate using linear, sequential checkpoints. As such, it is critical to examine the aesthetics and mechanics that comprise in-game death for a broader understanding of its overall effects on player experience.

3.1.2.3 Dynamic Difficulty Adjustment

Dynamic Difficulty Adjustment (DDA) describes a challenge design strategy that continuously and automatically adapts a game's difficulty level to a player's current skill level [121, 215, 247], and as such attempts to keep the player in a constant state of flow [73]. There is evidence that dynamically adjusting components in games affects their perceived difficulty [73, 121, 239] and boosts player confidence [57]. Other advantages of DDA include a decrease in the risk of players quitting a game due to frustration from constant deaths as well as an increase in a players' perceived self-efficacy [57, 102]. Furthermore, it has been argued that player engagement and enjoyment can be maximized with DDA in games [73, 204, 244]. However, one notable criticism of most current DDA techniques is that they are based on designer intuition, which may not reflect actual play patterns [121]. Therefore, a taxonomy highlighting specific mechanics and design choices around in-game death and respawning could serve to inform and aid the design of these techniques.

3.1.3 Rationale for Grounded Theory and Taxonomy Development

Grounded theory is a methodological approach in which a theory is constructed after data had been collected and analyzed [46]. Grounded theory was the selected approach as opposed to thematic analysis, because we wanted the constructed theory to be grounded from the data. Secondly, grounded theory enabled us to use the constant comparisons of new data to old data to continuously refine the concepts that we uncovered, which is helpful when exploring a relatively underexplored research

topic.

Taxonomies provide a means to organize and classify concepts and have been used to classify games and their components, as discussed in "3.1.2.1 Game Taxonomies and Frameworks". We decided to develop a taxonomy to help identify specific game components that affect the experience of challenge. These components can be used in player experience studies and game studies analyses to help us better understand their impact. Knowing which of these factors are most significant contributes to failure and challenge design research.

3.1.4 Methods

To develop the taxonomy, we utilized a grounded theory approach. We conducted an analysis of 62 platformer video games to identify essential features and mechanics that addressed death and respawning. The process began with an iterative process of selecting recent popular platformer-tagged games on Steam within the period of January 2018 to May 2019. The 62 games were split among positively-reviewed (21 collected), mixed-reviewed (22 collected), and negatively-reviewed (19 collected). We chose a spread of positively to negatively reviewed games to ensure that we were collecting the broadest range of failure and retry mechanics to inform the creation of our taxonomy. Games were identified as positively-reviewed if they had at least 85% or higher of their player audience positively recommend the game, mixed-reviewed if they were between 60% to 84%, and negatively-reviewed if they had less than 60%. We adjusted for a high approval

Positively Reviewed:	Mixed Reviewed:	Negatively Reviewed:
G6, G11, G14, G18, G19, G22, G27, G28, G30, G31, G35, G36, G39, G40, G43, G47, G52, G56, G57, G60, G62	G2, G4, G7, G8, G9, G10, G12, G13, G17, G21, G24, G26, G29, G33, G34, G45, G46, G49, G51 , G53, G55, G58	G1, G3, G5, G15, G16, G20, G23, G25, G32, G37, G38, G41, G42, G44, G48, G50, G54, G59, G61

Figure 3.1: The 62 platformer games in our corpus, categorized by corresponding critical reception: *Positively*, *Mixed*, and *Negatively Reviewed*. A ludography is included for our dataset.

Game Name	Dead Cells
Release Date	Aug. 6, 2018
Game Tags	Platformer, Rogue-like, Pixel Graphics, Metroidvania, Action
Rating	Very Positive (94%)
Number of Reviews	23,088
Description	"You grew up with the roguelikes, witnessed the rise of the roguelites and even the birth of the
Death Condition	When health is depleted from 100 to 0.
Death Mechanics	Sound:
	Visual: Player is told that they died and the number of cells they lost.
	Losses: Player loses inventory on them and loses some cells.
	Respawn Location: Death sends player back to the beginning of the game.
	Retains: Blueprints that level up the character overall.
	Gains:
Game Mechanics	jump, use primary and secondary weapon, double jump, dodge, jump downwards, interact with object (open, take, talk), upgrade
Obstacles - Damage	enemy attacks, spikes
Obstacles - Environment	walls, doors, ladders/chains, portals

Figure 3.2: An example of observation notes in progress.

percentage of at least 85% for positively-reviewed games, because we observed that even games with the poorest reputations had about half of their players recommend them while critically-acclaimed games generally had overwhelmingly positive reviews of 90% or more.

After the games were selected, we examined each game by watching a playthrough available online or playing it myself. As we observed the game, we recorded how it approached handling player death, collecting information such as what conditions resulted in death, where players respawned, what was lost and gained, what obstacles players faced, and visual and auditory representations of death.

Qty	Characteristics					
7	Death by hurt/No HP	Respawns at checkpoint (short)	No inventory	Upgrades		Celeste, Katana ZERO, Neon Beats
1	Death by hurt/No HP	Respawns at checkpoint (short)	Keeps all inventory			
3	Death by hurt/No HP	Respawns at beginning of level	No inventory			
1	Death by hurt/No HP	Respawns at beginning of game	No inventory			
1	Death by 0 HP	Respawns at beginning of game	Keeps all inventory	Upgrades		
4	Death by 0 HP	Respawns at beginning of game	Loses inventory	Upgrades		Dead Cells, Dungreed, Vagante
1	Death by 0 HP	Respawns at beginning of game	Loses some inventory	Upgrades, level up		Niffelheim
2	Death by 0 HP	Respawns at checkpoint (short-medium)	No inventory			Bloodstained: Curse of the Moon
3	Death by 0 HP	Respawns at checkpoint (short)	Keeps all inventory			Mark of the Ninja: Remastered, Guacame
1	Death by 0 HP	Respawns at checkpoint (short)	No inventory			
1	Death by 0 HP	Respawns at checkpoint (long)	Loses inventory (coins)		Upgrades	
2	Death by 0 HP	Respawns at savepoint	Keeps all inventory			Touhou Luna Nights, Iconoclasts
1	Death by 0 HP	Respawns at savepoint	Lose a life			Mega Man 11
1	Death by 0 HP	Respawns at savepoint	Loses inventory	Upgrades		The Messenger

Figure 3.3: An example of how affinity diagramming was conducted to determine how different codes related to each other.

After noting observations, we started the coding process by performing open coding on the collected data. Afterwards, we performed axial coding to identify a set of emerging concepts around death and respawning.

After the codes were identified, I worked with another researcher to have multiple iterative discussions to explore the relationships among them, resulting in the selective coding of the five key categories for the taxonomy. See Figure 3.3 which depicts the overall coding process.

3.1.5 The Taxonomy of Fail and Retry in Platformers

The Taxonomy of Fail and Retry in Platformer games was formed based on the concepts and mechanics that emerged from coding and analysis. The taxonomy describes five major aspects of the cyclical process of death and respawning: (1) *Obstacles*, which are the cause of (2) *Failure Conditions* being met and resulting in player failure depicted through (3) *Aesthetics* as well as causing (4) *Changes to Player*

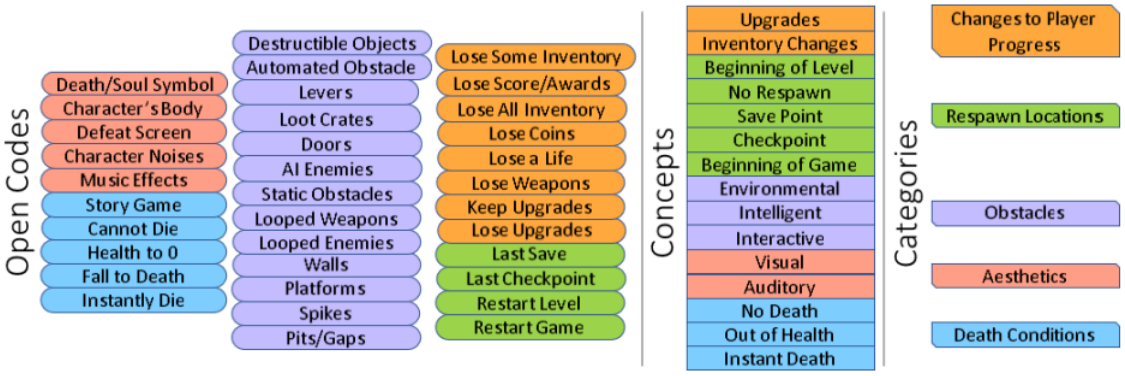

Figure 3.4: The coding process with 1) open coding, 2) related into concepts using axial coding, and 3) grouped using selective coding to create taxonomy categories.

Progress before being reborn at (5) *Reset Locations* to repeat the entire process.

Figure 3.5: The coding process with 1) open coding, 2) related into concepts using axial coding, and 3) grouped using selective coding to create taxonomy categories.

3.1.5.1 Obstacles

Obstacles in platformers present challenges and difficulties for player to overcome [217, 221, 240]. We identified three notably different types of obstacles that could lead to player death:

- *Intelligent* obstacles are objects in the game that actively attempt to kill the player, with movements/actions that respond in real-time to player actions.
- *Environmental* obstacles are directly part of the game environment that upon contact can lead to player death. They can either be *static* obstacles that do not move or *automated* obstacles that move in fixed ways.
- *Interactable* obstacles are objects in that game that can be activated or interacted with.

3.1.5.2 Failure/Death Conditions

Failure/Death Conditions

Failure Conditions are player situations that result in a state of player failure or death. In platformers, we identified three types:

- *Instant/One-Hit Death* is when a character dies immediately from a single injury from an obstacle.
- *Out of Health/Health Bar* is when the life of the player's controlled character is dependent on maintaining a health bar.

- *No Death* is when player death is not possible.

3.1.5.3 Aesthetics

While there are many interpretations of aesthetics, we refer to the sensory phenomena that players experience when failing in games [182]. Aesthetics impact player emotions and the overall gaming experience [128, 132]. We noted the common *Visual* and *Auditory* aesthetics surrounding in-game death.

- *Visual* aesthetics of player failure primarily focused on changes to character appearance often combined with the use of death screens. Iconography, such as skulls, soul depictions, and blood, was also used to indicate player death.

- *Auditory* aesthetics of player death often included player-controlled character noises, such as cries or grunts, sometimes combined with electronic retro sounds. Background music often abruptly stopped or changed to distinguishable solemn melodies.

3.1.5.4 Player Progress Changes

Upon player failure/death, aspects of player progress were often either retained or lost (rarely added to). Most changes to player state can be categorized as *Upgrades* and *Inventory*.

- *Upgrades* that were earned before player death were often retained, such as power-ups, weapons, skill levels, and achievements. Even games with permadeath-like

mechanics often retained earned upgrades as a way to promote a sense of player progression despite frequent failure. item *Inventory* systems typically contain indicators of player progress, such as currency, lives, and items. Platformers were more likely to experiment with the range of inventory components that were lost when players fail, such as either decreasing quantities or losing them all.

3.1.5.5 Reset/Respawn Locations

Reset Locations are where the player-controlled character is brought back to life to continue gameplay after dying. There were five observed types of locations:

- *Start of Game (Permadeath)* is when players are directed back to the beginning of a game and have to restart and replay the game.
- *Start of Level* is when players are directed back to the beginning of a level or stage that they failed to complete.
- *Checkpoint* is when players are directed to a previously saved point that was activated automatically when players pass through it.
- *Save Point* is when players are directed to a previously saved point that was activated manually when players decide to save their progress.
- *No Respawning* is when there is also *No Death* in gameplay.

3.1.6 Discussion

We observed various components of platformer games to develop death and rebirth concepts for our taxonomy of death & rebirth in platformer games. We also ran our game corpus back through some of the taxonomy categories in order to highlight design decisions that may be positively or negatively impacting the player experience. Our taxonomy shows that there are a substantial number of mechanics, aesthetics, and design decisions that go into the failure and retry elements of games, despite the surprisingly limited amount of literature examining these categories directly.

3.1.6.1 Guiding Dynamic Difficulty Adjustment Techniques

Game designers must focus on the balance between inspiring confidence in players and providing sufficient challenge [127]. As mentioned earlier, techniques such as DDA attempt to effectively strike this balance for players of varying skill levels [121, 215, 247], keeping the player in a constant state of flow [73]. However, current DDA techniques have been criticized for being based primarily on designer intuition rather than actual play patterns. While existing approaches addressing this issue have utilized machine learning [121], our taxonomy presents a different opportunity since in-game death—and the categories of our taxonomy as a result—is inherently linked to challenge. Specifically, our taxonomy presents a structured tool grounded in the design of commercial platformers to categorize the different design possibilities around death and rebirth. As a result, it provides novel but broadly applicable elements of a platformer's game design for dynamic adjustment. For

instance, adjusting how far backwards a player respawns, how much of their progress is maintained, and the overall conditions for death are all approaches that have not been explored deeply in current DDA literature, but are highlighted in our taxonomy.

3.1.7 Limitations

It is important to acknowledge that the platformer game genre has now evolved to include multiple subgenres with distinct characteristics. This evolution of platformers may affect the way certain observed games were received by players and their resulting critical reception. Additionally, there are various player styles and preferences that are not accounted for in anonymous Steam user reviews. Positive and negative reviews may also not be related to aspects of death and rebirth, and could partially be from other aspects of the games (e.g., overall aesthetics, critical bugs, and so forth). As such, using overall Steam scores for a game to judge the efficacy of specific taxonomy categories is fairly limited. However, it does serve to illustrate how the taxonomic breakdown could be utilized to examine the impact of specific design decisions around the handling of death and rebirth on player experience.

3.1.8 Conclusion

We utilized grounded theory to develop a taxonomy of failure and retry concepts in platformer games. The goal of our taxonomy was to provide a means for game designers and researchers to better analyze and design how platformers handle in-game failure. We identified 5 key categories as the basis of our **Taxonomy of Fail**

& Retry in Platformer Games: (1) *Obstacles*, (2) *Failure/Death Conditions*, (3) *Aesthetics*, (4) *Player Progress Changes*, and (5) *Reset/Respawn Locations*. We also ran our 62 game corpus back through some of the taxonomy categories in order to highlight certain design decisions that may be positively or negatively impacting player experience. Further studies could be conducted to more deeply understand how categories and concepts in our taxonomy impact crucial player experience aspects such as game flow, engagement, challenge, autonomy, and self-efficacy.

3.2 "Die-r Consequences": Player Experience and the Design of Failure through Respawning Mechanics

Now that we identified the components of failure in a popular video game genre, I aimed to study how those components related to the player experience. The Fail and Retry Taxonomy in Platformers was utilized in a subsequent player experience study. We investigated the relationship of a failure and retry component, *Reset Locations*, to player experience (PX) constructs, such as mastery, challenge, autonomy, curiosity, and immersion. We conducted this study to examine how various aspects of player experience are affected when modifying a single challenge and failure component.

3.2.1 Background

Death is commonly ingrained in the player experience as a way to represent failure [94,126,137,179]. While there is much work that examines the mechanics of player

death in games through the lens of difficulty – dynamic difficulty adjustment [74, 116], challenge design [34, 205, 240], and challenge modeling [221] – there are other aspects of the player experience (PX) that have similarly crucial roles in how a game is perceived. More specifically, games are typically evaluated in a general sense, such as whether they are fun, hard, or have flow; however, it is often difficult to address the direct connection of those perceptions to specific game design mechanics. Therefore, it can be helpful to break the player experience down into narrower areas. Challenge is one example of a *functional* aspect of PX, whereas there are also *psychosocial* aspects such as meaning, mastery, immersion, autonomy, and curiosity [2]. As death is largely unavoidable when playing games, game designers and researchers should work to better understand how players are affected by it.

In this paper, we conducted a between-subjects study with 72 participants where we modified where players respawned after dying in a simple 2D side-scrolling platformer game, based on respawn point locations from the Fail and Retry Taxonomy [67, 68, 170]. In respective test conditions, the respawn points were located in: the very start of the game ("permadeath"-like), the start of a level, the last reached checkpoint, or the last point where the player manually saved the game state. We used the Player Experience Inventory (PXI) [2] to examine how altering the consequences of death on player progress affects challenge and psychosocial aspects of PX. We also examined whether players' affinity for challenge and goals in games (i.e., their traits) were related to their experience of those PX constructs.

3.2.2 Related Work

3.2.2.1 Player Death

Aytemiz [13] differentiated player failures into either *in-loop* (expected difficulties within game loop, such as failing to solve a puzzle) and *out-of-loop* (unexpected difficulties outside of game loop, such as accessibility issues). When players encounter in-loop failures repeatedly by dying, the motivation for gameplay is brought to life.

Despite death being the way of life in games, there is surprisingly a limited amount of academic work on the subject of its mechanics. There has been interest in death primarily from the game studies perspectives, such as regarding its representation and relationship to human experiences of mortality [94, 126, 137, 174, 179, 180]. However, death and respawning mechanics themselves are lesser examined. One notable exception is the use of "permadeath" mechanics—the permanent in-game death of a playable character [59]—where there is interest in studying why players are drawn to these high-risk mechanics [6, 43, 59, 189]. This genre of games have also gained commercial popularity in recent years as demonstrated in games such as *Hades*, *Dark Souls*, *Rust*, and *DayZ*.

3.2.2.2 Player Experience and Failure

Recall that the Player Experience Inventory (PXI) was developed to measure both functional and psychosocial aspects of player experience on one scale. The breadth

of concepts that PXI measures at once enables game designers and researchers to more clearly understand how the selection of game design elements relate to certain player experiences. Therefore, the PXI was particularly useful in our case, as we were interested in how specific respawning elements affect relevant PXI constructs, such as mastery, challenge, autonomy, curiosity, and immersion. For clarity, these were the following definitions given for our selected constructs: (a) *mastery* is a "sense of competence and skillfulness derived from playing the game", (b) *challenge* is "the extent to which the challenges in the game match the player's skill level" (not the same as difficulty level), (c) *autonomy* is "a sense of autonomy and freedom to play the game as desired", (d) *curiosity* is "a sense of interest and curiosity the game arouses in the player", and (e) *immersion* is "a sense of absorption and immersion experienced by the player" [232]. These were relevant as they addressed players' self-perception of their skills and interest in the game as they face variations of setback punishments (i.e. respawning to different locations).

Mastery-oriented individuals are often related to having better resilience to experiences of failure, such as working harder to find solutions to problems, as opposed to those helpless-oriented who more easily discouraged [84, 85]. Craig Anderson has examined the relationship between mastery orientation and failure-related behaviors in video games [8–11]. *Challenge* and difficulty levels affect the intensity of those in-game failures and the skill level required to manage them [124]. As attribution theory explains that people tend to relate events to specific causes [133], it's crucial to examine whether players experience *autonomy* to understand what factors they attribute their

failures to (e.g. their skills, the game's design, etc.). Lastly, games are supposed to be engaging regardless of difficulty level. Therefore, measuring *curiosity* and *immersion* can inform whether players feel compelled to keep playing despite experiencing failure. These constructs are conceptually related to the PENS definition of presence [2], which is often measured as a crucial component of player enjoyment [202].

3.2.3 Rationale for Player Experience Survey

While there are numerous ways to measure player experience (PX), the use of the Player Experience Inventory (PXI) [2] Likert scale-based survey was most appropriate to evaluate multiple PX constructs all at once and quickly. The survey enabled us to analyze how different PX constructs related to different platformer game design modifications in isolation.

3.2.4 Methods

The goal of this study is to use the Fail and Retry Taxonomy [67, 68, 170] to explore how modifying reset/respawn point locations after in-game death affects the player experience. We tested four reset point location conditions (independent variable): (1) respawn to start of game (permadeath), (2) respawn to start of level, (3) respawn to checkpoint, and (4) respawn to savepoint (Fig. 3.3 shows these respawn groups on a game progression timeline). As mentioned earlier, this study examines the relationship of those conditions to the player experience of mastery, challenge, autonomy, curiosity, and immersion (dependent variables). We also explored whether player death count

and challenge- and goal- player orientation trait scores significantly related to those PX constructs.

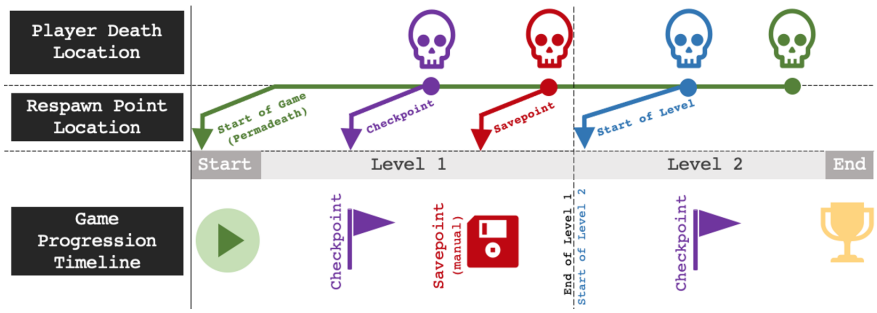

Figure 3.6: A timeline depicting where players will respawn upon dying in the game, depending on the reset point location type: checkpoint, savepoint (manual), start of level, and start of game (permadeath).

We assumed that altering reset locations would be a simple but effective way of varying the degrees of punishment after in-game death. Juul described this type of consequence as a "setback punishment" [124], where the player needs to replay parts of a game. The variation of punishment for player failure affects the perception of a game's difficulty and flow. However, Juul also found that the desires of players are often contradictory, as they simultaneously want to win (i.e. game should be easy) and to be challenged (i.e. game should be hard). Achieving this tricky balance in game design is a challenge in itself; therefore, we explored the nuances of that dynamic by examining other parts of the player experience in addition to challenge.

We assumed that a small punishment for failure with respawning to regularly-set checkpoints – the most popular of respawning mechanics found in a previous study on platformer games [170] – would immerse players the most, relating to higher self-

perception of skills (mastery) and motivation to keep exploring the game (curiosity).

On the opposite end, we assumed that the most severe punishment for failure with the permadeath-like respawning to the start of the game would break immersion the most, relating to lower self-perception of skills (mastery) and motivation to keep exploring (curiosity).

As for other setback punishment variations, we assumed that giving the player agency to save the game whenever they wanted would afford the most autonomy, and that having the player respawn to the start of levels was a better balance for difficulty (checkpoints would be too easy and permadeath would be too hard).

Participants completed surveys before (pre-test) and after (post-test) playing the game.

In the pre-test survey, data was collected for demographics and player orientation trait scores through the Trait Model of Game Playing Preferences [227]. Tondello et al.'s player orientation traits included aesthetic, narrative, goal, and challenge orientation; the study focused on challenge and goal orientation scores.

The game recorded final player progress statistics; our study focused on the total player death count.

In the post-test survey, we used the Player Experience Inventory (PXI) [2] to measure functional and psychosocial PX constructs. The study focused on mastery, immersion, autonomy, curiosity, and challenge. Abeele et al. [2] established the construct validity of the PXI using both exploratory and confirmatory analysis. Items across both surveys were measured on a 7-point Likert scale, ranging from 1-Strongly disagree to

7-Strongly agree.

Participants were recruited through university students and social media sites (e.g. Twitter, Reddit, Facebook, Discord, and Slack). A total of 72 participants (age ranged from 18-44 years old; broken down into 18-24 years old group (43.5% of participants), 25-34 years old group (52.7%), and 35-44 years old group (4.2%)), completed the study fully online. The breakdown of gender was the following: 37 participants identified as female, 32 as male, and three as non-binary. Daily gaming frequency habits data was also collected, with 22.22% of participants playing less than one hour daily, 34.72% playing 1-2 hours daily, 34.72% playing 3-4 hours daily, 4.2% playing 5-6 hours daily, and 4.2% playing 7+ hours daily. All participants participated voluntarily, with only eligible university student participants receiving class credit.

When participants clicked the invitation link, they were randomly assigned to one of the four test conditions: (1) respawn to start of game (permadeath), (2) respawn to start of level, (3) respawn to checkpoint, and (4) respawn to savepoint. Participants first took the pre-test survey regarding demographics and player orientation traits. They were then given up to 15 minutes to play a version of *Jumpy*, the platformer game. They weren't given information as to the death and respawning mechanics in their version. They were simply given the game controls (moving and jumping) and scoring rules – every 10 points earns a heart and beating the entire game within a certain time period earned a bronze, silver, or gold medal. If they finished the game faster than 15 minutes or didn't finish on time, the game stopped and their final gameplay statistics were displayed. Simple stats were displayed such as their total completion time, total score,

total number of deaths, and earned medal. Then, they were automatically moved to the post-test survey where they took the PXI [2].

3.2.5 "Jumpy" Platformer Game Design

To investigate our hypotheses, we conducted a between-subjects study. We created a simple platformer game *Jumpy* in four versions for each respawn point location condition: (1) respawn to start of game (permadeath), (2) respawn to start of level, (3) respawn to checkpoint, and (4) respawn to savepoint. All versions of the game employed the same mechanics and only differed where the player respawned after they died in the game.

We intentionally designed it so that other identified Death and Rebirth Taxonomy components (death conditions, player progress changes, aesthetics, and obstacles) were uniform to isolate the potential effects of specifically modifying respawn locations. The game had a total of five levels that increased in difficulty. Implementing conventions from the platformer genre, the player moves across the level from left to right until they collide with a treasure chest, which represented the end of a level.

As the only mechanics in *Jumpy* are to avoid environmental obstacles (move left, move right, jump, collect coins, and get hurt), we implemented a more forgiving death condition *out of health*, as opposed to *instant death*. The player started with five hearts and could earn up to three bonus hearts by collecting coins. Each coin was worth 10 points and every 50 points earned one bonus heart (max total health of eight hearts).

Any player collision with an enemy or environmental obstacle resulted in the loss of a heart. The player died whenever they lost all their hearts (hence *out of health*) or fell into the water or spiky pits.

We also standardized player progress – both number of hearts and points – to save only up to the last reached respawn point location and end of a level (e.g. when beating a level, the current number of hearts and points are saved). I.e., all player progress from the last reached respawn point is lost upon death (e.g. in the respawn to start of game (permadeath) condition, all points and/or hearts earned are lost when you die before beating the entire game). The consequences for player death then ranged from low-risk (checkpoints and/or savepoints) to high-risk (start of game).

Furthermore, the levels were identical across conditions and designed with two types of *environmental obstacles* [67, 170] that hurt the player on collision: (1) *static* enemies and environmental objects, which stayed in place, and (2) *automated* enemies, which patrolled in consistent movement patterns. Additionally, to prevent the potential bias of aesthetic representations of death in this study, player death (failure) simply triggered a very short sequence of events where a glitch sound played, the player's character faded out, and abruptly cut to the player being dropped to the last reached respawn point location.

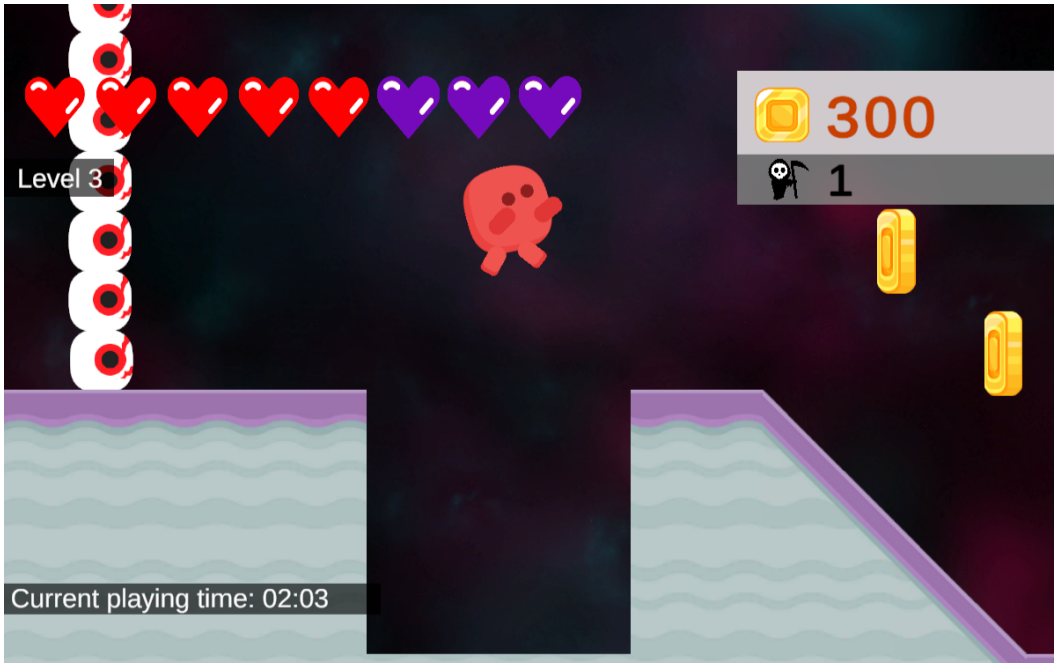

Figure 3.7: A screencap of *Jumpy*. Player progress stats (hearts and points) were displayed on the game UI at all times.

3.2.6 Findings

3.2.6.1 Statistics

With an alpha = 0.05 and power = 0.80, conducting an a priori power analysis for an ANOVA with effect size = 0.4 using G*Power [36] resulted in the projected sample size of 68 participants with 17 participants in each test condition. Firstly, we conducted normality tests and found that we didn't have normal distribution. Data transformation techniques (square root and log10) also didn't normalize the data. Therefore, we decided to use the Kruskal-Wallis H test, or "one-way ANOVA on ranks", an alternative non-parametric method to analyze our data. Additionally, we were also interested in whether death count and players'

orientation traits related to PX constructs. We used Spearman's Rank-Order Correlation to analyze those relationships. An alpha level of 0.05 was used for all statistical tests. See Table 3.1 for a table of statistical tests results.

Table 3.1: Player Experience Constructs in Relation to Death Counts, Reset Types, and Player Trait Scores

	Mastery	**Challenge**	**Autonomy**	**Curiosity**	**Immersion**
Death Count	Spearman's $\boldsymbol{p = 0.037}$ $\boldsymbol{r_s = -0.367}$	Spearman's $\boldsymbol{p = 0.027}$ $\boldsymbol{r_s = -0.261}$	Spearman's $\boldsymbol{p = 0.023}$ $\boldsymbol{r_s = -0.268}$	Spearman's $\boldsymbol{p = 0.032}$ $\boldsymbol{r_s = -0.253}$	Spearman's $\boldsymbol{p = 0.017}$ $\boldsymbol{r_s = 0.554}$
Reset Location	Kruskal-Wal $p = 0.212$	Kruskal-Wal $p = 0.592$	Kruskal-Wal $\boldsymbol{p = 0.021}$ $\boldsymbol{\eta^2 = 0.112}$	Kruskal-Wal $\boldsymbol{p = 0.011}$ $\boldsymbol{\eta^2 = 0.134}$	Kruskal-Wal $p = 0.642$
Challenge Trait Score	Spearman's $\boldsymbol{p = 0.048}$ $\boldsymbol{r_s = 0.234}$	Spearman's $p = 0.542$ $r_s = 0.073$	Spearman's $p = 0.120$ $r_s = 0.185$	Spearman's $p = 0.887$ $r_s = 0.017$	Spearman's $p = 0.788$ $r_s = -0.032$
Goal Trait Score	Spearman's $p = 0.683$ $r_s = -0.049$	Spearman's $p = 0.322$ $r_s = -0.118$	Spearman's $\boldsymbol{p = 0.038}$ $\boldsymbol{r_s = 0.245}$	Spearman's $p = 0.069$ $r_s = 0.216$	Spearman's $p = 0.138$ $r_s = 0.177$

3.2.6.2 Reset Location Types and Player Experience (PX) Constructs

Significant differences of moderate effects were found in the medians among the reset point location type groups for PX constructs of **autonomy** ($\chi^2(3,\ N = 72) = 9.757,\ p = 0.021,\ \eta^2 = 0.112$) with mean ranks scores of 36.89 for reset to start of level, 42.86 for reset to start of game, 23.86 for reset to checkpoint, and 42.39 for reset to savepoint, and **curiosity** ($\chi^2(3,\ N = 72) = 11.230,\ p = 0.011,\ \eta^2 = 0.134$) with mean ranks scores of 35.64 for reset to start of level, 48.22 for reset to start of game, 25.14 for reset to checkpoint, and 37.00 for reset to savepoint.

We then conducted post-hoc tests adjusted with Bonferroni correction to evaluate pairwise comparisons among the four groups. The results of these tests indicated the following significant differences:

- For *autonomy PX*, the reset to start of game (permadeath) group slightly scored higher than the reset to checkpoint group ($p = 0.037$).
- For *autonomy PX*, the reset to savepoint group also slightly scored higher than the reset to checkpoint group ($p = 0.046$).
- For *curiosity PX*, the reset to start of game group significantly scored higher than the reset to checkpoint group ($p = 0.005$).

No significant differences were found among the reset point location groups for mastery, immersion, and challenge.

3.2.6.3 Death Counts and PX Constructs

Significant correlations of varying effects were found between player death counts and all the measured PX constructs (mastery, immersion, autonomy, curiosity, and challenge). We detail the respective significant results:

- For **mastery** PX, death counts had a weak negative correlation across all reset point location groups (r_s = -0.367, p = 0.037). However, the reset to start of level group in particular had a strong negative correlation with death counts (r_s = -0.693, p = 0.001).
- For **challenge** PX, death counts also had a weak negative correlation across all reset point location groups (r_s = -0.261, p = 0.027). However, the reset to checkpoint in particular had a strong negative correlation with death counts (r_s = -0.610, p = 0.007).

- For **autonomy** PX, death counts had a weak negative correlation across all reset point location groups (r_s = -0.268, p = 0.023).

- For **curiosity** PX, death counts had a weak negative correlation across all reset point location groups (r_s = -0.253, p = 0.032).

- For **immersion** PX, death counts did not have significant correlations overall, but did show a moderate positive correlation for the reset to start of game group (r_s = 0.554, p = 0.017).

Overall, it appears that examining results for respective reset point location groups yielded stronger correlations, reinforcing their differences.

3.2.6.4 Player Orientation Traits and PX Constructs

Examining results for respective reset point location groups similarly yielded stronger correlations made when analyzing player orientation traits and PX constructs. Significant correlations of varying effects were found between player orientation traits of challenge and goal and mastery, autonomy, and immersion. We detail the respective significant results:

- For **challenge orientation trait**, *mastery PX* had a weak positive correlation across all reset point location groups (r_s = 0.234, p = 0.048). However, challenge orientation trait scores in the reset to start of level group in particular had a strong positive correlation with mastery (r_s = 0.674, p = 0.002).

- Regarding *immersion PX*, the reset to savepoint group in particular had a moderate positive correlation with challenge orientation trait score ($r_s = 0.534$, $p = 0.022$).

- For **goal orientation trait**, *autonomy PX* had a weak negative correlation across all reset point location groups ($r_s = 0.245$, $p = 0.038$).

3.2.7 Discussion

We will discuss the observed effects of modifying the location of respawn points on each player experience (PX) construct respectively for clarity and their implications for game design for specific types of players.

3.2.7.1 Autonomy: Transparency & Goal-Oriented Players

Our assumptions for effects on autonomy were partially supported. We hypothesized that players would experience the most autonomy in the respawn to savepoint condition (*H3*) and the least in respawn to start of game (permadeath) condition (*H2d*). Recall that permadeath actually had highest autonomy (mean rank of 42.86) with savepoint following closely after (mean rank of 42.39). We found the high autonomy ratings in the savepoint group intuitive, as players had free will to save their current progress at any point in the game. This also accompanied our findings that players scored autonomy higher the less they died, and may have had some impact on the permadeath group's higher perceived autonomy since they experienced the least deaths (mean of 25.06).

However, we initially expected the permadeath group to experience the least autonomy, because dying in that condition led to the greatest loss (all player progress), so we found it interesting that respawn to checkpoint actually scored the worst (mean rank of 23.86). We theorize that respawn to checkpoints scored the least autonomy because players weren't involved in the decision as to where they respawned after dying in the game. Though placements of respawn point locations may seem intuitive to game designer(s), those decisions may appear arbitrary or a frustratingly "bad" decision from the player's perspective. When designing the game for our study, we selected checkpoints around stretches of the game that could be more difficult to complete (e.g. a checkpoint right before a long jump that required precise timing or a checkpoint right after beating a challenging area). Regardless, the player may not have wanted their progress to be automatically and unexpectedly saved at a checkpoint. Despite the consequences of death being the greatest in the permadeath condition, players knew exactly what to expect whenever they died.

Additionally, a player's goal orientation trait score – indicating how much they enjoyed completing game goals – showed a slight relationship to their autonomy score ($H7c$). This suggests that if one were to target goal-oriented players, the game should afford a high degree of autonomy. A potential method to accomplish this is to pay careful attention to relaying as much information about the consequences of death to the player. Though our game did not explicitly state what happens when a player dies, in the savepoint condition, the controls for saving the game were displayed as part of the start screen. In the permadeath condition, the consistent reset to zero points, initial

five hearts for health, and relocation to the very start of the game was explicit and obvious. These factors could have contributed to the experience of highest autonomy in that condition. We suggest that more work could examine this phenomenon deeper, as something like a specific study that focused on the presence (and lack) of transparency around death and respawning mechanics could have an effect on player autonomy.

3.2.7.2 Mastery: Frequency of Failure and Achievements & Challenge-Oriented Players

Though this study did not yield significant differences among the respawn point location groups in mastery (*H1a*, *H2a*, *H7a*), we did find that mastery significantly related to death count (*H5a*) and challenge orientation trait scores (*H6a*) —particularly in the respawn to start of level condition. Specifically, as we expected, players scored mastery lower the more times they died. We argue this indicates game designers should try to minimize the occurrences of persistent unconquerable failure if they want to maximize their players' self-perception of mastery.

However, this experience could vary depending on players' orientation traits. Our findings showed that in the respawn to start of level group, players who were more challenge-oriented scored mastery higher. Challenge-oriented players prefer difficult challenges [227]. Therefore, this suggests that if one wanted to target challenge-oriented players, implementing middle-ground consequences for failure such as respawning to start of levels could better higher mastery. We hypothesize that designing a level that is too easy simply could backfire for challenge-oriented players, as they may perceive

their in-game skills to be superficial due to the game's lack of difficulty. In our game, failing/dying in the respawn to start of level condition meant that the player didn't lose all of their player progress, yet still had to live with the periodically-saved consequences of their past actions, whether those were good or bad performances in previous levels. Beating a level seemed to be a fairer assessment of ability compared to the low-risk, high-reward situation in respawn to checkpoints and savepoints and extreme-risk, no-reward situation in permadeath.

3.2.6.2.1 Preventing Learned Helplessness in Educational Games Game design that affords mastery could help engage players that are less mastery-oriented (i.e. prone to learned helplessness). This knowledge can also be particularly helpful in the case of educational game design, where failure experiences have been found to promote learning [11]. Future work could study how setback punishment, such as in the form of respawn points and player progress changes, could impact the effectiveness of educational games in different subject areas.

3.2.7.3 Curiosity: Revealing Less Means More

We initially expected that players would rate curiosity highest in the respawn to checkpoint condition (*H1c*) and the least in start of game (permadeath) (*H2c*). However, our findings found the reverse to be true. We assumed that players would be overwhelmed with frustration in having to completely start over repeatedly every time they died, leading to less curiosity or motivation to finish the game. Analyzing our

findings showed it is apparent that designing specifically for curiosity is based on how much is revealed to the player over time. Players were least curious when respawning at checkpoints, because it was more likely for them to save their progress in a level and therefore see more of it faster. This contrasts players who respawned to the start of game (permadeath) who likely saw less of the levels, having to play more slowly and carefully to avoid death, due to the higher-risk consequences of proceeding in the level without caution. Our findings did show that the more times a player died, the lower they scored their curiosity and permadeath had the least amount of deaths (mean rank of 21.19). Consequently, we suggest that game designers pay closer attention to what is revealed over time to their players to maximize a sense of curiosity in their game.

3.2.7.4 Challenge: Death Counts Affect Perception of Difficulty

To reiterate, a higher challenge score in the PXI [2] meant players perceived the game's difficulty to be appropriate (i.e. match their perceived skill level), not that they perceived the game to be the most difficult. We expected respawn point location groups to demonstrate differences in regards to challenge PX scores (*H2e*, *H4*, *H6c*, *H7e*) but did not find any. However, higher death counts did significantly relate to challenge PX scores (*H5b*), meaning that the more times a player died, the more they felt that that the game did not have an appropriate difficulty level (i.e. unbalanced difficulty). This observation was particularly strongest in the respawn to checkpoint condition, which makes sense as players in it had the highest death counts (mean rank of 50.78, compared to 21.19 in permadeath). Additionally, Arias & Larsson [147] previously found that

players were more accepting of difficult gameplay when they felt that they had more influence in the game. The perceived high level of difficulty would then be justified by a greater sense of autonomy in the eyes of the player. As previously discussed, the checkpoints group also experienced the least autonomy, which may have affected their perception of the game's challenge level.

Another possible factor is that similar to autonomy, the presence (or lack of) explicit internal or external information about the game's difficulty affects the perception of it. A game like *Jumpy* did not state its intended challenge level (e.g. difficulty selection screen) nor had reviews of it online that players had as a point of reference. Our findings do indicate that if game designers were to create an intentionally difficult game, they may need to be intentional with their failure design choices as implementing checkpoints may make the game feel unbalanced. Overall, we do not necessarily want to state that respawn point locations have absolutely no effect on perceived challenge. Rather, we call for more research to be done on these nuances and how other aspects of PX and game design (i.e. beyond simply altering one mechanic, such as balancing player progress changes or differing representations of death/failure) influence the perception of difficulty in games.

3.2.7.5 Immersion: Raise the Stakes of Player Actions

Counter to our initial expectations, no significant differences were found among the respawn point location groups for immersion. We assumed that immersion would be most present for players that respawned to checkpoints because it would afford a more

continuous experience for players (*H1b*), and least present for players that respawned to the start of game (permadeath) because it would afford a more disjointed experience (*H2b*).

However, it was within the respawn to start of game (permadeath) group where we observed that the more times a player died, the more immersed they actually felt. Instead of creating a disjointed player experience, it appears that players were more immersed playing the high stakes extreme-risk, no-reward game version. These findings were supported by the literature surrounding permadeath. Copcic et al. [59] summarized the shared sentiment of permadeath scholars that the finality of dying in games gives more excitement and meaning to in-game death and player actions. Interestingly, we also found that the more challenge-oriented a player was, the higher they scored immersion (H6b). Within this context, it is more obvious to see the connection to the rising popularity of permadeath mechanics in roguelikes, RPGs, and other game genres. Scholars have argued that dying can lead to greater player satisfaction/enjoyment [42, 189, 231]. The sunk cost fallacy [99] could also be relevant here, as players want to see some reward worthy of the time they spent playing the game. With the permadeath condition, they lose the reward (e.g. satisfaction of beating the game) every time they die, so it could affect their engagement (immersion) to persist past failure. Therefore, our findings indicate that if game designers wanted their challenge-oriented players to experience a higher degree of immersion, they should raise the stakes in gameplay to afford more active zen focus compared to passive/casual attitudes.

Overall, our findings clearly indicate that modifying the location of respawn points can affect respective aspects of the player experience, as opposed to simply measuring whether a game is fun, hard, or has flow. We believe this calls for more research into how game design elements – especially relating to functional/systematic death mechanics – can be more intentionally used to create specific player experiences tailored to particular types of players.

3.2.8 Limitations and Future Work

When designing the study, we anticipated facing difficulties with participant recruitment during the coronavirus pandemic, as we depended on remote online participation that required at least 20 minutes of a volunteer's time. It is possible that our results could've trended towards more significant results with more participants. Additionally, quantitative data from surveys is useful but still only one type of tool to tell the story of player experience. A mixed-methods approach incorporating qualitative methods – such as obtaining live player reactions to failure and/or recorded in-game behaviors – would be useful to accompany survey data, and this is work that we hope continues in the future.

Regardless, our findings show the relevance of studying the relationship of death and respawning mechanics with functional and psychosocial aspects of player experience. We hope that our work can be used to motivate other games researchers and designers to experiment with designing player failure, as well as provide a starting

point for further studies on the experience of failure (or lack thereof) in other game genres (e.g. RPGs, narrative-based games), modes (e.g. cooperative versus competitive multiplayer), and platforms (e.g. console, mobile, VR/AR).

3.2.9 Conclusion

In this work, we explored the effects of modifying the location of respawn points in a platformer game on the player experience (PX). Upon dying in the game, players were respawned to one of the following locations: start of the game (permadeath), start of the level, checkpoint, and savepoint. Altering those conditions were tested for their effects on PX constructs, such as mastery, challenge, autonomy, curiosity, and immersion. We also studied the relationship of player death counts and player orientation traits – challenge and goal – with those PX constructs.

We found that there were significant differences among the respawn point location groups. Players who respawned to checkpoints typically experienced less autonomy and curiosity compared to players that respawned to start of game (permadeath) and those who respawned to savepoint. Player death counts also had significant relationships with all measured PX constructs. Additionally, players' challenge orientation trait scores related to their experience of mastery and immersion, whereas their goal orientation trait scores related to their experience of autonomy. These findings suggest that modifying death and respawning mechanics has the ability to affect respective aspects of the player experience. Our findings indicate that more work can be done to further explore how to tailor experiences of failure towards

specific types of players in various contexts such as entertainment and/or education (serious games).

3.3 "Try Again?": A Macro-Level Taxonomy of the Challenge and Failure Process in Games

To answer lingering questions I had after developing and testing the Fail and Retry Taxonomy in Platformers, we had to cast a wider net of games for our observation. After my two projects, I was left wondering:

- What components of the failure process were missed when limiting the examination of games to platformers?
- How can we assess the challenge and failure process of games that do not have explicit death or respawning in gameplay? (e.g. more simulation-type or narrative-oriented games)

My next research efforts then involved the development of a taxonomy about challenge and failure that is extensible across game genres and interaction modalities, as well as inclusive of games without explicit marks of player failure. This required exploring a more macro-level view of challenge and failure processes in games.

Therefore, in this work, we set out to understand the essential design elements of the challenge and failure process across a broad range of games. The main research questions that our work seeks to answer include:

- Can design patterns identified in existing failure taxonomies be generalized? E.g., such as to other game genres and mechanics outside of platformers or interaction modalities such as embodied games in virtual reality (VR)?
- Are there additional aspects of challenge and/or failure in terms of design patterns to consider for new emerging forms of gaming experience, e.g., VR?

3.3.1 Related Work

3.3.1.1 Complex Experiences of Failure

Failure is interesting in that it can be studied from the psychological, design, and humanistic perspectives. In human-computer interaction, researchers have combined these perspectives to find that failure can lead to positive emotions and outcomes [8–11, 40, 95, 100]. For instance, negative game events have been shown to lead to positive and meaningful experiences [189]. Mastery- and challenge-oriented individuals in particular are more likely to appreciate the experience of failure on the way to success [9, 10, 66]. Previous work in queer game studies has also argued that some players actively seek out failure due to dissatisfaction with abiding by the status quo [108, 166].

In addition to positive experiences, failure has also been found to increase cognitive engagement [122], and actively playing rather than watching increases the neurological reactions to failure [129]. Furthermore, Frommel et al. found that temporary failure is integral to the eventual experience of success [100].

Failure is also important to understand in the context of learning games. Using the lens of productive failure, Anderson et al. found that initial failures in educational games actually promoted learning through collaborative discourse [11].

3.3.1.2 Design of Failure in Games

The specifics of failure mechanics in games haven't been studied extensively outside of permadeath, a high-risk mechanic with the permanent death of a playable character upon failure [42, 59]. Regarding the general design of failure, Juul identified four different types of punishments [124]:

- *Energy punishment*: Loss of energy, bringing the player closer to life punishment.
- *Life punishment*: Loss of a life (or "retry"), bringing the player closer to game termination.
- *Game termination punishment*: Game over.
- *Setback punishment*: Having to replay part of the game; losing abilities.

While this is useful in determining the more specific consequences of failure, there are broader aspects of failure design that need to be examined. For instance, it has been shown that there must be a balance between the rewards and punishments for failure and success so that the player remains motivated [195]. Failure with no consequence (unlimited failure) is proven to be less effective for a player's learning because they can fail continuously until they find the right path. Additionally, game designers are constrained in their failure design by the players' game literacy

expectations and production constraints [96]. Even so, game designers need to be careful while designing for failure as common game elements have been found to lower a player's failure tolerance and therefore their learning [47].

Failure is ultimately a key part of a game's core loop, but failures can be classified as in-loop and out-of-loop [13]. In-loop failures support the design intent of the game and are what make a game engaging and challenging, whereas out-of-loop failures are unintentional (from the designer's side), detract from the vision of the game, and should be minimized. Aytemiz [13] defines a Taxonomy of Failure with six classes of failure with in-loop and out-of-loop classifications:

- Encoding Input
  - In-Loop Failures: failing the sequence of what to interact with, like in a puzzle game
  - Out-of-Loop Failures: not knowing the controls/input or physically can't use the controls
- Decoding Output: interpreting feedback from the game
  - In-Loop Failures: failing to perceive differences or visuals in perception based games
  - Out-of-Loop Failures: accessibility issues
- Discovering Mechanics

  - In-Loop Failures: failing to connect and relate mechanics together for emergent gameplay
  - Out-of-Loop Failures: failing due to lack of mastery or didn't know a specific mechanic

- Setting Goals
  - In-Loop Failures: failing to prioritizing or choosing a next step such as in an open world
  - Out-of-Loop Failures: player doesn't know what to do and is unintentional by game design

- Planning
  - In-Loop Failures: failure of plan when plans are part of the game
  - Out-of-Loop Failures: player failing due to their choices even though the game is designed so that plans do not matter

- Execution
  - In-Loop Failures: physically failing to complete plan
  - Out-of-Loop Failures: player's plan fails or player makes mistake in plan

Both types of failures do impact the failure process in games and should therefore be kept in mind for our study's context.

3.3.1.3 Challenge and Skill Atoms

There has been previous work that attempted to formalize game grammar when discussing challenge components in games. Cook [58] came up with the concept of "skill atoms", which is a "feedback loop between user and system that is organized around a central challenge or skill". Through multiple runthroughs of the atom, the player masters the skill to effectively play a game.

Deterding (2015) delineated the components of a skill atom as the following:

- **Goals**: System states the user attempts to achieve. Goals are typically explicitly suggested by the system but must be actively pursued by the user to be goals.
- **Actions**: What the user can do to approach her goals.
- **Objects**: Entities the user acts upon; their configuration embodies the system state.
- **Rules**: Specifications what actions the user can take and how they affect the system state. These may be algorithms, humanly enacted rules, physical laws, or acombination thereof.
- **Feedback**: Sensory information that informs the user of system state changes resulting from her actions or autonomous system processes; entails immediate feedback on each action and progress feedback on the user's accumulated progress.
- **Challenge**: The perceived challenge of achieving the user's current goal, posed by the current system state relative to the user's perceived current skill.
- **Motivation**: The psychological needs energizing and directing the user to seek out and(continue to) engage with the system—typically competence.

While there are some similarities to the previous taxonomy we developed in this work, it takes it a step further to give and name contextual examples of common incremental conditions/game-states that players experience when taking on a challenge

and also name that repetitive feedback loop that Cook [58] identified (which in our work, we call the "mini failure loop").

3.3.1.4 Relationship of Challenge and Failure in Games

At the granular level, a challenge can be represented by obstacles [217,221,240], which can be depicted by intelligent enemies to defeat and environmental obstacles to traverse [67]. When the player does not manage to achieve those said goals, that results in a failure state [68]. The modification of challenges/obstacles in a level also affects the difficulty of gameplay, which impacts the likelihood of the player reaching success in the game [76]. Therefore, challenge and failure in games have a direct relationship with one another.

Previous work has examined the design, types, and factors to describe the complicated experience of challenge [35, 76, 230].

Peng explored how emotional challenge was found to be more intense on VR than on a monitor-display [188]. Challenge is also a key factor in other experiences of games such as: flow, frustration, and the stuck state [29, 48, 83]. However, similar to failure, these experiences can lend themselves to the overall satisfaction of the player. For instance, the balance of challenge and ability is essential to keeping players in the "flow zone", a state of focus and enjoyment [48]. As a result, frustration can increase player engagement and motivate players to learn from their mistakes when challenge is attuned to their skill level [29, 183].

Notably, Anderson [9] examined what players consider to be failure in video

games. It was found that failure was identified beyond instances of hard-coded failure (losing health or dying), such as poor performance, lack of progress, or giving up. For clarification, players viewed something as a failure relative to their current performance in a level. I.e. if they are continuously struggling to pass a section for a while, then they will most likely view each failed attempt as a failure. This player-centric view of failure is important to note, as it reveals more about where players are more likely to give up on a game.

3.3.2 Methods

To develop this new taxonomy, we applied similar methodology that we utilized when creating the Fail and Retry Taxonomy in Platformers. However, we cast a wider net of games by selecting the top 50 VR-tagged games on Steam regardless of genre. So unlike the prior taxonomy which was limited to platformers, the corpus of games included action, adventure, casual, RPG, simulation, strategy, and sports/racing games. This was intentional to capture a wide, inclusive range of challenge and failure components.

We observed each game by watching an online video playthrough when the game wasn't available. We played or watched for at least two *failure loops* to determine what design patterns were present in the game related to challenge and failure. We define a single "failure loop" as a section of gameplay in which the player has been presented with a challenge, tackles said challenge, and then results in a failure state (such as player death). For games in which a failure loop could not be identified, they

were coded as "no failure/death".

We then applied conceptual memoing [22] along with a hybrid approach of deductive and inductive coding [203]. For each game, we noted the game's process of failure, using previously derived codes from existing taxonomy work [67, 170] and creating new codes for subsequent additional design patterns that we observed. Examples of these include: failure conditions (critical and partial), process of failing, reset locations, player progress changes, aesthetics, and, because of the chosen platform, unique VR game mechanics/actions.

After open coding, we performed axial coding to identify relationships among our open codes to determine our initial set of categories. Through discussion sessions, we pieced together our findings through selective coding into the resulting three main components in our new taxonomy, as well as the relationships among them.

3.3.3 The Taxonomy of Challenge and Failure in Games

3.3.3.1 Player Challenges

Player Challenges refer to the process of players attempting to overcome trials/obstacles under a set of rules and restrictions. These challenges consist of three parts: (1) game modes, (2) obstacles, and (3) embodied actions.

- *Game Modes* determine whether someone plays solo (singleplayer), competes with others (competitive play), or cooperates with others during gameplay (cooperative play). These different modes of play can have vastly different impacts on challenge

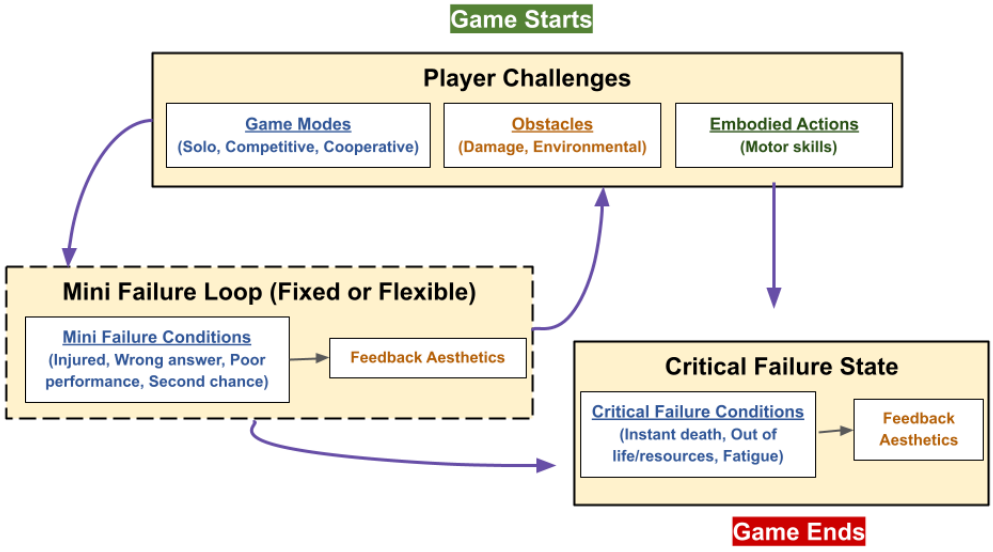

Figure 3.8: The Taxonomy of Player Challenge and Failure. When the game starts, Player Challenges either lead to: (1) a Mini Failure Loop that goes back and forth into subsequent player challenges until reaching Critical Failure State or (2) directly to Critical Failure State. The player, then, has the option to retry again.

and the perception of failure [148, 192, 243].

- *Obstacles* are hurdles that a player must overcome to progress in the game. Obstacles can affect gameplay by either disrupting or encouraging flow [118, 155]. The types of obstacles are [67, 170, 217]:

  Damage Obstacles that hurt the player (e.g. enemy attacks, traps).

  Environmental Obstacles which are barriers that block the player (e.g. walls).

  Mental Obstacles which are cognitive challenges that must be solved (e.g. puzzles).

- *Embodied Actions* Bodily actions that the player must take and the level of motor skill that they require [171]. In VR, they are physical motions that pair virtual

and real-life actions. These include gestures with the arms, hands, fingers, body, and head. *Motor skills* are also a subset of embodied actions and a major facet of challenge because they determine how easily and accurately one can input the appropriate actions through an input device [111]. Previous work suggests that traditional physical games can also play a role in emotional experiences of players [148]. *Arm motions* include climbing (alternating pulling arms up and down, melee attack/throwing (swinging arms), shooting/selecting (pointing), and grabbing (grab and pull). *Hand motions* include reloading (quick drop of hand, then lift) and pulling up player status/action menu (turn wrist). *Body motions* often include dodging obstacles and head motions to see a 360-degree field of view. While we specifically looked at VR actions as those were our selected corpus, Embodied Actions can easily be extended to other platforms, such as controllers or mouse, or even specific hand movements in board games.

3.3.3.2 Mini Failure Loop

After *Player Challenges* have been determined and met, there is a fork in gameplay that could first lead to a *Mini Failure Loop*. This refers to the loop within the overall cycle of failure and retries in gameplay. Entering this inner loop means that the player faces a mini/partial setback in gameplay that temporarily hinders the game progression, such as getting hurt, losing items, or losing progress/time. This loops until the player permanently fails their run of the game. There are two types of Mini Failure Loops: **fixed** and **flexible**.

- *Fixed loops* mean that the rules of failure stays consistent during gameplay. E.g., the difficulty setting, obstacles (such as number of enemies), level design, and so forth can not be changed and do not adapt to the player during a play session.

- *Flexible loops* mean that the rules of failure are modifiable, such as changing game modes, game levels, player modifications (e.g., weapon choice), or even dynamically adapting difficulty based on player performance. These can be changed at any time during the game or at the very least between levels.

There are also two core aspects of Mini Failure Loops: the conditions and accompanying aesthetics.

3.1.3.3.2.1 Mini Failure Conditions *Mini Failures* are partial setbacks on the way towards a more permanent failure state. This is similar to the non-hard-coded examples of failure identified by Anderson [9] as mentioned earlier. Examples of mini failure conditions met during gameplay are when:

- *Injured* is when the player's health decreases, either gradually over time or getting hurt.

- *Wrong answer* is when the player has input the wrong puzzle solution.

- *Poor performance* is when the player is currently performing poorly, often in sports or simulation games

  E.g. Missing a shot in a basketball game or being passed by others in a racing game.

- *Second chance* is when the player has died, but has the ability to be revived by another player (human or AI).

3.1.3.3.2.2 Mini Failure Feedback Aesthetics Feedback Aesthetics refer to how mini failures are depicted to the player. It is crucial to signal to the player what their current status is in the game at all times so that they are able to appropriately interpret failure [9, 157]. It should be noted that for games without explicit failure states, the feedback aesthetics can be as simple as ensuring that the player sees they have regressed in their progress (e.g. by showing a loss of time on a timer). There are two core design elements underlying mini failure aesthetics: Player Status Display and Sensory Phenomena. *Player Status Display* refers to the diegetic information about the player's current state, typically health, mana/ammunition, and so forth [186]. *Sensory Phenomena* refers to the visual and auditory signals given to the player when meeting a mini failure condition. Common signals include red flashes, marks towards direction of a hit, and/or the shrinking of the player's health bar.

3.3.3.3 Critical Failure State

The other potential fork in gameplay from Player Challenges is to go directly to the *Critical Failure State*. This refers to the end of a game run that is reached when a failure condition is reached. Similar to the Mini Failure Loop, this component is comprised of a failure condition and aesthetics.

3.1.3.3.3.1 Critical Failure Conditions This is the criteria met when a player completely fails the game and can no longer progress until another retry at a run.

- *Instant Death* is the failure state reached after a player dies immediately after a single injury/mistake [170]
- *Out of Life/Resources* is the failure state when a player dies gradually after a series of sequential injuries/mistakes until player life/resources is at zero [67]
- *Fatigue* is the failure state met when a player decides to completely stop playing a game, either due to not being able to solve a puzzle, beat a level, or out of pure boredom or exhaustion. This is extensible to games without dying or respawning.

3.1.3.3.3.2 Critical Failure Feedback Aesthetics While having similarities to how mini failures are depicted, the aesthetics for critical failures appear more final. For example, visual aesthetics often include the screen being decolorized to black-and-white, red tinting, red text (e.g., "You Died"), flashes of white, and fading to black. The audio clips played are similarly more dramatic, as there is usually the sound of grunts/cries with either the music cutting or being distorted.

3.3.4 Discussion

Our Taxonomy of the Challenge and Failure Process identifies overall design patterns regarding the process of failure in games. Through observation of actual gameplay across 50 games, we uncovered a failure process that is applicable to a wide variety of games across genres and platforms.

3.3.4.1 Versatility: Applicable to Physical Games

To further exemplify the taxonomy's versatility, we will apply it to a couple simple analog playground games for demonstration.

3.3.5.1.1 Hide and Seek: Immediate Critical Failure State In the basic form of the game of *Hide and Seek*, the game mode set is competitive play. One player –the seeker– closes their eyes counting to 100 seconds, while all other players –the hiders– find hiding spots. Thus, actions taken are either hiding or seeking. In this setting, environmental obstacles block the hiders from being seen by the seeker, and the damage obstacle for the hiders would be the seeker's hand, as their touch upon being found would mean that they are immediately out of the game. Therefore, when players are found, they immediately reach *critical failure state* and the game ends for them.

3.3.5.1.2 Hopscotch: Mini Failures To play *Hopscotch*, a traditional hopscotch diagram consisting of ten squares is drawn on the floor. The game mode set is competitive play. During the player's turn, they must first aim to throw a marker into the square one. If the marker lands outside of the square or on a line, then they lose their turn. Therefore, actions taken in this game are hopping and throwing, and environmental obstacles are the lines and borders of the hopscotch diagram. Losing a turn due to *poor performance* is considered a *mini failure*, as the player is still a part of the game after making a mistake. In *Hopscotch*, the player must simply attempt that square (ex: square one) again on their next turn, which slows them down from

completing all ten squares the fastest to win. The player would reach *critical failure state* upon another player finishing ten squares first.

Ultimately, because of the taxonomy's versatility across game genres and platforms, it enables game researchers and designers to examine failure processes more generally. As a result, the taxonomy could even be extended to other analog genres such as table-top games.

3.3.4.2 Mini Failures: Supports Previous Failure Research

Notably, the design patterns identified by our taxonomy complement previous work that has been done on how players experience failure. Anderson et al. [11] interviewed players to similarly find that the experience failure goes "beyond hard-coded failure (losing health or dying)" to "[include] poor performance in a section already completed, lack of progress, or giving up". We identified poor performance and lack of progress as types of Mini Failures and completely giving up as a type of Critical Failure State due to Fatigue. This demonstrates that our new taxonomy provides the potential for games researchers and designers to use the new, generalized vocabulary to speak about and advance failure research processes and design patterns in games.

3.3.5.2.1 Fatigue = Failure? The role that fatigue plays in failure processes is one that is still understudied. Our taxonomy defines fatigue as "when a player decides to completely stop playing a game, either due to not being able to solve a puzzle, beat a level, or out of pure boredom or exhaustion." Notably, each one of these respective

situations means something different in the experience of failure, as we discuss below.

When a player is struggling to solve a puzzle or beat a level due to a cognitive challenge, that situation often results from increasing mental fatigue/exhaustion [20]. A player who is determined to finish a game without consulting internet how-to guides for help would get stuck in this scenario, resulting in a mental fatigue failure state upon them giving up.

When a player is struggling to beat a level due to a performative challenge, say a difficult boss, and then gives up, that results in another type of fatigue failure state that better deals with physical fatigue [70]. This is especially relevant when applying it to physical playground games. Physical exhaustion is even more emphasized in games like *Hide and Seek*, *Hopscotch*, or *Tag*.

The difference between fatigue in video games and physical games is that, oftentimes, the fatigue failure state in a video game can be temporary and retried/continued from if the player decides to pick up from the game even several years from then. In physical playground games, the fatigue failure state oftentimes means that the player was too exhausted, which resulted in a mistake, ending in a permanent irrecoverable critical failure state for them.

It would be interesting to study how this fatigue type of failure relates to the player experience of competence in different situations.

3.3.4.3 Difficulty vs. Accessibility: Fixed Loops vs. Flexible Loops

With discussions surrounding dynamic and adjusted difficulty being at the forefront of the gaming community throughout the years [223], it is interesting that we discovered the patterns of *Fixed loops* versus *Flexible loops*. To reiterate, *fixed loops* mean that rules of failure/challenge do not change during a gameplay loop (more traditional), while *flexible loops* can alter anything from difficulty mode to game modes, levels, or player modifications (more hybrid). The latter makes it easier to customize a gaming experience that is suited to one's own skills and abilities, especially after having played a section of a game and struggled with getting past it. In this way, a game is made more accessible when its challenge/failure loops can be modified [193]. The most common way that video games accomplish this is by making the difficulty mode changeable at any point during gameplay [107]. We argue that using this vocabulary to describe the ways challenges can be modified in games to alter the experience of failure can be beneficial towards distinguishing traditional and hybrid styles of play.

3.3.4.4 Uses in Game Design and Research

Regarding games research, the taxonomy could be used to examine how modifications of the components of failure can affect the player experience. For instance, researchers could study how challenge and failure design patterns affect flow, enjoyment, mastery, and perceived challenge/difficulty in a more generalized way. Such research would be also be applicable to subgenres of games such as

serious/educational games. Certain learning styles could thrive with particular failure design patterns when attempting to teach subjects through games. In addition to learning styles, player types and traits could also be examined in relation to challenge and failure design [68] The application of granular challenge and failure design work to various contexts is just the beginning.

Similarly, game designers could benefit from using the taxonomy to plan and/or organize their challenge and failure mechanics when building their games. Experimentation in challenge and failure consequences are particularly prominent in the roguelike and roguelite genres, featuring permadeath mechanics. The combination of challenge components with failure mechanics could be broken down using terminology from our taxonomy to discuss game balance/difficulty adjustment across stages of game design.

3.3.5 Limitations

Our analysis was limited in that we only observed VR and analog playground games. While exploring the VR category gave us a broader look across genres and mechanics than traditional 2D/3D digital games to make the taxonomy more generalizable, we still do not fully know its limitations until it is tested further with additional genres (e.g., table-top games), mechanics, games modes, input modalities, and platforms.

There are also limitations from observing a subset of games, rather than playing every game ourselves. Due to cost and time concerns, we ensured that we watched the

player progress through at least two failure loops during their game run. While this was enough to determine the failure loops present in a game, there could be more (extremely time-intensive) insights discovered by watching entire gameplays.

3.3.6 Conclusion

We utilized a hybrid approach of deductive (based on previous existing taxonomy) and inductive coding to develop the Taxonomy of Player Challenge and Failure. We identified three overarching components of player failure processes in games: Player Challenges, Mini Failure Loop, and Critical Failure State. Our goal was to extend the previous taxonomy to other game platforms and genres, beyond platformer video games. Another goal was to provide a means for game designers and researchers to break down and analyze failure design in a general sense. Future work could include how challenge design relates to story-driven games or games without failure.

Chapter 4

Social & Emotional Challenge

After conducting the work related to performative challenge, reflecting on the findings led me to reconsider whether the perception of challenge was primarily due to a game's design. Much of the findings from those works revealed that the context of a gaming experience mattered heavily. My subsequent research questions then transitioned towards a player-centric exploration towards deepening my understanding of the psychosocial aspects of the player experience. I wondered:

- What other types of challenge/difficulty are there to explore in relation to the overall player experience (more psychosocial aspects)?
- How can failure/challenging experiences be made meaningful for players?

With those questions in mind and through further literature review, I found myself exploring the realm of emotional challenge. When examining how emotional challenge has been evaluated in existing work, I realized that doing so is relatively

new. Therefore, I did further research to understand what were potential outcomes of inducing emotional challenge. I found that player reflection was common to associate with emotional challenge topics in games research, which was a form of eudaimonic experience. I realized quickly that initially relying on the definition of challenge as a "tasK" [3] had limited my perspective to considering challenge only as related to difficulty and failure from the hedonic view of gaming [54].

At this point, I wanted to better understand how challenge design related to more complex emotional experiences, such as when players queer failure [108]. We began delving deeper into how players define and are affected by emotional events in games. I hypothesized that trying to better understand how to design for emotional gaming experiences would result in also understanding how to afford meaningful reflective player experiences. All of this led to the second major research question in my dissertation which was:

- **"What emotional game design patterns relate to player reflection?"**

4.1 Exploring how Emotional Challenge and Affective Design in Games Relates to Player Reflection

To first understand the design and impact of emotional challenge in existing games, we conducted a survey that explored the relationship between affective game design patterns and player reflection. Examining the reflective player experience is crucial as games become increasingly emotionally-impactful in their message, especially

as they are also now used to teach social-emotional learning concepts [113,131,134,211].

4.1.1 Background

Player enjoyment and fun can no longer be simply gauged by the frequency of smiles [231] while playing a game. Technology has progressed to improve the levels of immersion in which games tell complex and responsive stories that can emotionally impact players deeply [119, 245]. Isbister [119] argued that "games can actually play a powerful role in creating empathy and other strong, positive emotional experiences." With digital games in particular, Karpouzis & Yannakakis [245] said that we now have the "ability to sense player emotion, through cameras, microphones, physiological sensors and player behaviour within the game world, and utilise that information to adapt gameplay accordingly or generate content predicted to improve the player experience and make the game more engaging or interesting." Clearly, combining games with rising technology can make their emotional power effect even stronger when designed for thoughtfully.

The type of challenge presented to players in these emotionally-driven games is a bit different from what we are used to. In addition to what we typically know as hard fun (or performative challenge [75]), there is a type of fun closer to what has been coined as "serious fun" that depends on emotions and reflecting upon them during play [149]. Serious fun is when players "aim to change how they think, feel, behave, or to accomplish real work" [149].

Reflective player experiences have been proven to hold value for the gaming

community, in that reflection is a process that players generally enjoy [143, 167]. This is particularly important in the context of games that address serious and/or complex themes in their narrative, seeking to induce emotional reactions from their players. "Emotional challenge" [53] is a term that describes and measures this phenomenon—the "hard fun" of emotional play—and researchers are increasingly curious about how it relates to player experience and reflection [53, 75, 167].

One motivation to study how to design for reflective player experience is because games are increasingly used in the area of education and games for learning, especially towards social-emotional learning [113, 131, 134, 211]. In learning processes, reflection about the content increases the depth of knowledge, contextualizes knowledge, and helps build structural connections in knowledge and social connections among learners [45]. Therefore, understanding how emotional experiences in games relate to reflection is increasingly important, especially for games that aim to impact players in deeper ways.

Even games that are aimed primarily for entertainment have unintended learning experiences that are influential towards players' real lives [212]. When players were asked to recount emotionally moving gaming experiences, they were able to describe moments that were experienced an entire decade ago but have still left a lasting emotional impact [241]. Games researchers and designers alike could benefit from research in this field to continue to create monumental video games.

In this work, we seeked out to better understand emotional challenge in games and how to best design for it, focusing on how emotional challenge relates to meaningful

reflective player experiences. The sub-questions that this work seeks to answer are:

- How does emotional challenge in games relate to reflection?
- What affective game design patterns are important for reflective player experiences?

4.1.2 Related Work

4.1.2.1 Evolution of Stories in Games and Emotional Challenge

While there were narrative-based games such as *Oregon Trail* (1971) and *Colossal Cave Adventure* (1975), story was not at the forefront of the most popular video games such as *Pong* (1972) and *Space Invaders* (1978). Narrative in games has evolved from "player assumption, to written backstory, to written narrative context, and eventually to text, graphics, and movies integrated directly into the game experience" [110]. The popular perception of challenge in games was limited at the time to what was called functional [53] or performative challenge [75], which addressed players' physical limitations to interact with the game (i.e. the speed and accuracy with which actions can be performed) [75] or skill with strategy [53]. Game design therefore focused on flow [64] and perfecting just the right amount of performative challenge to maintain a player's interest and focus [135, 142].

Cole argued that the other side of the spectrum were games that focused on the game story and feelings that it induces in players; this was appropriately named "emotional challenge" [53]. Instead of challenge via physical game mechanics, the

foundation of emotional challenge is built upon emotional and intellectual engagement with an unfolding narrative [110]. The challenge eventually became the task of measuring such an experience, similarly to how performative challenges are measured by enjoyment and flow [202, 224]. Denisova et al. [75] developed such a survey via Likert Scale method, which had both components of performative challenges and, most importantly in our case, emotional (scale items detailed in "Methods" section). Other previous work similarly explored measuring emotional challenge in relation to immersion, enjoyment, and competence [28], in 'core gamer' and avant-garde titles [53], as well as on the virtual reality (VR) platform [187, 188].

4.1.2.2 Reflective Player Experience

There is much to learn about reflection in games as it increases understanding of "engagement beyond the moment-to-moment experience of gameplay" and is considered a crucial part of learning [167]. Mekler et al. [167] found that while higher-level reflection in the above framework is difficult to achieve, players find the activity of reflection in itself valuable. Additionally, Whitby et al. [241] found that players also reflect during gameplay ("endo-transformative" behaviors) in addition to outside of it.

There appears to be a relationship between complex emotions and reflective player experiences [21, 168]. Bopp et al. [26] asked players to recall "emotionally moving" gaming experiences and found that players actually enjoyed experiencing negatively-valenced emotions such as sadness. Gowler & Iacovides [103] dove deeper

into uncomfortable emotions in gameplay and found that it often served as a "catalyst for reflections on wider societal issues and concerns". Similarly, Whitby et al. [242] found a sequence of trigger, reflection, and transformation constituted perspective-challenging experiences. Clearly, there is value in learning how to design for these more complex gaming experiences, as they can lead to long-lasting, and even transformative, reflective impacts on players. The importance of reflection towards learning then suggests that games can be used to address complex themes and social-emotional learning [113].

4.1.2.3 Affective Patterns and Social-Emotional Learning

Generally speaking, the affective domain of learning consists of how we perceive, experience, and process the emotional aspects of social interaction [158]. While understanding and managing one's emotions are key affective elements, so is establishing relationships with others [163, 226]. One way to build and maintain relationships with others is through social-emotional learning, which consists of affective components such as self-awareness, social awareness, and relationship skills [185].

As stated earlier, with the rise of incorporating emotional challenges in games, a way to identify, evaluate, and create these challenges is through using affective patterns. Examples of affective patterns in games include, but are not limited to: 1) *avatar emotional expression*: "facial expressions alter in response to in-game events or player through player commands", 2) *avatar display of human frailty*:

"inclusion of less than optimal physical traits in an avatar", and 3) *the traumatized avatar*: "an avatar with emotional trauma [that] allows players to gain a deeper understanding of what drives the avatar and thus empathize with it" [82].

Affective patterns in games can help promote social-emotional learning by prompting players to not only think about specific scenarios, but also to get a (virtual) first-hand *experience* with perspective-taking and decision-making [153,237]. As a result, this could also induce various levels of reflection among players.

For example, consider this scenario where a player has to choose whether or not share their feelings to an in-game character. If the player does so, then their bond with the character will deepen, and they may be more likely to help the player in times of need amidst battles. However, if the player does not do so, then their bond may remain the same or weaken, as they will not be as inclined to interact and/or help the player when they are available. Regardless of the player's decision, this affective pattern provides opportunities that encourage player reflection.

4.1.3 Rationale for a Survey

While we initially thought of using interview methods to answer our research question, it became apparent quickly that we should not be leading when asking players to reflect on their gaming experiences. A broad open-ended survey allowed the respondents to provide entries that were of any length and depth that they felt was appropriate to their experience. Using a survey also allowed us to pair results from Likert-scale questionnaires, like from the CORGIS [75], to coded open responses. A

survey provided a way to obtain data from a larger amount of people, compared to just several qualitative interviews.

4.1.4 Methods

We recruited 59 participants through social media (e.g. Twitter, Facebook, Slack, etc.) using a combination of the authors' personal contacts and Amazon Mechanical Turk (MTurk). The only conditions for participation was that participants had played video games previously and responses needed to be in English.

To obtain a wide diversity of responses, we created a Qualtrics survey that asked participants to recall an instance where they faced an emotionally challenging situation in a video game. As this method did not have as much flexibility as interviews, we provided a definition of "emotional challenge" as "challenge which confronts the player with emotionally salient material or the use of strong characters, and a captivating story. A player cannot overcome emotional challenge with skill or dexterity, but by resolving tension in the narrative, by assessing their identification with game characters, and by resolving ambiguities" [75]. Afterwards, we then structured the response section into these prompts:

1. *"Recall a time you experienced an emotional challenge in a video game."*
2. *"What made that experience emotionally challenging?"*

Participants were free to write, with as much or as little detail, about any game in their responses.

After describing their experience, participants scored it according to challenge ratings using the Challenge Originating from Recent Gameplay Interaction Scale (CORGIS) [75]. I utilized the emotional challenge dimension of the CORGIS measurement tool—which has good internal consistency with Cronbach's a of 0.84 ([75]). It asked for the degree of agreement with the following statements through a 7-point Likert scale ranging from strongly disagree (1) to strongly agree (7): (a) *This game is more than just a game to me*; (b) *The things that happened in the game made me sad*; (c) *I invested much thought into the game*; (d) *I felt a sense of responsibility for characters and events in the game*; (e) *The game made me think about real life issues*; (f) *Playing the game was stimulating*; (g) *I felt a sense of suspense when playing the game*; (h) *The game had moral dilemmas in it where the choice was not obvious*; (i) *The game involved making moral choices that I didn't agree with"*.

While CORGIS also measures other aspects of challenge such as performative challenge, those constructs were not relevant, as our study focused on emotional reflection, and therefore excluded from analysis.

4.1.4.1 Qualitative Data Analysis

After collecting the data, I had another researcher take part in the analysis process. We utilized a deductive thematic analysis approach [36], as we already had a set of affective patterns to look out for in the data (a top-down approach). Deductive thematic analysis was appropriate for this work as we had a codebook based on existing theory to shape how we identified and analyzed the themes. We merged the

responses from our three prompts and coded them together as one unit. We independently deductively coded the written portion of the survey responses (53 total) for referenced affective game design patterns based from Dormann et al.'s previous works [80–82]. Examples of such patterns in addition to those previously mentioned include: healing/nurturing others, emotional decision-making, and sacrificial action [82] (see Table 3.2 in page 58 for the complete codebook).

After collecting the data, we had two researchers take part in the analysis process. We utilized a deductive thematic analysis [36] approach, as we already had a set of affective patterns to look out for in the data. We merged the responses from our two prompts and coded them together as one unit. We independently deductively coded the written portion of the survey responses (53 total) for referenced affective game design patterns based from Dormann et al.'s previous works [80–82]. Examples of such patterns in addition to those previously mentioned include: healing/nurturing others, emotional decision-making, and sacrificial action [82] (see Table 1 below for the complete codebook).

To find the top affective game design patterns presented in Table 4.1, we calculated the percentage that a design pattern appeared out of all other patterns that surfaced in a reflection level.

Next, we coded individual responses according to their highest achieved level of reflection based on Fleck & Fitzpatrick's [93] framework, which could be (from highest to lowest quality): critical reflection, transformative reflection, dialogical reflection, reflective description, and description. We selected this framework due to

Table 4.1: Affective Patterns Codebook, from Dormann et al. [80–82], Bjork & Holopainen [23], & Lankoski & Bjork [145]

Affective Game Design Patterns	**Definitions**
Animal companion sims	A simulation of a real animal, intended to reproduce the effects of actual pet ownership.
Avatar display of human frailty	Describes the inclusion of less than optimal physical traits in an avatar. These traits more closely mirror the reality of human life.
Avatar emotional expression	Avatars' facial expressions alter in response to in-game events or through player commands.
Call to action	Provides functions within the game framework that inspire players to step beyond the game and actively participate in social activism.
Competing for attention	The competition between several characters to get attention of one character.
Consequences of long ago actions	Reminds players that the current outcome is a consequence of a previously made decision.
Emotional decision making	Affecting player emotions through decision-making processes.
Emotional immersion	Being emotionally affectedby the events that occur in a game.
Empowerment	Players feeling that they can affect the events and the final outcome of a game.
Gain allies	The goal to add new members to a social network defined as an alliance.
Healing/nurturing others	Refers to the use of game resources to heal damage sustained by teammates and/or NPC companions.
Identification	The characters or parts of the game with which players identify.
Internal conflict	Having a set of desirable goals where progress in one typically makes others more difficult.
Negative emotions (anger, guilt, shame)	Uncomfortable emotions that are triggered by gameplay or themes in a game.
NPCs with emotional masks	The NPC who uses an emotional mask is a character that displays one kind of emotion when they are secretly feeling another.
Sacrificial action	The action of prioritizing others' well-being (NPCs and, in multiplayer games, other players) ahead of the player's own character's well-being and advancement.
Shared learning	The opportunity for players to share lessons from the game with other players. Through direct and indirect cooperation, players work together to master the game.
Social dilemma	Instantiated in a game through internal conflict.
Social maintenance	Perform actions to redefine and refine the relation to a group.
Sympathy for victims	Involves support for feeling concern and compassion for victims.
The traumatized avatar	An avatar with emotional trauma allows players to gain a deeper understanding of what drives the avatar and thus empathize with it.

its usage in previous reflective player experience studies [167] for consistency. Two researchers conducted this analysis separately; for discrepancies in coding, a discussion afterwards was conducted until consensus. A summary of coding themes and representative responses can be found in Table 4.2.

With two qualitative coders, the result of our interrater agreement analysis was substantial (mean Cohen's $\kappa = 0.794$; range $\kappa = 0.665$ to $\kappa = 0.91$). Since we used the coding reliability thematic analysis approach, interrater reliability is a key measure of coding quality [37, 38].

4.1.4.2 Quantitative Data Analysis

As we had a smaller sample size due to grouping participant responses by reflection level, we then used the nonparametric Kruskal Wallis H test to analyze our quantitative data, given one of our assumptions that *there is a significant difference among the aforementioned reflection groups regarding emotional challenge ratings—i.e., meaning that the more emotionally challenged players feel, the deeper their reflection about their gaming experience will be.* We then conducted post-hoc tests adjusted with Bonferroni correction to evaluate pairwise comparisons among the five reflection groups.

4.1.5 Findings

4.1.5.1 Participants and Emotionally Challenging Games

Of the original 59 participants describing emotionally challenging gaming experiences, six had to be excluded due to responses not relating to a video game (i.e.

Table 4.2: Example used for scoring qualitative answers and corresponding representative responses from study participants.

Representative Response	**Reflection Level**	**Affective Patterns**
1) "I recall when Animal Crossing came out in 2020, I was very much addicted to building my own island. However it takes a lot of hours just to travel around other islands to retrieve resources. I was constantly stuck not knowing the correct steps to take in order to speed things up."	Non-Reflective Description	N/A
2) "I know I learned to accept that I can't win and walk away until I'm ready to try again. I don't know if I would consider that lesson coping, though. As I play, I still get frustrated and catch myself being explicitly aggressive (many WTFs and are you serious go on). I think the coping may be that every time I try to fight a boss after I die, I come up with a different strategy that might work."	Reflective Description	Emotional immersion, anger
3) "I learned that there are times when you are going to have to do things that are tough. As someone in the military, I have to deal with that quite often. So to me I learn to separate my feelings from the things that I have to do that will be mentally tough on me."	Dialogical Reflection	Emotional immersion, identification, emotional decision-making, empowerment
4) "I think playing the ending of the game *Red Dead Redemption 2* was quite an emotional challenge. By the time you reached the end, you really felt heavily invested in the main character Arthur Morgan. There's an intense gunfight right before a pivotal moment in the game. We find out that Arthur dies because of injuries and disease. It's especially emotional because you can only get this ending if you have high honor, which means you made very noble choices throughout the game ... I felt emotionally attached to the character. My actions shaped the ending. I learned that doing the right thing doesn't always lead to a happy ending. Made me think that I have to live in the moment and enjoy life while I can."	Transformative Reflection	Emotional immersion, emotional decision-making, empowerment, consequences of long ago actions
5) "Pretty much every decision in Dragon Age Origins. ...All of the experiences were moral dilemmas. There was no clear "right" answer, but potentially a "best" answer depending on one's own view of ethics/morals. For some of the decisions involving party members, there's a sense of connection to them and the fear that making the "wrong" choice will harm them or disappoint them or cause them to leave the party or end the relationship with my character. Basically, moral dilemmas with difficult consequences. Thinking through each situation and the potential courses of action reinforces the way that I think through ethical dilemmas IRL. So I guess it was maybe good practice in managing emotions/stress associated with decisions in a no-risk environment."	Critical Reflection	Emotional immersion, identification, emotional decision-making, empowerment, consequences of long ago actions, social dilemmas

real-life sports play). Within the remaining 53 responses, the age range from participants were from 18-66+ years old, with 28 who identified as male, 22 as female, and 3 as non-binary. Their years of experience playing video games ranged from to 3 years to 44 years. The games referenced by more than one participant as an emotionally challenging experience were *The Last of Us* (n=3), *Red Dead Redemption 2* (n=2), and *Undertale* (n=2). Though we initially expected mostly singleplayer experiences due to the focus on story emotional challenge, competitive and cooperative multiplayer online games (n=14) such as, *League of Legends* and *World of Warcraft*, were a notable portion. The most popular game genres included Role-Playing Games (n=44), Action Adventure (n=41), and Shooters (n=33).

4.1.5.2 Emotional Challenge Ratings

Through the nonparametric Kruskal Wallis H test, we found there be a significant difference ($\chi^2(4, N = 53) = 13.108, p < 0.011$, effect size= .252) in emotional challenge ratings across the five reflection groups. Descriptive statistics can be found in Table 4.3 and a matrix of post-hoc pairwise comparisons in Table 4.4. Apart from the transformative reflection group (mean rank=37.08, N=6) which was slightly higher than critical reflection (mean rank=36.80, N=5), the emotional challenge ratings/mean ranks progressively increased from lowest to highest levels of reflection (also observable through the means). Observing the ranks, it is clear there is a large jump (nearly double) in emotional challenge ratings from reflective description (mean rank=22.78, N=18) to dialogical reflection (mean rank=35.45, N=10) and above

levels.

Table 4.3: Emotional Challenge Ratings among Reflection Groups

Reflection Level	**N**	**Mean Rank**	**Mean**	**Standard Deviation**
Non-reflective Description	14	18.57	4.8214	0.67957
Reflective Description	18	22.78	5.0389	0.84376
Dialogical Reflection	10	35.45	5.72	0.75836
Transformative Reflection	6	37.08	5.8	0.56214
Critical Reflection	5	36.80	5.84	1.04547

Table 3.4 below displays the conducted post-hoc tests adjusted with Bonferroni correction to evaluate pairwise comparisons among the five reflection groups, in which the significant differences demonstrate that the reflection groups are distinct from one another.

Table 4.4: Matrix of Post-hoc Tests with Bonferroni Correction for Pairwise Comparisons across Reflection Groups

Non-reflective Description (ND)	1.0				
Reflective Description (RD)	0.444	1.0			
Dialogical Reflection (DR)	**0.008**	**0.037**	1.0		
Transformative Reflection (TR)	**0.014**	**0.049**	0.838	1.0	
Critical Reflection (CR)	**0.023**	0.072	0.873	0.976	1.0
Reflection Level	ND	RD	DR	TR	CR

4.1.5.3 Levels of Reflection

4.1.4.3.1 Non-reflective Description and Reflective Description The first two levels of reflection consist mainly of statements that describe what happened during the participant's gaming experience, i.e. mostly dealing with the emotion unrelated to the game's narrative. What differentiated reflective from non-reflective is simply whether the response included reasons for actions or interpretation, but in a reportive way [93].

For instance, in responses #1 and #2 from Table 4.2, while the participants

describe feeling frustrated, the reflection repeatedly focused on specific functional/mechanical aspects of gameplay, such as time, logistics, and strategy that impacted their experience. While there was *Emotional Immersion* in the response, it was largely due to the *Anger/Frustration* of losing.

4.1.4.3.2 Dialogical Reflection As discussed earlier, dialogical reflection is a step deeper into reflection by examining relationships. In response #3 from Table 4.2, it is clearly a deeper emotional reflection than the last responses, as it actually involves identification with events happening in the game and a perspective taken towards a lesson learned about emotionally coping.

4.1.4.3.3 Transformative Reflection Response #4 involves a participant who similarly goes through a process of perspective-taking, but with a focus on *Emotional Decision-Making*. They described struggling with the death of their main character, as choices they made led to this ending caused by having "high honor" in the game, seeing the impact of *Consequences of Long Ago Actions*. They end by saying that the experience has taught them that doing "the right thing doesn't always lead to a happy ending", so they need to practice being more present in enjoying precious moments in real life.

4.1.4.3.4 Critical Reflection While there were not many responses that achieved critical reflection due to its required depth, these responses represented the highest quality reflections we obtained. Response #5 was such an example of critical

reflection. The participant emphasized that their experience required a lot of *Emotional Decision-Making* that brought about moral/*Social Dilemmas* and *Sacrificial Action*, due to there being *Consequences of Long Ago Actions*. The way they deeply pondered over their decisions before making them meant they felt *Emotional Immersion* while they had *Empowerment*/agency over those decisions. Because the participant included a reflection on ethics and morals and expressed that they carried over this experience into real life outside of the game, the response was coded as critical.

4.1.5.4 Affective Game Design Patterns

Each participant response was coded according to referenced affective game design patterns. Figure 3.5 below displays the top game design patterns for each reflection level. The higher levels of reflection contain the patterns in subsequently lower levels. For example, all levels of reflection above Non-Reflective Description also contain the pattern Emotional Immersion.

4.1.6 Discussion

4.1.6.1 Emotional Challenge and Levels of Reflection

We found that there is a high significance in differences for emotional challenge ratings among the five reflection groups, i.e., critical reflection, transformative reflection, dialogical reflection, reflective description, and description (from highest to lowest quality) [93]. Upon closer inspection, we noted that the lowest

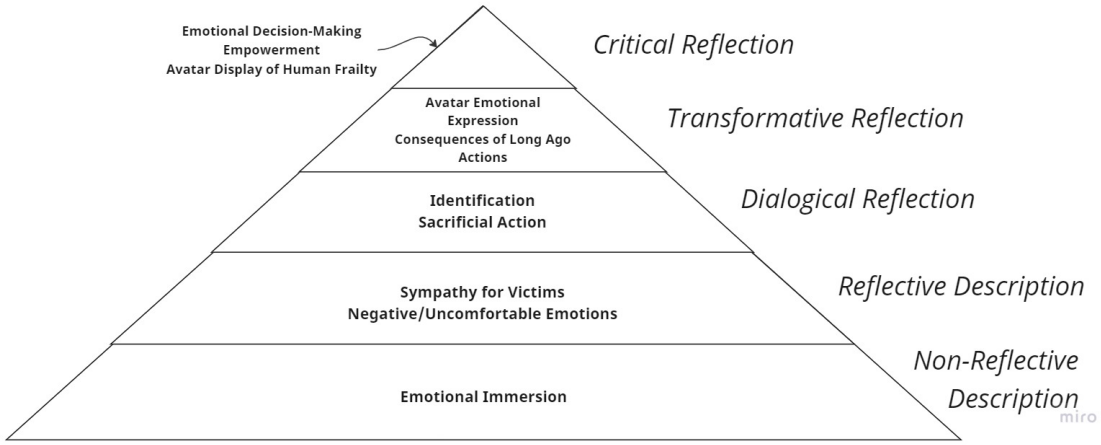

Figure 4.1: The top affective game design patterns by each reflection level.

level of reflection, *Non-reflective Description*, has the lowest mean rank of 18.57. It is in the dialogical reflection level that the scores for emotional challenge ratings greatly increase. According to Fleck & Fitzpatrick, dialogical reflection involves "searching for relationships between ideas and experiences in order to generalize from them and reach a different level of understanding" [93]. Therefore, it is at this level that thought processes shift from general descriptives to deeper reflection. This supports our assumptions that there would be a significant difference among the above reflection groups with respect to emotional challenge ratings and that they would increase from lowest to highest levels of reflection. These findings demonstrate that it can be inferred that *the more emotionally challenged participants felt about their gaming experience, the greater the depth of their reflection about it was.* This is crucial in furthering our understanding of reflective player experiences and how to better design for them, as it has been demonstrated from recent studies that video games do provoke complex emotions [28] and reflective experiences [167] that players enjoy.

It should be noted that we had somewhat different findings from Mekler et al. [167], in that they uncovered little to no instances of higher-level transformative and critical reflection, while we did uncover several instances. Upon further inspection, we believe that our different approaches to asking players to reflect had an influence on their varying responses. To reiterate, we gave a definition for "emotional challenge", whereas Mekler et al. [167] refrained from doing so and kept it broad. For our purposes, we chose to give a definition to ensure that participants had a baseline understanding of what we meant by emotional challenge since that is what we were measuring in our study. We do understand that this could have influenced the way players reflected; however, given that we still had a disproportionate amount of responses in the lower-level dialogical reflection and below groups, we do not believe that this skewed our results too much. Nevertheless, we do argue that our findings support Mekler et al.'s in that deeper levels of reflection from a game seems to require willingness from the player to think deeper and that may also require a trigger from within the game's design.

4.1.6.2 Affective Learning Game Design Patterns

Design knowledge on stimulating or induce deeper reflection through game design is still largely unexplored [134]. While ultimately, the levels of reflection do share affective game design patterns among each other, it is beneficial for game designers and researchers to know which patterns are useful for eliciting deeper thoughts and conversations among their players when designing meaningful play.

Figure 4.1 shows the top affective game design patterns for each reflection

level. Our results demonstrate that *Emotional Immersion* is at the core of emotionally challenging player experiences, as it was present from Non-reflective Description all the way to Critical Reflection. This is because one must first be emotionally immersed and present in order to feel emotionally challenged at all [15]. However, to achieve higher levels of reflection, it requires layers of emotional immersion, as broken down in the next subsections.

4.2.5.2.1 Empathy and The Value of Negative/Uncomfortable Emotions towards Eudaimonic Experiences Our findings support previous work that negative emotions lead to positive, meaningful experiences which players do enjoy [26, 167]. They also support Marsh & Costello's [161] previous work that found unease or discomfort provoked interpretative reflection in players. They also argued that "lingering" emotions post-encounter for players are important to encourage reflection. Recall that these types of reflective outcomes are related to the mixed-affect eudaimonic player experience [54].

When transitioning from non-reflective to *Reflective Description*, the most prominent affective game design patterns were *Sympathy for Victims* and other *Negative/uncomfortable Emotions*, such as guilt or sadness. Diving into deeper reflection levels clearly requires some type of trigger, such as inducing some mental or emotional discomfort in players.

Sympathy, guilt, and sadness are emotions that are related to empathy [87]. While a controversial topic, empathic processes can be deduced to three major

subprocesses: emotional simulation, cognitive/perspective-taking, and emotion-regulation [87]. This first step into reflection with empathetic emotions complements that initial emotional simulation and immersion that happens in the beginning of empathic processes. Therefore, it makes sense that the pattern for *Negative/uncomfortable emotions* first start to appear at the lower *Reflective Description* level, as this pattern acts as that initial trigger into deeper thinking for players.

Recall that there is a large difference in our findings for emotional challenge ratings from Reflective Description (mean rank=22.78, N=18) to Dialogical Reflection (mean rank=35.45, N=10). At the Dialogical Reflection level, the game design patterns for *Identification* and *Sacrificial Action* become more eminent. Hence, we argue that these patterns complement the cognitive/perspective-taking subprocess in empathic processes. *Identification* is linking or relating oneself to someone else or something in a game – whether that is the player-controlled character (PC), a non-player controlled character (NPC), or events that have occurred. *Sacrificial Action* is "prioritizing others' well being... ahead of the player's own character's well-being" [82]. Both affective game design patterns require perspective-taking to relate to aspects of a game and thus is why they appeared more frequently at higher level of reflections (dialogical reflection and above).

Similarly, the patterns *Avatar Emotional Expression* and *Avatar Display of Human Frailty* appeared often in the highest levels of reflection. The former describes facial expressions being responsive to game events or player actions, while the latter

describes including "less than optimal physical and mental traits in an avatar... [to] more closely mirror the reality of human life" [82]. These patterns serve more as stimuli to which players may react emotionally.

We then argue and support others' findings [26] that inducing difficult emotions do not have be shied away from. Psychological findings in fact have argued that "bad is stronger than good" [18], and that "negative" experiences often have greater impact than positive ones. This is not to say that positive game design should be avoided. Our findings simply highlight that to create emotionally challenging experiences in games, stimulating deeper reflection of negative/uncomfortable emotions through affective game design patterns should not be ignored. As more people are finding value in eudaimonic gaming experiences, identifying related patterns should aid in the design of emotionally-moving games.

Consider this survey response about an emotionally challenging gaming experience:

> "There is a section, early on in Assassin's Creed: Odyssey, where you have to choose between allowing a group of guards to kill an infected family to prevent disease, or kill the guards and save the family. The first time I played, I chose to save the family, I think because it related to me in such a way that I wasn't quite able to save my own family in a manner of speaking, so I thought that this would be the "right" choice to make in this situation.
>
> It turns out I was way, WAY wrong, much like I was wrong in my own life choice. The family I saved eventually died off, then the disease killed everyone else on my home island. While it doesn't change the overall narrative of the protagonist, it was nonetheless a bit of a gut punch to learn that Mr. Spock is usually right: the needs of the many outweigh the needs of the few. Or the one.
>
> [I learned] that not every decision that I make has right or wrong answers. Though it rings a little hollow, the truth is that sometimes you just have to make a choice, and live with the results of that. Both choices might be

> bad, but not choosing anything can be worse, and even debilitating. I know I made the wrong choice, but in the end, it may not have mattered, and really did the best I could at the time."

While the player experienced an emotional "gut punch" moment, it is clear that it led them to reflect on the choice that they made in the game and how that relates to a personal belief in real life. As challenging as it was, it was crucial for the player to see and empathize with the suffering of the characters for them to reflect on a deeper level about the experience.

4.2.5.2.2 Identification in Games Recall that identification is a pattern that started to appear more at the Dialogical Reflection level. Additionally, 26 out of 53 of games referenced were actually Role-Playing Games (RPGs), in which identification is a huge part of gameplay. According to Cohen [51], identification can be defined as a "process that consists of increasing loss of self-awareness and its temporary replacement with heightened emotional and cognitive connections with a character". In addition to a loss of self-awareness, identification also consists of "textual features intended to provoke identification" and "internalizing a point of view rather than projecting one's own identity". Since we did not specifically ask participants whether they were self-aware throughout their gameplay experience, we cannot make confirmations to this point of the identification process. However, we can for the latter two parts, as "textual features" can be equated to design elements in games (i.e. character, quest, and narrative designs) and "internalizing a point of view" can be equated to the five levels of reflection (from descriptive to critical). Both of which can

be obtained from the survey responses directly and contribute to experiencing emotional challenges in games. Therefore, it supports the fact that the *Identification* pattern becomes more prominent at the *Dialogical Reflection* level where players start forming connections between pieces of knowledge that they have gained. The connection between the in-game and out-of-game reality are forged when players begin to identify with characters and events happening in the game.

For example, consider this survey response when talking about a specific emotional challenge from *NieR: Automata*:

> "...one of the bosses was a strong, talented, and passionate opera loving robot who put in so much time and energy to become a great opera singer robot, because the robot who she saw as her true love didn't look her way as she got better and didn't love her as much as she loved him. So throughout the boss fight, you get little snippets that show scenes of the turmoil that led to her current state of a broken heart. The music gets louder and dramatic and the opera robot's singing starts to turn into screaming and her attack patterns get more sporadic...so when you take a second to connect the dots with this story that's unraveling in front of you, it's emotionally challenging to end her, as on one hand it sucks that she went through this experience and you can end her suffering. But on the other hand, I wished I was able to help her move on and let her know that there are and will be others who'll recognize and love her and her talents."

Through the detailed retelling of this particular scene using game design elements ("textual features") and alternative perspectives ("internalizing a point of view/not projecting their own"), this participant was not only more likely to identify with this character to a degree, but also faced an emotional challenge that influenced the way they experienced the game.

Building off of identification, with any relationship, there is a degree of emotional attachment. As Lewis et al. [152] states, emotional attachment can

encompass a variety of an individual's feelings that can influence the connection a player has with character(s). Bopp et al. [27] conducted a study that researched how emotional qualities may categorize the type of attachment players may have with video game characters. They characterized seven distinct emotional attachment types: "Cool and Capable," "Respected Nemesis," "Admired Paragon," "Crush," "Concern for one's Protege,." "Sympathetic Alter Ego," and "Trusted Close Friend".

Out of the seven types, Bopp et al. [27] discovered that three distinct emotional attachment types were consistently associated with PCs: "Admired Paragon", "Cool and Capable", and "Sympathetic Alter Ego". Bopp et al. [27] define "Admired Paragon" as characters that, "embodied virtues the participants aspired to be themselves... as role models to whom they look up to". "Cool and Capable" is defined as "feeling empowered, amused, and excited about a character's in-game capabilities". Lastly, "Sympathetic Alter Ego", which they characterize as when participants "felt sympathetic towards characters, because they felt they shared similar personal experiences with them".

One of our participants shared their experience when playing *Red Dead Redemption 2* as the PC, Arthur Morgan:

> "I knew going into the game that there was an emotional storyline but I was surprised by how invested in the characters I became. Having to try and hold the gang together and resolve Arthur's issues as he dealt with people outside the gang was tough. Arthur started out cold and hard but as the story progressed, I was to make choices that showed a softer side and ultimately decided how Arthur would meet his end either selfishly or sacrificing himself for others."

Despite already knowing the "emotional storyline", this participant was still able to become emotionally attached to the PC (Arthur Morgan) as they stated that it

was difficult to "hold the gang together (NPCs) and resolve Arthur's issues. . . " especially when making choices that led to them to see and experience Arthur change from a cold-hearted to softer cowboy. Hence, based on the participant's response, we can note that this participant's emotional attachment to the PC did correlate with the definitions of the top three forms of emotional attachment ("Admired Paragon", "Cool and Capable", and "Sympathetic Alter Ego") with a PC.

Hence, identification and emotional attachment through choices and/or actions can lead to unification with character(s), but also present emotional challenges through requiring the emotional intelligence to empathize with character(s).

4.2.5.2.3 Autonomy Above All As seen in Figure 4.1, the highest levels of reflection deal with a lot of autonomy-focused game design patterns, to include *Emotional Decision-Making*, *Empowerment*, and *Consequences of Long Ago Actions*. Coincidentally, Dormann et al. [82] previously argued that these three patterns are the most crucial foundations of social-emotional learning in games. We then argue that these above patterns are shared among deeper levels of reflection (e.g. transformative and critical reflection). Additionally, we then argue that these patterns are necessary to induce emotional challenge in gameplay, if one were to target a reflective player experience and a social-emotional learning gaming experience. One can then also assume that *Transformative Reflection* and *Critical Reflection* are the levels in which higher levels of learning occur for players. This furthers our understanding of how to best design serious games and games for learning.

These findings clearly align with previous work emphasizing the importance of autonomy in player experience, especially based on Self-Determination Theory (SDT) [2, 202, 224]. Players typically enjoy having autonomy and the freedom to make decisions as they please. Emotional immersion by itself is not enough to stimulate deep reflective player experiences. In the case of evoking emotional challenge, players must have the autonomy to be directly involved in game events and actively immersed in its emotionally complex themes. Whitby et al. [241] found that the intersection of narrative and game systems where players can actually perform the actions to make decisions as part of gameplay made for memorable perspective-challenging moments. Having the emotional themes of the game be passive and something to stumble upon by accident cannot guarantee that players will take away reflective meaning from gameplay.

To extend an earlier example, *Sacrificial Action* is one of the potential patterns that address an action being taken after *Emotional Decision-Making*. Action requires player *Empowerment*, which is "[when players feel] they can affect the events and final outcome of a game" [82], and results in *Consequences of Long Ago Actions*. When a player has the autonomy to sacrifice some aspect of their experience to benefit someone/something else in the game, it is a form of empathic process that takes place. It can then be argued that player autonomy is important when designing games for empathy as it stimulates a lasting reflective impact on players.

While autonomy in games is clearly important and often seeked out, it is often hard to design for "full" autonomy and therefore a somewhat rare experience.

Regardless, there are ways that games can be evaluated for their autonomy affordances even without giving players complete autonomy.

An example of how a game utilized a subtle lack of autonomy to emphasize its dramatic narrative can be seen in the following excerpt from one of our participants:

> "Largely personal trauma combined with a distinct lack of agency in that moment. My mother is an unreliable alcoholic. Conway's alcoholism is not subtle, it's a recurring thing that's brought up in the game. In previous scenes though you are given a choice whether or not to drink (or at least whether or not to focus on Conway's drinking) and I had always picked a different choice because I wasn't super interested in a story or an experience that revolved around alcoholism. You have no choice here. Conway will drink the expensive whiskey and take the job. You have to watch him self-destruct and there's nothing that you can do about it. It was viscerally unpleasant to me. This moment is vital for the game's story. It's central to what Kentucky Route Zero is about. But I felt powerless and furious at the game for making me make that choice in the moment. It was the marriage of me always having that choice before only to have it ripped away from me in that moment combined with just my general experience, I guess."

The player clearly felt emotionally challenged by the game placing their PC down a route that they were explicitly trying to avoid, especially because it related to a situation that matched their personal life. This use of a play on autonomy acted as a trigger for the player to connect the game deeper to reality and reflect on a personal level.

Hence, we advocate that through affective game design patterns, the inclusion of and focus on player autonomy design helps form more meaningful emotionally challenging experiences. However, just as demonstrated in the previous example, one needs to be mindful when it comes to autonomy design, especially in certain moments of games that are meant to be emotionally powerful as it can greatly

influence the message sent to the player base.

4.1.6.3 Multiplayer Emotional Challenges

Something we did not initially foresee was the significant representation of multiplayer online games in about 26% of our responses. We thought that nearly all of the accounts would be about single-player gaming experiences, as those games are primarily where emotional challenge design is more of the focus. However, there were many accounts that involved both collaborating with a team and competing against an opposing team (e.g. *League of Legends*). While many of the previously identified affective design patterns [82] were applicable to these scenarios, such as *Healing/Nurturing Others* or *Sacrificial Action*, we do argue that it would be worth pursuing the identification of additional new multiplayer-focused affective design patterns, given the domination of online multiplayer games today. An example response is as follows:

> "In the game Ultima Online you can become a thief character. You must balance your emotions to be able to steal from friends and keep your identity a secret. The game doesn't require that but to be a good thief you must steal and it makes people very angry. So playing a good thief meant keep my character a secret and stealing from friends at times. It is a challenge to keep in mind this is a game and not let your [sense] of right and wrong keep you from being the best thief you can be."

In the excerpt above, there is added complexity to the gameplay, as it occasionally requires performing a bad deed against a real-life person. Our findings support the concept of social challenge and/or demand [31,32,75], which is defined as "the extent to which a video game triggers an implicit or explicit response in the player to the presence

of other social actors." We argue that there is an additional layer that could be explored regarding emotional challenges when specifically playing with and/or against real-life players.

Though multiplayer games, especially competitive ones, often have the dynamic of adrenaline-filled emotions, it could still be useful to have affective design patterns and/or dynamics identified such as *Cooperation* or even *Revenge*. Such patterns could uncover how to best design for joint multiplayer reflective experiences, which is underexplored.

Overall, we argue that it is possible to design for eudaimonic gaming, such as reflective emotionally challenging experiences, through our identified affective design patterns. We hope that game researchers and designers alike can use this knowledge to effectively develop and research games with complex themes, serious games, and games for entertainment.

4.1.7 Limitations and Future Work

As some of our participant responses took a more player-centric focus for emotional challenge, we realized that there is a limitation in the existing academic definitions of "emotional challenge". Emotion in games is a highly subjective experience [119], and therefore, future work in emotional challenge research could potentially explore the expansion of existing emotional challenge definitions to consider how specific characters, actions, or objects may resonate differently with

different players. Similarly, terms in the current definition such as "captivating story" should be more clearly operationalized.

Regarding our quantitative findings, while our statistical results show that there is not much of a drastic numerical difference in emotional challenge ratings once one has reached the *Dialogical Reflection* level, one must also note that that may not be the case when a game is played at the level of hundreds or even thousands of players. So certain patterns, such as providing *Emotional decision-making* to players, may actually result in the deepest reflections (*Critical Reflection*) one gets out of their player base. However, future larger scale studies are necessary to delve more deeply into this question. Additionally, our smaller sample size when breaking participants up into reflective groups could also explain why there was not a strong separation once reaching the *Dialogical Reflection* level.

A survey is limited in terms of not being as qualitatively rich as interviews, where one can follow up on initial responses given by participants. Additionally, a survey is not able to capture the objective data that one could obtain by recording gameplay and then asking or listening to participants reflect on what they are experiencing. It also should be noted that the recall of emotional experiences is not the same as the actual experience of emotions. That is why, for future research, we propose an observation and interview-focused study, where one can engage with participants more closely.

We were also limited by the number of responses we were able to receive, especially given that the higher levels of reflection (transformative and critical reflection) are more rare and harder to obtain when asking players to reflect [167]. Therefore,

obtaining a larger amount of participants would still most likely yield a disproportionate number of lower and higher levels of reflection. However, given our N=53 is split into five smaller groups, our results should be viewed carefully. It would be interesting to have a larger sample size in future studies to see if the trend continues. Regardless, we were able to balance getting both the qualitative and quantitative data we needed for this current study through our survey.

4.1.8 Conclusion

There is growing interest in eudaimonic gaming outcomes, such as reflective player experiences. Previous work has found that players value both reflection and uncomfortable emotions of varying degrees when playing games. It is then clear that emotional challenge, or the task of presenting players with narrative conflict and complex themes in gameplay, has some impact on reflective player experience. Through survey analysis and applying the codes for levels of reflection and affective game design patterns, we answer how emotional challenge in games relates to reflection. Secondly, we answer what affective game design patterns are most important to stimulate reflective player experiences. We found that there is a significant difference and mean ranks increased across the five reflection groups, meaning that deeper reflections come with more emotionally-challenging experiences. Additionally, we found that autonomy-based and negatively-valenced game design patterns were most referenced in the higher-level reflections, which support previous work in the area. We use these findings to discuss implications for affective and

emotional challenge game design.

4.2 (Anti)Social: Exploring Emotional Challenges in Multiplayer Experiences

After the emotional challenge reflection study, it was intriguing that 26% of the recounted emotionally challenging experiences were unexpectedly from multiplayer games. This further expanded on the idea that challenge should be explored from a player-centric perspective. I was curious about what types of dynamics occurred among co-players in these challenging experiences. I wondered:

- How does sociality affect the emotional experience of games?
- What does emotional challenge mean in the context of social games?

Consequently, I conducted another survey study that addressed multiplayer gaming, inclusive of experiences that are competitive, collaborative, or tandem play in nature.

4.2.1 Background

Multiplayer games – both cooperative and competitive modes – enable feelings of relatedness to be met naturally through player-to-player interaction [14, 202]. It was found that satisfying the need for relatedness promoted a sense of presence, game enjoyment, and intention for future play [105, 202]. Therefore, it is apparent there are benefits to understanding multiplayer gaming experiences deeper.

Though there is existing research on the topic, much of it falls underneath the subtopic of cooperative gaming specifically because of its prosocial goals to encourage participation, collaboration, and communication [104,209,228]. Researchers have found that "cooperative team play promoted feelings of cohesion, which activated trust (i.e., the expectation of reciprocal cooperation), which in turn increased cooperative behavior" [106]. Other studies had similar findings in that cooperative actions in-game promoted helping and other prosocial behaviors in general [69,77,78] as well as increased interest, engagement, and motivation [62,192].

To address the research gap regarding negatively-valenced interaction dynamics in games, we asked players about what was emotionally challenging in gameplay relating to the game's narrative, difficulty level, and social elements through an exploratory survey. Additionally, it is important to note that we explicitly did not name the dynamics "positive" and "negative". While one can almost always correctly assume that "prosocial" dynamics relate to mostly positively-valenced experiences, it still depends on the combination of a game's specific design and individual players' orientation traits as to how a player will experience a game (e.g., if negatively-valenced emotions will be perceived positively [25,26,28,65,66,68]; see subsection B in section V for specific examples and discussion).

4.2.2 Related Work

4.2.2.1 Multiplayer Gaming

One of the earliest works we found in cooperative game design research addressed game mechanics, split between cooperatives design patterns and challenge archetypes [199, 209]. The following were the **Design Patterns for Cooperative Games** found by Rocha et al., 2008 and Seif-El Nasr et. al, 2010:

1. **Complementarity**: Players play different character roles to complement each others' activities.

2. **Synergies between abilities**: Allows one character type to assist of change the abilities of another.

3. **Abilities that can only be used on another player**: Enforced to encourage cooperation between players. An example in *Team Fortress 2* where medics can heal other players.

4. **Shared goals**: A pattern used to force players to work together, like in *World of Warcraft*, where a group of players are given a single quest with a shared goal.

5. **Synergies between goals (Interlaced/Intertwined goals)**: When players have different goals, a way to force them to cooperate is to have synergy between their goals.

6. **Special rules for players of the same team**: When actions have different effects when done on a friendly player (e.g., Friendly Fire modes).

7. **Camera setting**: Design for how a camera is shared in co-op games (e.g., split screen horizontally/vertically, one character or all characters in focus, etc.)

8. **Interacting with the same object**: Providing interactive objects that can be manipulated by characters' abilities.

9. **Shared puzzles**: Similar to shared goals; general category for all cooperative design puzzles.

10. **Shared characters**: Providing a shared Non-Player Character (NPC) that players can assume, such as in the *Lego* videogames.

11. **Special characters targeting lone wolf**: NPC characters that target players who work alone.

12. **Vocalization**: Embed automatic vocal expressions on player characters that alert of challenging events, encouraging cooperative and supportive play.

13. **Limited resources**: Encourages players to share or exchange resources to reach the same goal.

While these design patterns are extensive, the works only examined cooperative games to uncover them. With the foundation that has been set down by cooperative gaming research, we can now address the gaps – such as also in competitive gaming contexts and games across different genres.

4.2.3 The Relationship between Emotional and Social Challenge

It is clear that introducing sociality in a game adds an additional layer to the emotional experience of players [130]. Much of player experience research focuses on positive affect and "fun" [55]; therefore, related research on challenge has stayed fairly orthodox as well, meaning that it is typically examined from the perspective of performative challenge or difficulty. That is, until the rise of emotional challenge research. While challenge in games is typically understood as being determined by skill or dexterity, Cole et al. [53] used the term "emotional challenge" to differentiate challenge that targets "the core pleasure for the player" as the "resolution of tension within the narrative, exploration of ambiguities within the diegesis, or identification with characters, that is...achieved...with cognitive and affective effort". In other words, the foundation of emotional challenge is built upon emotional and intellectual engagement with an unfolding game narrative [110].

Early research in the area demonstrated that players also enjoyed experiencing negatively-valenced emotions [26,119]. They also found that emotional challenge evoked a wider range of negative emotions and was appreciated significantly more by players compared to traditional challenge [28]. The ways players were emotionally challenged included "confronting difficult themes, grappling with tough in-game decisions, and by having to keep in control of their own intense negative emotions" [28]. Recall that this type of mixed-affect experience is related to what Cole & Gillies call the "eudaimonic gameplay experience" [55].

While there are many prosocial aspects of multiplayer gaming, there are also anti-social dynamics that are underexplored. The most widely discussed topic in this area deals with undesired behaviors such as multiplayer online toxicity that is prevalent in highly competitive games [19, 162]. However, there is a gap in understanding what other less extreme "antisocial" dynamics there are when sociality is introduced in a game. Some social dynamics may not be perceived as "prosocial" but they still clearly play a part and add to the challenging experience of multiplayer/social game design.

As of now, it is unclear what role emotional challenge or the eudaimonic player experience has in the context of multiplayer/social gaming. As sociality can heighten emotions in a game [130], it is important to explore how players perceive emotional challenges in social gaming scenarios.

4.2.4 Rationale for a Survey

While the rationale to use a survey is similar to the previously discussed study, it was particularly helpful in the case of researching something that is understudied. As we wanted to identify as many independent themes as we could from our data to cover a broad range of non-singleplayer gaming experiences, using a survey allowed us to reach a larger number of players of different experiences that we did not initially account for (e.g. tandem play).

4.2.5 Methods

The goal of this study is to explore how players experience social and emotional challenge when playing games with other people. We aim to understand the relationship of emotional challenge and social challenge. To do this, We wanted to understand what players perceive as "emotionally challenging" in relation to a game's narrative, difficulty level, and social elements. While the concept of emotional challenge had been primarily examined through singleplayer experiences, there is much to be explored about the ways that people play and perceive games together. As games are now accepted as an interactive form of media to experience a wide range of emotions [25, 119], it makes sense that people want to increasingly share those experiences with each other.

As this is an exploratory study, we do not want to head in with explicit expectations or hypotheses, instead letting our analysis and insights emerge organically from the data. However, there are a few expected results based on existing literature of games; we anticipate a similarly wide range of responses containing a variety of emotions that people feel when playing with or against others [130]. We also expect that players typically experience more intense social and emotional challenge in competitive scenarios versus cooperative scenarios [141].

We recruited 40 participants through university affiliated and personal social media recruitment posts (e.g., Discord, Twitter, Facebook, Reddit, Slack, etc.). The only conditions for participation were that participants have experience playing games with at least one other person and that responses needed to be in English.

As the goal of this study is to be exploratory and generative on our understanding of the variety of ways players experience emotional challenge in social/multiplayer games, we employed a Qualtrics questionnaire with open-ended questions about perceived challenging experiences when playing social/multiplayer games. Specifically, to obtain a wide diversity of responses, we asked participants to recall an instance where they played a game with someone else, state the title of the game, and then reflect upon their experiences with respect to three different prompts:

1. How was the game's story/narrative emotionally challenging?
2. How was the game's difficulty/required level of skill emotionally challenging?
3. How was interacting with other people emotionally challenging?

Participants were free to write, with as much or as little detail, about any experience in their responses. After describing their experience, participants completed a player orientation trait survey on Trait Model of Game Playing Preferences [227] to give us context on their player traits.

After collecting the data, three researchers took part in the analysis process. We utilized a thematic analysis approach [36] because this enabled us to take the data that we collected as a whole from the survey and arrive at organized themes and ideas. This contrasts the grounded theory approach that we used in earlier works where it was a continuous process of coding and analysis during data collection. With the obtained data, we conducted consensus coding, or independently inductively coded, [44] the written portion of the survey responses. This resulted in 40 unique

codes total. Examples of codes included: “incompatible playstyles", “imbalance of skill levels", “competition strain relationship", and such. To resolve differences in the independent codes, the researchers discussed until agreement was reached on code definitions. To calculate the player orientation trait scores, we averaged overall ratings related to narrative orientation, challenge orientation, goal orientation, and aesthetic orientation.

4.2.6 Findings

4.2.6.1 Participants

The 40 survey respondents we attracted were quite diverse. Regarding age breakdown, we had 18 participants in the 18-25 years old category, 14 participants in 26-35 years old, 5 in 36-45 years old, and 1 46-55 years old. Regarding gender breakdown, we had 19 who identified as female, 15 as male, 3 as nonbinary, and 1 who preferred not to say. We also kept track of average player orientation trait scores using the Trait Model of Game Playing Preferences [227], and we found that out of 7, ranked highest orientation trait to lowest, respondents scored an average of 5.68 for aesthetic orientation, 5.58 for narrative orientation, 4.75 for goal orientation, and 4.57 for challenge orientation. Therefore, we can assume that our respondents having a relatively high score for narrative orientation meant that many of them care about the emotional impact of a game relative to its story.

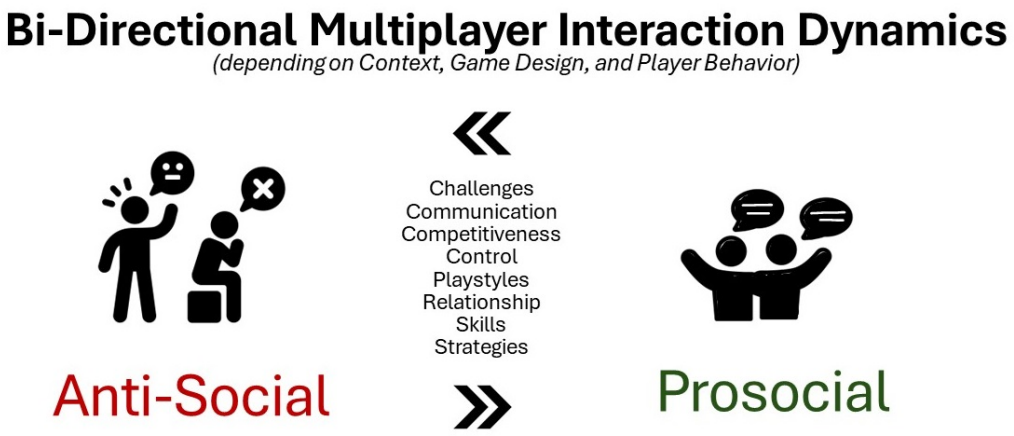

Figure 4.2: The factors in multiplayer interaction dynamics named in the middle either lean towards being prosocial or anti-social depending on the game context and player behavior.

4.2.6.2 Prosocial Dynamics in Multiplayer Experiences

Through our analysis, we were able to identify dynamics in social game settings that lead to prosocial behaviors (in alphabetical order). While some of these dynamics could also induce emotional or social challenges when pushed past a point, they mostly result in supporting the bond and rapport between players. Additionally, while the dynamics **goal-setting**, **role assignment**, and **similar skills** support a few of the previously mentioned "Design Patterns for Cooperative Games" [199, 209], the majority were novel with respect to understanding emotional challenge in social/multiplayer games.

1. **Discovery/learning**: When players explore and learn new parts of the game together. This is related to research on collaborative learning through games, where members of a group achieve common goals while they are learning [246].

2. **Encouragement**: When players vocally and/or implicitly (through in-game actions) support each other. This is related to research on social support in games, where emotional connections form between players [98].

3. **Familiarity with co-players**: When players know their partners, whether as friends or family. This is related to research that compares the player experience when gaming with familiar people versus total strangers [86].

4. **Goal-setting**: When players determine a joint objective(s) to reach. Related to "shared goals" and "synergies between goals" [199, 209].

5. **Healthy competition**: When players compete for fun without toxicity. This is related to research on ethics of competition in social/multiplayer games [181] and whether they are healthy or not [52].

6. **Motivated by game story**: When players are emotionally attached to the narrative and are encouraged to see it through together (more narrative-oriented). This is related to research that discusses a missing gap in stronger storytelling elements in multiplayer games [154], such as this paper itself.

7. **Real-life relationship gain**: When players use gaming together to keep up with their relationship in real life. This is related to research that examines gaming friendships and how they affect offline social support [79].

8. **Roleplaying**: When players identify with their respective controlled characters.

This is related to research that examines character attachment in games, where pro-social players feel a greater sense of control over their characters [30].

9. **Role assignment**: When players take on roles and responsibilities in a team. For example, someone is a tank and the other is a healer. Related to "complementarity" [199, 209].

10. **Shared decision-making**: When players discuss decisions together, leading to deeper reflection on their actions. While this is related to research on moral decision-making in games [238], much of this work is only studied from a singleplayer perspective.

11. **Similar playstyles**: When players have styles of playing that match. For example, players are both prone to not taking the game's goals too seriously (less challenge-oriented). This is related to player orientation traits research [227].

12. **Similar skills**: When players have skill levels and powers that match. For example, both players are at the experienced/veteran level. Related to "synergies between abilities" [199, 209].

4.2.6.3 Anti-Social Dynamics in Multiplayer Experiences

We were also able to identify the following dynamics in multiplayer game settings that lead to anti-social experiences. Notably, while many of these anti-social dynamics are intuitive or well-known within the gaming community, such as **toxicity** [19] or **over-competitiveness** [235], in a social/multiplayer emotional

challenge context the **fighting over control**, **real-life relationship strain**, and **setback** anti-social dynamics are particularly novel and warrant future study.

1. **Cheating**: When players participate in unfair tactics in gameplay. This is related to research that explores player motivations behind cheating in games and how it impacts the player experience [197].

2. **Communication issues**: When players struggle to talk with one another leading to friction. While much of social/multiplayer gaming research focuses on positive prosocial outcomes for in-game communication [4], there is a gap in understanding how a lack of effective communication affects social-emotional challenge.

3. **Conflicting strategies**: When players have clashing mental models/ideas/strategies that lead to inefficiencies in gameplay. This is related to research that examines conflicts that arise when there are differences in motives and ways to reach resolution [214].

4. **Dissimilar playstyles**: When players have clashing styles of play that do not typically mesh well with each other. For example, someone is goal-oriented but the other player has a more leisurely approach. Like **similar playstyles** (prosocial), this relates to the study of player orientation traits [227].

5. **Dissimilar skills**: When players have severely different levels of skill, often leading to a range of frustrations. Like **similar skills** (prosocial), this relates to the lack of "synergies between abilities" [199, 209].

6. **Fighting over control**: When players struggle with deciding who takes charge over decision-making. While there is research that says varying degrees of interdependency [90] in shared control does not greatly affect the player experience [225], there is not much explored about having low or conflicting interdependency in games.

7. **Real-life relationship strain**: When players carry their emotions from the game into real-life and negatively impact their relationship. While there is plenty interest as to how multiplayer game usage in general relates to one's social capital and offline friendships [229], there is not much research on how the player experience itself influences the in-game to out-of-game relationship between co-players.

8. **Sabotaging**: When players intentionally hurt other players, whether on the same team or not. While some have grouped this dynamic with toxic behaviors [248], it is worth examining more specifically as it arises even with same-team scenarios, especially when players are frustrated with their performance.

9. **Setback**: When players lose or miss a set goal. Frustrations often increase after each subsequent setback/failure. When researching failure, over half of the accounts from players were from multiplayer experiences [100], which implies there is even more to learn about how players perceive joint failure and how parts of it are attributed to the team versus the individual.

10. **Toxicity**: When players are engaging in harmful behaviors with each other,

typically verbally. As mentioned before, this is commonly studied in games research [19].

11. **Over-competitiveness**: When players participate in toxic-leaning behaviors when competing with one another. This is also commonly studied in games research [141].

4.2.7 Discussion

4.2.8 Refining "Social Challenge"

We found that there is strong support for the concept of "social challenge". Most of the accounts of emotionally challenging experiences were referred to in relation to a game's difficulty level (physical/performative or cognitive challenge) being affected by sociality in a game and/or a game's social elements themselves (social challenge). While this does support the notion that social challenge can be considered a challenge subtype [75], we argue that our findings still prove it worthy to better define what social challenge is.

Our reworking of its general definition is *"challenge that requires the socioemotional skills to collaboratively or competitively interact with other human or AI players".* Let's break this definition down quickly. Saying that social challenge requires interaction skills is obvious, but adding whether the approach is through collaboration or competition sets the scene for what types of interaction dynamics take place (anti-social or prosocial). Secondly, the word "socioemotional" emphasizes that

social challenge requires a level of emotional intelligence (e.g. reading other players' hidden motivations or emotions). While that has similarities to skills required from emotional challenge, it is distinct in that it involves the management of others' feelings. Another aspect of the definition that is important to call out is that these interactions can be with human or AI players, as even understanding NPCs' feelings and intent requires socioemotional skill.

4.2.8.1 Relationship between Prosocial and Anti-Social Dynamics

As mentioned earlier in the introduction, the dynamics of prosocial and emotional challenges in games can vary depending on the game design and player traits/goals. For example, the dynamic of **sabotaging** in a game could be either all in good fun (prosocial) or souring the dynamic between players (anti-social). In other words, there is a line in which a prosocial dynamic crosses into an anti-social dynamic, or vice versa.

We argue that this emphasizes that game designers must carefully consider what type of dynamics they intend to foster through their designed gameplay. For example, it might be intentional that in a game, **fighting over control** is a core part. In other words, an emotionally challenging anti-social dynamic was something that was intentionally designed for. We give this example to clarify that we are not advocating for game designers to avoid anti-social dynamics. Doing so can actually result in interesting unique gameplay, such as incorporating **communication issues** and **conflicting ideas** into the party game *Keep Talking and Nobody Explodes* (2015).

However, we must be careful as we found that these anti-social experiences are often linked to feelings of frustration. There are dynamics such as **toxicity** that are more extreme than others and should probably not be encouraged when designing a game. Online gaming toxicity has been found to relate to racism and sexism [101].

4.2.8.2 Narrative's Role in Multiplayer Experiences

4.2.4.3.1 Reflection on Choices An aspect of the social demand required when playing with others is the awareness that someone else is cognizant of your actions. A quote from one of the participants highlights this concept below:

> "Yes, the story made us murder an innocent elephant. I had to force my friend to keep playing and continue the story. The dwelling on our actions with another person actually made it more challenging because the act of killing the cute elephant felt more real. The game doesn't give us a choice, but with another person playing, it does feel like there's a choice, maybe with just not playing the game." - Participant 11

Participant 11 reluctantly took ownership for their actions, because the game required player action towards the murder of this elephant to progress the game. Whitby et al. [241] similarly found that the combination of narrative and game systems resulted in consequences that prompted player reflection. The addition of sociality into decision-making in a game is underexplored. It is intriguing that the addition of another person's perspective gave more weight to player actions, making it 'more real'. This relates to the dynamic of identifying with their controlled characters or **roleplaying**. We call for more research to be done on **shared decision-making** in games to understand its impact on the emotional challenge experience.

4.2.4.3.2 Lack of Emotional Challenge via Story in Multiplayer Games Most respondents stated that the game story/narrative did not affect much of their emotional experience in the surveyed multiplayer games. Many of our participants shared the sentiment in the quote below:

> "There wasn't a storyline or narrative in *Teamfight Tactics*. If there were background lore and story significance to the games we played, I did not engage with them or look for them at all. As for an emergent narrative from gameplay, it was only somewhat emotionally challenging." - Participant 28

However, there is one game worth noting that came up as an exception – *It Takes Two*. The game is a story-heavy co-operative two-player video game. The premise of the story deals with a little girl dealing with the impending divorce of her two parents. What most likely makes the game stand out is that the game story and mechanics/level design are tightly coupled, often containing visual and auditory aesthetic references to love and partnership. Even though the game contained traditional performative (physical) tasks and cognitive puzzles, the game story literally provided emotional context for the presented challenges. There is also a diegetic reason given to motivate why two players must work together, even reflecting couple's therapy themes. This enabled players to be **motivated by the game story**, which increases overall engagement with a game [210]. While this is just a brief analysis on the game's emotional power, it makes sense that players felt emotionally challenged by the game story in this case.

This brings up a question as to why most of the other multiplayer games did not succeed in providing players the traditional narratively-motivated emotional

challenge. We assume that it is because game design for social games focus more on the performative (physical), cognitive, and social challenge side of things. We call for the creation of more emotionally story-driven multiplayer experiences alongside traditional social games to enrich the diversity of games we can play with others.

While most of interactive digital storytelling research focuses on the singleplayer experience, Spawforth and Millard [222] reimagined the singleplayer *Dark Souls* as a multiplayer narrative. They found that it is possible to have asynchronous and synchronous effects on other players' story outcomes based on choices that one makes. While we have a long way to go to realize this type of futuristic gaming experience beyond interactive text, it is inspiring to see research that values social-emotional aspects of the multiplayer experience.

4.2.8.3 Who You Play With Matters

We observed that it ultimately matters who it is that you are playing a game with. It has a great effect on the emotional experience that one might have. We found that the following factors affect the player experience: skill level comparison, playstyle comparison, and relationships between players.

4.2.4.4.1 Skill Level Comparison The most mentioned dynamic between co-players was that regarding the comparison of player skill levels. This seemed to be something that players were very conscious about when playing with others. We especially noticed this among players that self-identified more as novices in the game that they referenced.

See the following quotes about feeling like an amateur player compared to other players:

> "...that's because compared to my friends, I'm fairly new, so I feel a bit behind and would often feel bad about burdening the team or getting 'carried.'" - Participant 26

> "being bad in crucible feels bad. you just know you're doing poorly and everyone else is more skilled than you. being bad at the story is frustrating because the narrative feels locked to those not at a skill level." - Participant 33

Negatively-valenced emotions such as frustration, guilt (about being "carried" by teammates), or shame were commonly talked about in our responses among those who were novices. In contrast, a positive perspective about differing skill levels benefiting gameplay progression was offered by the following participant:

> "Luigi's Mansion 3. The last time I played this game I was stuck on a boss that I was having a lot of trouble with and it had been stressing me out. My friend offered to play goo Luigi and help me beat the boss and it was so much easier with another person! It was cool we did it together but it also felt like it wouldn't have been possible at my skill level to do it on my own, despite it generally being thought of as a single player game." - Participant 24

Because referencing skill levels was so common in our responses, it is clear that **dissimilar skills** induces some emotional challenge in players. We argue that emphasizing achievement-focused game design is beneficial towards fostering highly-competitive environments. However, one must be careful when emphasizing skill level differences among players during onboarding, if you desire creating an environment that is inclusive to novices and/or appealing to players who are less challenge- and goal-oriented.

While much of multiplayer games rely on similar skill-based matchmaking to keep game outcomes balanced [233], there could be value in mixing up skill levels to

achieve different types of social experiences, like the dynamic of **discovery/learning**. This could be similar to the way that some guilds in MMORPGs operate, based on mentorship of new members.

4.2.4.4.2 Playstyle/Player Traits Comparison Another factor that affects social dynamics in gameplay is playstyle or player orientation traits. According to Tondello et al. [227], players can have different levels of being challenge-, goal-, aesthetically-, narratively-, or socially-oriented. For example, if co-players have vastly opposite levels of challenge- and goal-orientation (**dissimilar playstyles**), they are likely to experience tension, as one would be focused on completing game goals while the other might not be as focused or invested in outcomes. In the participant quote below, they describe their frustration playing with someone who had a different playstyle from them:

> "I understood that the friend that was causing disruptions was trying to enjoy the game in his own way, but his playstyle was causing my other friend and myself distress. We eventually had to set some rules for using the shared resources, which he eventually complied to." - Participant 12

Shim et al. [213] found that information about player motivations (similar to playstyles) helps better predict whether a player will enjoy a game in multiplayer settings. It is clear that the dynamic of playstyles greatly affects the player experience in social games.

4.2.4.4.3 Relationships between Players We found that the relationship of players impacted the type of player experience one had. In the quote below, the participant describes how playing with their friends (**familiarity with partners**) positively affects

the style of gameplay behaviors for the group:

> "Valorant - Playing with friends makes the game a lot more fun than playing with strangers in my opinion. We often fool around, and sometimes try to damage each other all in good fun. When we play more seriously, it feels like there's more pressure but because the atmosphere is trusting and supportive, it makes it become a more positive experience in the way that if we make a mistake, it's fine and no one really gets punished for it emotionally." - Participant 14

In contrast to the positive effects above, this participant below describes the tension that can arise in your real-life relationship when playing with someone you are close to:

> "My sister and I don't compete with one another very often because it has damaged our relationship in the past. So even though we weren't directly competing on the same screen, we were aware of one another's scores." - Participant 8

Eklund [86] found that it is important to distinguish social gaming contexts according to the relational status of co-players: family, friends, or strangers. They found that gaming becomes part of everyday life as players adapt its forms to fit their evolving lifestyles. So regardless, there is indication that the nature of the relationship you have with your co-players is just as important as other game details (e.g., modes, platforms, etc.) in affecting the type of experiences you have in a game. Overall, it would be interesting to study the interrelationships across relationship closeness, skill level, and player trait dynamics and their effects on the player experience.

4.2.8.4 Support for Tandem Play Experiences

Lastly, we also found support for the concept of tandem play. Tandem play is defined as "when two or more players engage with a single-player game together,

moving through the game with a variety of potential motives" [56]. In the participant quote below, they describe focusing on the story while their friend focused on the game mechanics during tandem play:

> "Danganronpa V3: Killing Harmony- I voice called a friend who was playing the actual game, and we navigated through the storyline together. It was really fun for me because I don't do well with the actual action parts of game play (I have really bad eye-hand coordination), so it was enjoyable to engage in the visual novel and storyline without having to stress about the mechanics. My friend was interested in the story and also enjoys playing other games, so he said he liked being able to go through the entire game. Overall, I found it more fun than playing alone – it was nice to share the experience with someone else, and see how other people reacted to the same story. I also found that we noticed different clues, which was extremely helpful when doing class trials and other problem-solving parts of the game."
> - Participant 22

Delegating roles to each co-player based on individual gaming strengths is just one strategy to progress through a difficult singleplayer game. While that is one of the more active forms of tandem play, there are also tandem play experiences where there is one main player while others are "just watchers" or observers [184].

We call for further study into tandem play experiences, as this appears to be a more common gaming situation than one might initially think. It would be interesting to have a study where one had different combinations of playstyles/player orientation traits and observe how they handle tandem play. For example, seeing how a high narrative-oriented player will interact with a low narrative-oriented player in a decision-making game.

4.2.9 Limitations

Given that we used a survey to collect our data, we were not able to dive deeper into the responses that our participants gave and relied on how much they were willing to share. Therefore, some responses were longer and more in-depth while some were relatively short. Additionally, we should note that because we framed our questions from the "emotionally challenging" perspective, that could have influenced the way in which players reflected about their gaming experiences. However, as anti-social dynamics are lesser studied, we believe that this did add value to our findings.

4.2.10 Conclusion

Anti-social dynamics in multiplayer gaming research are lesser studied than prosocial dynamics. Therefore, we conducted an exploratory survey through the lens of what players consider "emotional challenging" in their gaming experiences relating to the game's narrative, difficulty level, and social elements. We discovered patterns in multiplayer interactions that we called prosocial and anti-social dynamics. We also found that it was common for multiplayer experiences to inspire reflection on one's decisions, skill level, and playstyles. We argue that these findings reveal venues for further research into those topics to expand our knowledge on social-emotional challenges in multiplayer experiences.

Chapter 5

Discussion

Chapter 3 discussed my work in performative challenge, and **Chapter 4** discussed my work in emotional challenge and social challenge. Synthesizing the findings from these works together resulted in a reworking of the definition of "challenge" and some challenge design recommendations.

5.1 A Player-Centric Definition of "Challenge" in Games

As mentioned before, Adams defined challenge in games broadly as "any task set for the player that is nontrivial to accomplish" [3]. Denisova et al. [75] defined "perceived challenge" as "a player experience that arises from one's interaction with a game's intrinsic challenges at a particular skill level". While these are broad enough to include a wide variety of experiences, they are actually too broad to operationalize. While Denisova et al. [75] addressed this indirectly by developing definitions for each challenge type, there still isn't a definition of challenge that is player-centric and clearly

inclusive of the different challenge types.

Refining the definition of Challenge (in games) resulted in **"an aspect of the player experience, in which literal or abstract obstacles must be engaged with, usually through some combination of performative, cognitive, emotional, or social skills".**

Let's break this definition down. Firstly, defining challenge as "an aspect of the player experience" identifies it as just one of the player experience "functional constructs", or one of the "immediate experiences as a direct result of game design choices" [2]. So while challenge is considered by many to be the heart of the player experience, my research has shown that there are other player experience constructs that are important to consider as they are also affected by modifying challenge (and failure) design components, such as mastery, autonomy, and the like (as discussed in *Chapter 3*).

In comparison to Adams' definition that presents "challenge" as a "task", the new definition presents it as a player experience construct, meaning that it exists as part of a larger experience or system. This contrasts Denisova et al.'s definition, which says that it is a "player experience", meaning that it is referencing the overall gaming experience. My new definition aims to present challenge as something in the middle of a granular task and overall player experience.

Secondly, "literal or abstract obstacles" in the new definition serves to identify the possible forms that challenges can take. Literal obstacles refer to those that are more physical in nature, such as the Intelligent, Environmental, and Interactable obstacles

identified in our platformer failure design taxonomy. These obstacles are typically more associated with inducing performative challenge. Abstract obstacles refer to those that are more vague and/or cognitive in nature, such as the Mental Obstacles (e.g. puzzles, story-line decisions) identified in our macro-level taxonomy on challenge and failure processes. These obstacles are typically more associated with inducing cognitive or even emotional and social challenge.

Both Adams' and Denisova et al.'s definitions do not refer to the ways in which challenge can appear to players. Adams simply says that challenge is any "nontrivial" task, which does not provide any signals as to what to look for to identify a challenge. Directly saying that a challenge exists as a type of obstacle that a player must engage with should help to identify what the challenges are in a gaming environment.

A subtle part of the definition in "obstacles must be engaged with" is meant to be open-ended in service of a player-centric perspective. This phrasing leaves the interpretation open to both player-defined and game-defined goals by not prescribing the type of engagement that needs to happen for challenge to occur. Players have the autonomy whether to restrict themselves to the game's rules or to break those boundaries out of rebellion. Players can even create their own self-imposed goals or rules within a game. Down to the bare minimum, the perception of challenge only requires that players experience something, typically in the form of obstacles that are either generally physically challenging or mentally challenging.

Lastly, emphasizing that challenges can be overcome by some "combination" of different skill types aims to drive home that challenge design in games doesn't have

to consist of solely one challenge type. For example, multiplayer games can consist of a combination of social challenge, cognitive challenge, and performative challenge in the form of quiz party games like *Jackbox Games*. Additionally, while challenge types are distinct from one another, it is clear that they have relationships with each other, such as demonstrated in *Chapter 4's* discussion on what is considered emotionally challenging in social(ly challenging) games.

This part of the new definition builds on Denisova et al.'s definition that says challenge "arises from one's interaction with a game's intrinsic challenges at a particular skill level". However, the new definition takes it a step further by identifying what types of player skills are commonly targeted by challenge design.

Overall, this definition aims to be inclusive of the multidimensional aspects of challenge and both its hedonic and eudaimonic outcomes that I explored throughout my works.

5.2 Challenge Design Recommendations

In this section, I provide some recommendations towards challenge design that were summarized from my explorations into performative, emotional, and social challenge works.

5.2.1 General Challenge Design

- *Challenge design should be focused on designing a desired end-to-end emotional journey for players to embark on.* Regardless of whether a challenge is

performative, social, or emotional, from the start, we must consider that a challenge should spark an emotional reaction from players. They must feel motivated or inspired to attack that challenge, or even make up their own player-defined objectives as they go. As the game loop (or "mini failure loop" from *Chapter 3*) continues on, players are faced with subsequent challenges that should vary in intensity. To achieve flow, there must be a balance of emotional highs and lows in gameplay. Lastly, all journeys come to an end. We need to be intentional with what type of memory a game leaves players with (e.g. ending with emotional reflection on choices made during the game or with the sentiment that the game was really hard and rewarding to beat).

5.2.2 Performative Challenge Design

- *Be careful not to overload players with constant insurmountable challenges.* As some games take pride on their intense difficulty levels, I am not advocating that games have to just be easy. In fact, notoriously difficult games have large loyal followings for a reason. However, these games still have rewarding mechanisms or aspects for each player attempt at tackling challenges. Providing constant hard challenges without goals to strive for is a difficult sell for most players, even those who are highly challenge-oriented.

5.2.3 Emotional Challenge Design

- *Player actions and choices should be impactful to the game events and/or outcome to promote a sense of autonomy.* Players typically enter a game with the goal of wanting to affect its events through a series of subsequent decisions. For decision-making games, this is obvious and literal. However, there are also subtle ways in other game genres where something like the pattern of *Consequences of Long Ago Actions* show up. When players feel that their actions have made an impact in the game, they feel rewarded and are more likely to reflect on their emotional experience as a whole. This makes for memorable gaming experiences that leave a mark.

5.2.4 Social Challenge Design

- *Whether you are fostering a competitive or collaborative environment, ensure that the social affordances provided are appropriate for the intended emotional experience of interaction dynamics during the game.* Social games vary in intensity, whether it is Player versus Player (PvP) or Player versus Environment (PvE) or both. While it is difficult to design a game that accommodates all playstyles, a game designer can help manage the interaction dynamics that occur by either increasing or decreasing the ability for players to interact and/or communicate. This affects the ways players can work together or against one another in multiplayer games.

Chapter 6

Conclusion

6.1 Key Limitations

The works that were described in this dissertation were meant to be generative and not dependent on specific psychological theories, as the space is still relatively underexplored. Additionally, as I reflected on my work, I realized that it is primarily focused on the post-game experience, such as eudaimonic outcomes like reflection and evaluating the player experience after a gameplay session. I want to emphasize that there would be value in seeing whether any of these results change when obtaining and analyzing live "in-the-moment" data, such as in-game player reflections. I would have also loved to collaborate with expert player experience and challenge researchers (and game designers) to consider multiple perspectives when developing the new challenge and type definitions. Overall, I hope my work inspires the games community to look into these aspects.

6.2 Lessons Learned

I learned a great deal throughout the five years of research work that comprised this dissertation. In the literal sense, I learned how to action on my many research questions, with the help of my advisor and colleagues. But most valuable to me was learning how to imagine and think beyond the boundaries of our current understanding. I will forever be grateful for this opportunity to freely explore my love for the gaming experience.

6.3 Future Work and Applications

- Regarding **performative challenge**, it is possible to explore the use of our challenge and failure taxonomies in further player experience studies. Other types of experiments would be interesting involving unexplored PX constructs.

  One could also explore how challenge design relates to player traits and/or learning styles in the context of educational games.

- Regarding **emotional challenge**, one could explore the use of our identified affective design patterns towards further study of reflective player experiences.

  I also pose that the definition of emotional challenge could potentially be revised to be more operationalizable.

- Regarding **social challenge**, one could use our identified prosocial and especially anti-social dynamics to further study social challenge.

It would be interesting to see how different types of players make decisions together in tandem play settings.

I also believe that looking deeper into tandem play would be beneficial to understanding other related topics like livestreaming.

6.3.1 Interactive Eudaimonic Experiences

I can only hope that any part of my work can eventually help make a small dent towards better understanding challenging game design. However, I am particularly interested in seeing where future research in socioemotional aspects of challenge design goes. I believe that discovering how to better engage people in interactive and immersive forms of media can lead to more meaningful (eudaimonic) experiences. I am especially optimistic about the capability of immersive forms of media that blur the lines between gaming and movies to help promote education for a variety of societal issues. I believe that reflection can be powerful.

6.3.2 Social Virtual Third Spaces

While in-person connection is irreplaceable, I also believe that investing in understanding the design social virtual spaces is valuable. Naturally, I believe that incorporating playful game design elements into these spaces can help foster social connection. I also think that games should increasingly be designed to afford shared meaningful (eudaimonic) experiences.

6.4 Last Thoughts

This dissertation work has found and addressed the gap in existing definitions of challenge and its effect on how we as a games research community conduct research related to it. While there is still much to uncover about challenge design, my hope is that any part of this work can be used towards more effective emotional game design and promoting the value of meaningful eudaimonic player experiences.

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