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Introduction

SUSAN E. RIVERS

As I prepare this issue of *Journal of Games, Self, & Society* for publication, we are in the midst of a global pandemic due to COVID-19. My home office now includes my three children—ages 7, 11, and 14—who are doing distance learning as schools are shut down across the country, in addition to my husband who runs a school and is working all hours to foster community across and between hundreds of families and educators. I'm finding that now more than ever games are a powerful tool for creating connections amongst us as a family and also with those from whom we are physically distant.

Games hit us where we are human. Gameplay is social. It is emotional. It is intellectual. Stories in major news outlets that once warned of the dangers of video games have been replaced with stories of how video games can carry us through a quarantine of undetermined length, supporting us in the fear and loneliness that for many of us has been unknown. Gameplay is entertainment, and it also keeps our minds active while providing a space for friends and family to meet and share joy, collaboration, and competition. Games can help us escape the confines of our homes and travel to new lands, both realistic and fantastical. I am inspired to read stories published in major news outlets about these and other benefits of gameplay during this time of social distancing. I am curious how this particular moment in time will inspire and compel game designers, scholars, educators, and parents. How will gameplay change, and what new games will emerge in the months ahead?

With *Journal of Games, Self, & Society*, we encourage interdisciplinary research, conversation, and community around games. Experts from many disciplines serve as peer reviewers for the articles published in each issue. The five articles featured in this issue span the space of theoretical, analytical, and empirical approaches to uncovering and exploring how games, game design, and gameplay contribute to a deeper understanding of learning, mental wellness, and humanity.

In "Existential, Transformative Game Design," Professor Doris Rusch, also a game designer, proposes that games can "contribute to a meaningful life." Drawing on literature from existential psychotherapy and mythmaking, Rusch urges game designers to create new myths in their games as a way to explore existential ideas—ideas that concern the human experience from death to freedom to isolation to meaninglessness—in pursuit of finding meaning. It is through exploring existential ideas in game design that games, she writes, "have the power to transform us on a deep, existential level." Game designers can find inspiration by turning to existential psychotherapy to create experiences that promote meaningful engagement. She offers, in her article, a framework for designers.

In "Systems at Play: Game Design as an Approach for Teen Self-Expression," Professors and colleagues, Matthew Farber and Mia Williams, examine how facilitated game design can be used to support teens in exploring and expressing their lived experiences as well as how systems are structured. Their qualitative analysis of the games created by teen designers utilizes the Mechanics-Dynamic-Aesthetic Framework (Hunicke, LeBlanc, & Zubek, 2004) to identify themes of present interest and concern for teens. They describe the set of games teens created during a summer workshop, and suggest that constructivist approaches to learning have promise to support teens' social and emotional development, and self-expression in particular.

Two papers in this issue provide careful case studies of two games, one exploring how digital games can serve as a memorial following the death of a loved one and one examining how game mechanics can be used in novel ways to represent a human experience. In "Physical Death, Digital Life, and Post-Self: *That Dragon, Cancer* as a Digital Memorial," Professor Gareth Schott presents *That Dragon, Cancer* as an example of how a novel approach to game design fosters empathy through the use of mechanics

that enable slowing down and preservation of moments, versus racing through to a win state. *That Dragon, Cancer* uses mechanics, Schott observes, in ways that work counter to what we have come to anticipate in more traditional gameplay. This subversion is what allows for deeper reflection on the nature of coping with a dying child. Schott explores how designer Ryan Green documents the loss, hope, and grieving of his son through a digital game, in ways that offer an extension of his son's life beyond the too few number of years he had.

The second case study, "Experiential Depression and Anxiety Through Proceduralized Play: A Case Study of *Fragile Equilibrium*," comes from Professor Andrew Phelps and his colleagues. They examine *Fragile Equilibrium* as an example of a game design approach that uses metaphor to represent mental health states, and depression and anxiety in particular. Instead of concrete characters or narrative structures, *Fragile Equilibrium* leans into experiential gameplay to facilitate player empathy for the struggles of managing mental health issues. Their analysis of *Fragile Equilibrium* applies Rusch's (2017) earlier work on deep games. Phelps et al. offer a framework as a design space for how representation, from literal to metaphorical, and use of avatars, from realistic to abstract, can inspire game designers to explore the complexity of mental health and games.

The final article in this issue is "Mechanical Experience, Competency Profiles, and Jutsu," by graduate student Sasha Soriane and Professor Jacque Carette. Their work aims to fill a gap in the literature around the accessibility of mechanical challenges in games. To better understand challenge profiles offered in games, they present a framework for describing the accessibility of a subset of challenges. Their documentation of the physical skills required to complete exemplar mechanical challenges is extensive, and offers an important step in designing mechanical challenges that may be more inclusive of players with different levels of mobility. Considering the accessibility of players at the margins (i.e., those with limited mobility) may spark design innovations. This article offers an approach to taking such accessibility needs into account in the design process.

In the face of daily uncertainty during the COVID-19 pandemic, I do find hope in the creativity, innovation, and design choices put forth by the

scholars and designers included in this issue. I wonder what novel games and design approaches will emerge both from the scholarship published here and in the coming days of unprecedented social isolation.

March 25, 2020

Boston, MA

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CHAPTER 1

Existential, Transformative Game Design

DORIS C. RUSCH

ABSTRACT

This paper explores an approach towards creating existential, transformative games—games that contribute to a meaningful life. It takes its departure from existential psychotherapy and proposes to draw on its main themes and goals to inform the conception of game ideas and gameplay experiences. Making an argument for the function of myth to communicate existential ideas in a way that speaks to the unconscious and affects intrinsically motivated, personal change—change that is based on psychological resonance rather than imposition or force—it investigates strategies for game designers to create new mythologies.

Keywords

Existential psychotherapy, transformative game design, psychological resonance, myth, unconscious, dream, active imagination

INTRODUCTION

When I speak of existential games—games that contribute to a meaningful

life—my main frame of reference is existential psychotherapy. According to existential psychotherapist Irvin Yalom (1980), the human experience is characterized by anxiety, stemming from the "Givens of Existence" or "Ultimate Concerns": death (life is finite), freedom (we have to make choices and it is unclear what they should be based on), existential isolation (we are all ultimately alone in this universe), and meaninglessness (life has no inherent meaning, we have to find our own). A meaningful life is one in which a person has faced and accepted the inevitability of death, developed a sense for their purpose or calling, focused on making self-directed choices that are in alignment with their true nature, and cultivated quality connections to things beyond their self. Another key figure in existential psychotherapy, James Bugental (1992), wrote, "Viewed from an existential perspective, the good life is an authentic life, a life in which we are as fully in harmony as we can be. Inauthenticity is illness, is our living in distorted relation to our true being." (p.246).

Games have the power to transform us on a deep, existential level. One of the most famous and striking testaments of this is the letter that (then) 15-year old Sophia sent to Jenova Chen after she played *Journey* (Thatgamecompany, 2012) with her dying father:

> Your game practically changed my life (...) My father passed in the Spring of 2012, only a few months after his diagnosis. (...) In my dad's and in my own experience with *Journey,* it was about him, and his journey to the ultimate end, and I believe we encountered your game at the most perfect time (Takahashi, 2013).

For Sophia, *Journey* is an existential game. It contributed to making her (and her father's) life more meaningful by way of contemplating death and experiencing the preciousness of life and connection. My goal in this paper is to explore how we can create more games that do this without merely trying to re-create the ones that already exist. Please note, I do not believe there is a recipe or easy formula we can apply that will lead to mind-blowing, profound, life-altering games. There is, however, a lot of ground to be (dis)covered between going about game design as the modeling of systems in a systematic way (that follows a repeatable framework) and a purely intuitive approach that relies on a designer's genius or tacit knowledge. What I am proposing here is between the poles of following

rigorous, rational processes and opaque, artistic exploration. This article will help map the territory of existential, transformative game design and provide orientation for designers interested in intentionally designing games that contribute to a meaningful life. This relates strongly to the mission of the *Journal of Games, Self, and Society*: to foster a deeper understanding of humanity—and possibly its thriving—through games. This paper sketches out salient areas of exploration. No doubt it will still leave much to be discovered in future work.

First, please note that what I am proposing here is not that games shall become substitutes for existential (or any other kind of) psychotherapy. Neither do I want to engage in a discussion about the parallels and differences of the transformative mechanisms and potentials of games and therapy or whether games by themselves can *be* therapy. I am not excluding this possibility, but it is neither my focus nor my goal in this paper. What I am proposing is for designers to be inspired by salient themes and concepts from existential psychotherapy to create evocative, expressive games that provoke a meaningful engagement with the Givens of Existence, and—as Joseph Campbell (1991) wrote in regards to creative mythology—allow players to "respond to them of themselves, with recognition, uncoerced." (p.3).

After a review of relevant, existing work, I will discuss how the overarching themes and goals of existential psychotherapy can inform experience goals for games that contribute to a meaningful life. I will then make a case for myth as inspiration source for existential themes and provide practical guidelines and strategies on how to tap the unconscious to create new mythologies for games. I will further discuss the concept of "psychological resonance" as established by psychiatrist Erik Goodwyn (2012, 2016, 2018). I propose designing for psychological resonance as a means to prompt intrinsically motivated and personalized transformation as an alternative to the approach of many games for change that aim to change players in specific ways, determined by the game's creators or other stakeholders. Note that for simplicity's sake I use "games for change" to subsume all flavors of transformational games, including educational games, serious games, empathy games, training simulations, behavior change games, games for health, citizen science.

THE KNOWN SHORE

The following section is an overview and critical discussion of existing research that is relevant for an existential, transformative game design framework. It investigates the capital "T" Transformational Framework by Culyba (2018) and its limitations. It discusses the contribution of reflective game design (Khaled, 2018) and existential game studies (Leino, 2010; Möhring, 2013) for the design of games that contribute to a meaningful life. It then turns towards existential psychotherapy, myth, and ritual as inspiration sources for existential games and indicates the gaps in existing games research in that regard. Finally, it points towards a key concept in existential, transformative game design, psychological resonance, and explains how existing games research has acknowledged the importance of resonance for design that is relevant to players' lives, but understood it in a very different way.

The Capital "T" Transformational Framework and its Limitations

Before we can dive into where we are going, we need to discuss where we are coming from. First and foremost, this concerns the notion of transformational game design. Transformation has become a staple of the Games for Change discourse, with more and more games, game design approaches or whole labs being labeled "transformational" or "transformative." Sabrina Culyba (2018), author of *The Transformational Framework* and principle designer at Schell Games, explains that, regardless of any specific topic, *transformational* is meant to be "an inclusive term that can apply to any game where the intention is to change the player" (p.15). She acknowledges that any game has the potential to be transformational, but that Transformational games with a capital T are those designed with the explicit intent to change players in particular ways and beyond the gameplay experience itself. That means for a game to deserve the adjective "Transformational," the change ignited within the reality of the game (e.g., a new skill, behavior, attitude) must be transferred to real life. Furthermore, the change needs to persist beyond the time the player engages with a game. Intention, transfer, and persistence are

thus the three cornerstones of successful, Transformational game design (Culyba, 2018).

This definition makes good sense for many games in the games for change category. It also helps to label games as purposeful products with concrete uses, which increases their respectability and marketability to educational, therapeutic or other wholesome institutions. This is why the Transformational Framework has – in my experience as someone who has been heavily involved in this domain as a researcher and designer for the last 15 years – won significant influence in this domain. It further implies the expectation and / or promise that the change ignited by such a game can be measured. If we know exactly in what regards we want to transform players, and how to design for it, we should be able to clearly assess whether our design accomplished its goal, whether the change transferred to real life and persisted over time, or not. If we are not able to assess that, we cannot say with certainty whether Transformation happened. In a space where the most prominent question (and the most relevant question to secure funding and ensure institutionally-supported dissemination) seems to have become "can you prove it works?", the pressure is on to design for capital T Transformation.

Here is the rub, though: The kinds of change that we can pinpoint, design for, and assess so clearly with the Transformational Framework are limited. Or as Paolo Pedercini put it more boldly in his keynote at the 2014 Games for Change Festival, "Making Games in an F*** Up World," "the kinds of change we can clearly measure are not all that interesting." Yet, it is the dominant kind of change in the games for change community, particularly when we focus on games for (mental) health. This is supported by an extensive state-of-the art systemic content analysis of games for health conducted by Lu and Kharrazi (2018). Out of 1552 analyzed games, they found three levels of claimed influence: raising awareness for an issue (904 games, 58,27%), behavior change through change of intention / attitude towards a health issue (139 games, 8,95%), and changing the behavior directly through playing the game itself (509 games, 32,78%). These three types of change—awareness, attitude and behavior change—are arguably the most measurable. They are hardly, however, the only types of change possible or worthy of designing for. For one, they do not cover the kind of

profound transformation that can ignite subtle, elusive, uniquely personal, internal shifts that are based on what resonates with players, rather than change that is pre-defined and determined by the designers.

Tying up to Reflective Game Design and Existential Game Studies

Complementary work that influenced my thinking around transformation through games, and games that contribute to a meaningful life, is Rilla Khaled's (2018) research on reflective game design. Her theory revolves around the concept of *critical reflection*, which she explains as:

> (...) an interrogative process in which we critically assess the validity of presuppositions on which our beliefs have been based or how problems are posed or defined in the first place. Critical reflection is therefore less specifically focused on teaching us how to do, and more on how we make meaning, particularly concerning normative views, judgements, propositions, beliefs, opinions or feelings. It is less focused on product and more focused on process (p. 6).

Khaled (2018) observes that Serious Games often lack a reflective element. Instead they focus on presenting players with challenges that have clear solutions to be arrived at in safe environments. She finds this approach to be insufficient, particularly when it comes to, "games on subject matter more philosophically inclined or subjective in nature—a game about empowering individuals on how to escape the conditions of homelessness should not have correct answers" (p. 8).

This could not be truer for existential games, because—according to existential psychotherapy—the meaning we give to life is complex and uniquely personal. We find our own meaning. It therefore does not make sense to try and dictate answers about how we are supposed to live or connect, be, do or choose. It is more fruitful, instead, to stimulate contemplation and reflection of these matters, to raise questions and to design for open-ended, ambiguous, and unclear problems beyond measurability that prompt players to explore and possibly re-evaluate their own perspective. For designers of existential, transformative games, this means de-emphasizing an obvious, evaluating game structure and staying away from interpreting the value and meaning of gameplay actions for players, e.g., by using point systems or giving other clear indications of

right and wrong or good and or bad. Sicart (2009, 2013) made a similar argument in regards to designing games that prompt ethical contemplation. He states that, "those games in which agents just need to understand the procedural rules that determine the game state, without thinking about the actual moral implications of their actions, are deeply flawed in their ethical design" (Sicart, 2009, p. 199).

My argument for the potential of games to contribute to a meaningful life in an existential sense is further informed by the research of Olli Leino (2010) and Sebastian Möhring (2013). In his dissertation, Leino (2010) views *game* as interactive conceptual metaphor for "life" and argues for the similarities between "being in the world as humans" and "playing a game as player" (p. 11). Based on this metaphorical connection, Leino investigates the gameplay experience through an existential lens by taking departure from games' materiality. This materiality imposes a certain "gameplay condition" on the player, akin to the "human condition," with its Ultimate Concerns that is imposed on all of us by the existential givens of "life." Möhring (2013), building on Leino, also makes a case for the a-priori existential nature of games due to their spatiality and existential themes of struggle, war, love and failure. I concur with Leino and Möhring that there is a natural relationship between games and their engagement of salient aspects of the human condition through their existential structures and themes (Rusch, 2018). It has to be noted, though, that this does not make games automatically existentially meaningful to players. As I said before, "if games ubiquitously embody existentialism, this quality becomes invisible. Like the water is invisible to the fish. It doesn't lend itself to deliberate exploration or insight" (Rusch, 2018, p. 2). We still have to deliberately design for games that contribute to a meaningful life. These games have the potential to orient us towards, and possibly reconcile us with the Givens of Existence.

BUILDING ON EXISTENTIAL PSYCHOTHERAPY AND MYTH / RITUAL GAME RESEARCH

This is where this work goes beyond existing research and adds the perspective of existential psychotherapy, which is concerned with the purposeful investigation and contemplation of the Ultimate Concerns. By

borrowing from existential psychotherapy, its transformative goals and means of reaching them, existential questions and themes become the intentional driving force of the design, rather than merely being inherent in the a-priori nature of games.

Myth and ritual have been used extensively in existential humanistic and archetypal psychotherapy (e.g., Feinstein & Krippner, 1988, 1997; Hillman, 1996; May, 1991; Larsen, 1996), because they happen to be pervasive existential navigation and personal calibration tools. Previous research on the role of myth and ritual in games mostly explored their social, cultural, narrative, or aesthetic function (see Rusch, 2018 for an in-depth review of existing work). In my preceding article, I argued for investigating and leveraging the psychological and spiritual function of myth and ritual for existential game design. With the exception of noteworthy theoretical and practical design work by Whitney "Strix" Beltran (2012, 2013) that harnesses depth-psychology, specifically mythical archetypes, for identity exploration in role-playing games, this is an area that has as of yet remained under-explored in game design research. Here, I attempt to tie up to the discussion of *why* myth and ritual are fruitful inspiration sources for existential games by expanding on *how* we can create original mythical content and thus stimulate psychological resonance in players.

The Concept of "Resonance"

The notion of resonance in transformational game design (particularly learning games) is at the core of the book *Resonant Games. Resonant Games* (2018) was edited by Klopfer, Haas, Osterweil and Rosenheck, leading figures of the Education Arcade, a learning game research group at the Massachusetts Institute of Technology. Despite its title, this work has little to do with the kind of resonance I am proposing here. For one, Klopfer et al. focus on learning games designed for young people in and around the learning environment of the American public-school system. These games are about scientific and mathematical concepts as well as real life problems. While existential issues could be counted as a "real life problem," existential game design—at least as I am developing this concept here—is not what MIT's Education Arcade is focused on. I am after *psychological*

resonance in the existential games I am talking about, which is something else entirely.

Based on the highly interdisciplinary research of psychiatrist Erik Goodwyn (2012, 2016, 2018), psychological resonance refers to a deep, unconscious recognition and activation of archetypal patterns through symbols and imagery. Psychological resonance is at the root of the same kinds of mythic, symbolic, and ritual ideas popping up time and time again all over the world, across all cultures. It is the key to understanding "what makes one ritual more likely than another to be repeated across generations?" (Goodwyn, 2016, p. 33). Psychological resonance is about *what* speaks to us (as humans) and *why* it speaks to us, on a deep, unconscious and universal level. Understanding and harnessing psychological resonance is key to designing transformative existential games because of their emphasis on awakening our authentic self, aligning us with what rings true for us, so we can identify our own pathways to bliss, uncoerced and to our own terms. More on psychological resonance later.

TOWARDS AN EXISTENTIAL, TRANSFORMATIVE FRAMEWORK

Identifying Experience Goals: The Shortcomings of MDA

It is safe to say that games created for an audience (in contrast to, for example, games that are purely (self-)explorative), at some point in their concept and prototyping phase, develop a goal for what they want to convey or evoke in that audience. They articulate and then triangulate around an experience goal. This notion of designing for an experience goal is at the core of one of the most wide-spread game design methodologies, the MDA Framework (mechanics, dynamics, aesthetics), developed by Hunicke, LeBlanc, and Zubek (2004). This methodology has been developed to guide designers through the process of prototyping, testing, and iterating by hinging on the *aesthetics* they want to achieve with their game, "the desirable emotional responses evoked in the player, when she interacts with the game system" (Hunicke et al., 2004, p. 2). The key thought is that if you know what you want the player to experience, you can reverse engineer that into the game's *mechanics* that—by way of gameplay

dynamics (the emergent behavior of the system in motion)—will bring about this aesthetic experience. The MDA approach aims to keep the design process coherent and ensure that all the game elements contribute to a known, common goal. Any design issues that emerge can be traced along the continuum of mechanics, dynamics, and aesthetics, which helps the process of iteration.

The MDA framework makes creating gameplay experiences sound deceptively simple. It is not. Apart from two people not having exactly the same experience when encountering anything—including a game—the difficulty already starts with clearly defining what kind of experience you set out to design for. Jesse Schell (2008) wrote:

> And this is the paradox of experiences. On one level, they are shadowy and nebulous, and on another, they are all we know. But as tricky as experiences can be, *creating them is all a game designer really cares about.* We cannot shy away from them, retreating into the concreteness of our material game. We must use every means we can muster to comprehend, understand, and master the nature of human experience (p. 10).

Many designers want to fast forward to making the game rather than staying with the abstract. Taking the time to really, truly grasp what it is that one wants to conjure in the possibility space of the game is terrifying. The philosophical engagement of the game's subject is not seen as part of making the game, perhaps because it involves a lot of thinking with little playable output to show for at first. If you're goal is to make a game, delaying the "making" part for the sake of a deeper understanding of its subject can be unsettling and anxiety inducing. It is thus frequently shortchanged. I want to create some room for this here and hope it will get designers' creative juices flowing.

Examining Existential Psychotherapy Goals to Inform Game Experience Goals

James Bugental (1990) referred to *existential psychotherapy* as "life-changing therapy." Existential psychotherapy is not about providing a cure; indeed, it rejects a medical model of mental illness where patients are treated to restore a previous status of health. Existential psychotherapy is about

achieving something the client never truly had before—e.g., an authentic sense of identity, deep connection, or sense of calling. This lack eventually started to present as an issue of varying severity, from discontent to crippling depression. Existential psychotherapy can be seen in juxtaposition to solution-focused therapies. Life-changing therapy goes below the surface of (fixing) symptoms to emphasizing self-awareness and targeting the root cause of a personal issue, which is assumed to be linked to one of the Givens of Existence (death, meaning, freedom of choice, isolation, identity). Existential psychotherapy also shall not be mistaken with psychoanalysis, where the therapist is the expert of a patient's problem and presents them with an interpretation of what their issue is. Existential psychology is often informed by humanistic psychology, a form of therapy developed by Carl Rogers in the 1940s. Humanistic psychology is known for its client-centeredness. This means it is non-directive: the therapist does not direct the client towards a particular kind of change or tell them what to do. Instead, the client is empowered to take the lead in the therapeutic process. Existential humanistic psychotherapy supposes that the client is the expert of their own experience and that they inherently gravitate towards growth, healing, and fulfillment of their potential. The therapist is there to hold space, help the client identify areas of growth, and to guide explorations of alternative ways of acting and being to overcome personal obstacles. The fact that Rogers (1951) used the term *client* instead of *patient* also points towards his bias against diagnosing and labeling people as sick. A client-centered approach requires the therapist to be authentic about their feelings in a session, and to have unconditional positive regard for the client. The client is met where they are, not with an assumption of who they are supposed to be (Rogers, 1951).

Applying existential humanistic psychotherapy principles to existential, transformative game design means that the game does not target the change of a specific symptom, behavior, or attitude. Instead, it aims to provide a possibility space to explore and contemplate the game's bigger themes based on what resonates with players at a given point in time. Goals of existential psychotherapy as described in *Counseling Theories for Human Service Practitioners* (Gladding, 2014) that can inform these themes are:

- Making clients sensitive to their existence.
- Calling attention to clients' unique traits and characteristics.
- Helping clients improve their encounters with others.
- Assisting clients in establishing a will to meaning.
- Encouraging clients to make a decision about both present and future directions in life. (p. 40)

These goals of existential psychotherapy are not game experience goals yet. It would be foolish of me to try and dictate these goals, because I would always only be able to give a limited selection of them. I believe existential psychotherapy can inspire many kinds of games that give rise to many, many different kinds of gameplay experiences that can contribute to a meaningful life. Instead, I aim to prepare the ground from which myriad existential game design ideas can sprout by discussing how existential psychotherapy goals and their underlying philosophical tenets can be critically and creatively engaged. I use a phenomenological lens for that, embracing introspection and subjectivity alongside further insights from existential philosophy. I am also focusing on more generally philosophical goals (rather than the ones that require specific engagement with a particular client), because they lend themselves more to a translation into game design. Games, after all, are designed for an audience, not customized for one, individual player.

Existential Psychotherapy Goal: "Making Clients Sensitive to Their Existence"

When I think of my own experiences, key factors of becoming aware of my own existence are: an increased focus on the here-and-now and possibly a bodily felt sense of what is currently going on with me or around me; a decrease of Ego and its silly, daily struggles for the sake of seeing a bigger picture; and a sudden glimpse of the finiteness of life that makes it feel more precious. Now, these are the things that come up for me when I contemplate this existential psychotherapy goal. Someone else may have different associations. But if it were me aiming to design an existential game, I would continue to ask: what are the situations or circumstances

that allow for these factors to be activated? Experiences of awe come to mind: the vast quiet of the Baltic sea on a summer evening; feeling tiny in a redwood forest; huddling under a blanket on the porch at 5am with my four-year old cuddled up beside me; listening to nature waking up around us; and watching the sunrise. In all of these examples, the experience is characterized by a tension between joy and grief—joy for the moment, grief for its fleetingness. This tension commands giving a moment full attention. There are no other goals to attend to, no conflicts to deal with. It is being in a state of *active being* rather than *being active*. In the context of a game, this means avoiding elements that will compete for a player's attention and that reinforce contemplation in subtle ways.

Game Example: Every Day the Same Dream

Journey has done a great job of evoking awe through its gorgeous environments and playing with the theme of impermanence throughout. A completely contrary example of a game that artfully plays with raising awareness for one's existence is Molleindustria's *Every Day the Same Dream* (2009). In this short, black-and-white, single-player game, you play as a man who is stuck in the daily, soul-crushing routine of a dead-end life with a dead-end job and seemingly dead-end marriage. Every day you get ready in the morning, leave the house, drive to work, and do work. The bleakness of the scenario is in stark contrast to the experiences of awe I referenced above. The radical absence of something is also a way to draw attention to it. What makes this game so existentially painful is the triviality of its content, particularly the events and choices that disrupt the daily routine: taking a different path to work, seeing a leaf fall, a cow in a field, or a homeless person. Those little deviations stand out because everything else is so dull and they raise the question: "How pathetic is my life? Where can I take a different path, before it's too late?" As such, *Every Day The Same Dream* also relates to the existential psychotherapy goal of encouraging clients to make a decision about their present and their future life directions. It does not make any suggestions about what kinds of decisions a player should make. It just points out what happens if you allow life to lead you, rather than the other way around.

Every Day The Same Dream is an example of an existential game that shows

that we do not have to give players tons of compelling choices in order to facilitate contemplation of the responsibility we all have for creating the best or most meaningful life we can. The emphasis, I believe, should always be on giving players just enough to stimulate their own thoughts, to ask the big questions themselves, and take those questions or considerations into their real lives where their choices truly matter. As a general note, none of these musings about existential experience goals should be taken as directive. I believe the most powerful designs happen when their origins have been forgotten; when the ideas have been taken in and percolated and mixed with one's own experiences and become part of a bigger whole, a bigger worldview, and then emerge naturally as something you simply feel you have to express. This is particularly true for the next goal.

Existential Psychotherapy Goal: "Calling Attention to Clients' Unique Traits and Characteristics"

This goal has to be interpreted with a good portion of creative freedom. For one, playing a game with (more or less) pre-defined characters is different from exploring one's own traits in a therapy setting. Yet, we know that exploring identity is one of the strengths games have as a medium—by playing as someone else, we can get in touch with unconscious aspects of our personalities or explore how our values and beliefs map onto that of the character we are projecting ourselves onto (Gee, 2003). Due to their flexibility in character creation and enactment, there are big opportunities here in (live action) role-playing games, and thus they are being used more and more for purposes of personal development and self-inquiry by counselors, social workers, and spiritual leaders. Austrian game scholar, Katharina Mittelböck, (2018) wrote insightfully about role-playing games as personality development tools from a psychoanalytic perspective. The most fruitful identity exploration games do not make this function obvious; they tend to have some other focus.

Game Example: Bluebeard's Bride

The investigatory horror tabletop role-playing game, *Bluebeard's Bride* (Magpie Games, 2017), asks players to play as different aspects of the bride

character and as such has a strong component of exploring personality traits (or, to use the Jungian term: complexes). It is not *only* about that. It is how this identity exploration is embedded in the horror tale and how the game creates discussion between the players on how to respond to the various threats they encounter in Bluebeard's mansion that makes it a fascinating and evocative experience. Unsurprisingly, Whitney "Strix" Beltran, one of the game's designers and writers, has a background in depth and archetypal psychology—an approach to understanding the human experience by way of its unconscious aspects and psychological universals, i.e., archetypes. Beltran's (2019) talk on *The Power of Elegant Archetypes* in the Narrative in Games Summit at the Game Developers' Conference shows that she was clearly aware of how archetypal psychology informed *Bluebeard's Bride*—particularly the conception of the sisters as complexes that make up the bride's personality. Yet, the game owes its appeal to the creative rendering of these ideas in a story of abuse, oppression, and discovery. Depth psychology was a means to a creative end, not its point.

Existential Psychotherapy Goal: "Helping Clients Improve Their Encounters with Others":

Taken at face value and applied directly to game design without further inquiry, this existential psychotherapy goal could simply give rise to cooperative games. Such an approach, though, would completely miss the point and the deeper, existential theme at stake here: existential isolation. To improve our encounters with others, we have to improve our encounter with ourselves. Why? Existential psychotherapist, Irvin Yalom (1980), explains that behind existential isolation is the sentiment that, "we are all lonely ships on a dark sea" (p. 398). No relationship is lasting: either the other, or we, will die. There is no solution to isolation. What alleviates the anxiety and pain of our ultimate aloneness, is a deep, authentic connection with others that enriches our inner world by sharing in someone else's. The basis for such connection, though, is the acceptance of our existential isolation (Yalom, 1980). Yalom and colleagues (Yalom, 1980) conducted a study with successful therapy patients to understand which aspects of the therapy experience were the most helpful to them. Understanding the limits of intimacy ranked at twenty-third out of the sixty items. The

conclusion to draw from this is: to be able to open ourselves up to others—to see the lights of other dark ships in the sea, sharing in a similar situation of lonely dread—we need to confront and develop a certain tolerance for our isolation. Only then can our sense of isolation give way to compassion and empathy for others who participate in the same experience as us, rendering it somewhat less frightening. As Fromm (1956) put it in *The Art of Loving*, "paradoxically, the ability to be alone is the condition for the ability to love" (p. 88). These further existential and philosophical inquiries into the nature of isolation and obstacles to connection, as well as productive ways of addressing them, give much richer context and sources of inspiration for game design than the literal existential psychotherapy goal alone.

Game Example: Walden, a Game

Walden, a game (Fullerton and USC Interactive Media & Games Division, 2017) is a great example of a game evoking existential thought, particularly along the lines of contemplating solitude and connection. This is hardly surprising, as the player follows in the footsteps of American poet and philosopher, Henry David Thoreau, who conducted an experiment of living a self-sufficient life in nature at Walden pond in the 1850s. The game spans Thoreau's first year in the woods. As the game website describes: "…as you strive to survive off the land, you are encouraged to explore the beauty of the woods and the pond, which hold a promise of a sublime life beyond your basic needs" (*Walden, a game* website, n.d.). This promise of a "sublime life" has a strong spiritual component of feeling connected to something greater—and more lasting—than oneself. By exploring the life-death-life cycle of one year, attention is further drawn to the light (i.e., life as a continuous cycle) rather than the bulb (i.e., a human life trapped in one body for a limited time).

Looked at it superficially, one might struggle to see how *Walden, a game* should help to improve players' encounters with others. Yet, it is very palpable how the game stimulates contemplation of the value of aloneness and—by way of inviting conversation with oneself and experiencing one's own, fleeting existence in the context of enduring nature and life all around—paves the way for true conversation and connection with others.

Walden, a game may not be an obvious interpretation of the existential psychotherapy goal of "improving client's encounters with others," but it is not the obvious that game design should necessarily strive for. Game design should strive for the creative and authentic rendering of its experiential essence.

Existential Psychotherapy Goal: "Assisting Clients in Establishing a Will to Meaning"

At this point, it may have become clear that there are no hard boundaries between the different existential psychotherapy goals and the game experience goals they can inspire. Raising awareness for one's existence already implies a contemplation of meaning. Drawing attention to unique traits and characteristics is an invitation to use them purposefully and act in alignment with them, which is strongly related to a life that is experienced as meaningful. Discussing some of these goals individually, however, allows us to tease out different emphases and nuances of existential thought, providing different entry points for the creative process. This last goal—establishing a will to meaning—is probably the broadest and most encompassing, and therefore also the hardest to grasp of them all. It implies two things: a) that one of the Givens of Existence with which human beings struggle is a perceived "meaninglessness" of life and b) that having a sense of meaning is important. Viktor Frankl (1956), an Austrian psychotherapist who survived the Holocaust, found meaning to be so central not only to our thriving, but to our survival (particularly under adverse circumstances), that he founded his own branch of existential psychotherapy based on the search for it: Logotherapy. Logotherapy (*logos* being the Greek word for "meaning") is exclusively focused on helping clients find meaning in life (in contrast to other existential psychotherapy approaches, that also deal with the other Ultimate Concerns discussed above). In his book *The Will to Meaning* (1956), Frankl identifies three categories of Life Meaning: 1) what one accomplishes or gives to the world in terms of one's creations; 2) what one takes from the world in terms of encounters and experiences; and 3) one's stance toward suffering, toward a fate that one cannot change. The first category quite literally is about creativity, in whatever form one chooses to express it: from gardening to raising children to painting or growing a business. Being creative is

meaning generating. The second category is about being deeply engaged in experiencing life and all that it has to offer, e.g., enjoying music, appreciating nature, and loving wholeheartedly. While fully engaged in life, the question of "meaning" does not even come up. The third category is attitudinal and describes the ability to find meaning in suffering. If life feels meaningless because one has lost a loved one, one can find meaning in the suffering one has spared the departed by surviving them. While the pain doesn't go away, it at least serves a purpose now.

In *Existential Psychotherapy*, Yalom (1980) discusses different secular activities that can provide meaning for human beings. First is self-actualization, realizing one's built-in potential, to become fully what one is supposed to be in accordance with one's own unique blueprint. Second is altruism, "leaving the world a better place to live in, serving others, participation in charity" (p. 431). Third is dedication to a cause, which implies a measure of altruism, but contains other aspects as well, such as contributing to something greater than oneself that will endure beyond one's death (death-transcendence) and connection to something more lasting than the personal lifespan (thus going into other areas of existential concern, such as overcoming isolation anxiety and helplessness). Finally, the hedonistic solution: "The purpose of life is, in this view, simply to live fully, to retain one's sense of astonishment at the miracle of life, to plunge oneself into the natural rhythm of life, to search for pleasure in the deepest possible sense" (p. 437).

It is important to note that the hedonistic way—making choices based on what promises to be more pleasurable, short- or long-term—is not in contrast to altruism or dedication to a cause. It allows for the option that some sacrifice or pain is necessary to arrive at something that is ultimately more pleasurable. The pleasure principle is good news, because it states that you can be altruistic or loving or creative or dedicated to a cause because there is something in it for *you*, and that's fine! You don't have to be a martyr to experience meaning in life.

Existential psychotherapy considers that the things that provide life meaning fluctuate over a lifetime. Goals change depending on context and developmental stage. Yalom (1980) states: "Life meaning must be viewed in a developmental perspective: the types of life meaning change over an

individual's life; other developmental tasks must precede development of meaning" (p. 460). Teenagers and young adults are more concerned with self-actualization and developing their identity than older adults, who have achieved a measure of success and self-knowledge and can now orient outwards, towards contribution to others, e.g., through teaching, giving back, mentoring, volunteering. Similarly, situations in which one source of meaning—e.g. raising children—becomes obsolete (because the children are now adults), require a reorientation towards a new source of meaning, e.g., finding other occupations to become fully engaged in.

THE CONNECTION BETWEEN MEANING AND VALUES

How does any of this translate into game design? The best answer is indirectly, which is why I can't give a game example here yet. The point is not to decide which avenues of meaning generation are the most promising for a certain target audience at a given life stage or circumstance, or to model games that blatantly suggest specific actions or pathways for players as ways to live more meaningfully. While creating games in which you step into the shoes of a volunteer for a humanitarian effort is probably not a bad thing to do (given you can make this an engaging game, not a preach-fest), it is most likely a far too literal (and narrow) interpretation to touch players profoundly. Let's dig a little deeper, beyond the surface of behaviors and actions to the source of *why* we need meaning in the first place.

Our perceptual neuropsychological system is wired so that it constantly organizes everything it comes across into patterns. It constantly seeks to make meaning out of chaos. When no patterns or meaning are to be found, it makes something up (Goodwyn, 2012). If that is thwarted—if the brain cannot make anything up for some reason—it sends a distress signal. We feel anxious and helpless. *Meaning*, in that sense, is "an anxiety emollient. It comes into being to relieve the anxiety that comes from facing a life and a world without an ordained, comforting structure" (Yalom, 1980, p. 464).

One way to deal with the anxiety of meaninglessness is to find a structure to cling to. As Raph Koster (2005) points out, this is quite likely one of the main reasons our brains love games: there are plenty of patterns to

find and chew on and to distract us from a much less transparent and well-ordered life. Games being designed artifacts have clear possibility spaces in which everything somehow tends to make sense. They can have a purpose and support the concept of *meaningful play* defined by Salen and Zimmerman (2004) as actions being discernable and integrated into a bigger whole. Meaningful play is more a structural concept than it is related to content. As long as player actions are discernable and integrated into the game structure, they are declared meaningful in regard to the goal, regardless of what that goal may be or what the game overall may be about.

Structure alone, however, is not the answer. If structure is self-serving, it can easily feel pointless. Also, while engaging with the structured experiences of games may provide meaning during the act of playing, it does not necessarily translate into the rest of life. The point here is not to create games that function as a substitute for meaning elsewhere, but to create games that contribute to meaning in other areas of life. What we are looking for, thus, is not to give players a structure per se. In the existential transformative game design framework, we are looking to ignite a spark that prompts players to create their own structures. The building blocks for these intrinsically motivated, meaningful structures are values.

Yalom (1980) has provided a standard anthropological definition of *value*, "a conception, explicit or implicit, distinctive of an individual or characteristic of a group, of the 'desirable' which influences the selection from available modes, means and ends of actions" (p. 464). In other words: values tell us how to live. We can organize and structure our lives around values. As human beings, we search for meaning because we need direction and guidelines to live by. We long for "overall perceptual frameworks and a system of values on which to base our actions" (Yalom, 190, p. 464). Myth and ritual have served as important modalities to uphold values and lend cohesion to society and the individual psyche. But these forms do not permeate society the way they used to. Larsen (1996) states that myths—once corner stones of collective meaning making—have become disintegrated and replaced by science, laws, religious doctrine and social customs. In the same vein, Rollo May (1991) explains:

> Myth making is essential in gaining mental health, and the compassionate

> therapist will not discourage it. Indeed, the very birth and proliferation of psychotherapy in our contemporary age were called forth by the disintegration of our myths (p.15)

With the decline of social structures, like myths and rituals, that upheld certain values, we were left more and more to our own devices and became increasingly lost. That does not necessarily mean we have no values. That is only true for some people. For others, it might mean that they have (unconscious) values that do not serve them. Since any meaning and guidance is better than none, we eagerly pick up values as if they were germs at the airport. Especially when we are very young and do not know we have a choice. Hence, many values and beliefs we live by are part of our family history, they are the make-up of our personal mythology (Feinstein & Krippner, 1988). We may have had grandparents who lived by the credo that if you didn't constantly produce something, you were worthless; or a dad who held the belief that money was dirty; or a mom who thought life was out to get you so you could never let your guard down. It is easy to see how values and beliefs such as these can be absorbed unconsciously by a young mind and later get in the way of living fully. Whether we experience the existential dread of living a value-less life or are tortured by living by values that are sabotaging us at every turn, values are the key to living meaningfully and with integrity and to navigate the unique "Forest Adventurous" (Campbell, 2004, p.xxvi) with grace and in alignment with our true self.

At the core of the existential psychotherapy goal of "establishing a will to meaning" is thus to help clients discover their own compass, their own value system. Regarding how to go about this, the "life-meaning generating secular activities" stated above—self-actualization, altruism, dedication to a cause, hedonism—are pretty much as far as we get by looking at existential psychotherapy. As Yalom (1980) points out in his chapter on psychotherapeutic strategies to deal with meaninglessness:

> I shall review the literature dealing with clinical approaches to meaninglessness but will first note that it is an impoverished literature. Aside from a few scattered clinical notes describing exhortative techniques and some superficial techniques offered by Frankl, the literature is mute (p. 470).

He goes on to muse that "perhaps meaninglessness is such an inherently baffling issue that it defies the development of successful technology" (pp. 470-471).

The key take-away for game designers from the existential psychotherapy goal of "establishing a will to meaning" is thus a very high-level and abstract one. It can guide our thinking towards making games that help players explore their own values and beliefs, in how far they are aligned with their true selves and what that might mean for the decisions they have taken and might want to take in the future. But how should we accomplish this? I propose a close investigation of myth as the next step towards an existential transformative game design framework.

ORIENTING TOWARDS VALUES AND MEANING THROUGH MYTH AND RITUAL

Stuck with the baffling question of meaninglessness, some of the key figures of existential psychotherapy turned towards myth as a thousand-of-years old provider of meaning to humankind. There, they joined forces with depth and archetypal psychologists (e.g., Jung, Hillman). I find it highly satisfying (and encouraging for game designers) that when clinical approaches fall short, art is called upon! Art and science are two sides of the same coin. Together, they become real currency to purchase understanding of the human soul. May (1991) writes:

> A myth is a way of making sense in a senseless world. Myths are narrative patterns that give significance to our existence. Whether the meaning of existence is only what we put into life by our own individual fortitude, as Sartre would hold, or whether there is a meaning we need to discover, as Kierkegaard would state, the result is the same: myths are our way of finding this meaning and significance (p. 15).

I have argued previously that myths—understood as stories that spring "from powerful and mysterious inner processes" (Bonnet, 2006, p. 4)—bring us back in touch with ourselves (Rusch, 2018).

> (...) myth establish communication between our thinking selves and our feeling selves. When that communication is broken, we are out of sync with our purpose and who we truly are. Life—despite achievements—feels

> lackluster at best and meaningless at worst because it lacks congruency. (…) When the right myth comes along, it speaks directly to the unconscious through its archetypes, symbols, and metaphors. Living mythological symbols may be thought of as "affect images" (Campbell, 1972, p. 89) that bypass surface analytical cognition and talk directly to the deeper intuitive and emotional layers of intelligence." (Horton-Parker and Shelton, 1996). (Rusch, 2018, p. 3)

We can easily trace the parallels between the function of myth and the meaning-generating activities discussed in regard to existential psychotherapy. Both suggest that a deeper connection to the self (and its true values) aids in self-actualization. Self-actualization paves the way to greater engagement in life and more authentic connection with others. The overall striving towards growth that is inscribed in the hero's journey, for example, eventually leads to self-transcendence and altruism, expressed as the return to society with a boon, after having slain the dragon of one's ego.

In short, there are many indications that the island of myth is a promising place to explore towards the goal of creating games that contribute to a meaningful life. A key take-away for existential transformative game design is that the process of transformation occurs through resonance, not coercion. As I have stated elsewhere:

> When a myth resonates—when we recognize ourselves in the little girl with the matches, that lights one after the other in the bitter winter cold without ever receiving sustaining warmth until we're all burnt out and internally dead—we wake up to our inner voice, we start paying attention and we begin to wonder: "what if….?" This is the magic that sets transformation in motion. As C.G. Jung put it: "The auditor experiences some of the sensations but is not transformed. Their imaginations are stimulated: they go home and through personal fantasies begin the process of transformation for themselves." (Bonnett, 2006, p. 27) (Rusch, 2018, p. 4).

I have further argued for harnessing myth for games. Two key reasons that bear repeating are: first that games are popular, while (overtly) mythical stories have become less so. Second, games as a medium lend themselves to an experiential exploration of myth and their values and beliefs. Campbell (2004) explains one function of mythology as games people play, "how to make believe you're doing thus and so. Ultimately, through the

game, you experience that positive thing which is the experience of being-in-being, of living meaningfully" (p. 6). While Campbell is speaking of games metaphorically in this quote—a mental game of pretending this or that—we can just as well take him literally and create actual games that allow us to act upon the pretense and thus explore it more tangibly. For a fuller and more thoroughly referenced discussion on the virtues of games as a vessel for the mythical, please see Rusch, 2018.

CREATING NEW MYTHS FOR EXISTENTIAL, TRANSFORMATIVE GAME DESIGN

Leveraging myth for existential transformative game design could be productive. The question that begs answering is: how can we generate new, psychologically resonant myths? This requires a little detour through the bumpy terrain of psychological resonance.

Psychological Resonance

It is one thing to argue that mythology as we know it is a powerful agent of change, but this comes with the benefit of hindsight. Erik Goodwyn (2016) states: "resonant stories and expressions are easy to think, easy to remember / hard to forget, and that is why they are recurrent motifs (p. 37). He explains:

> Psychological resonance is defined as a characteristic quality that can be applied to any image or narrative, that describes its mental 'stickiness', its tendency to spontaneously emerge, and / or its intergenerational staying power. (...) Formally, I define highly "resonant" expressions as those which are
>
> 1. Highly resilient across generations of transmission, especially oral transmission.
> 2. Resistant to cultural efforts at eradication.
> 3. Spontaneously and independently emergent cross-culturally despite large distances in time or space. (p. 37)

This definition of psychological resonance has an *empirical* basis and as such can only be applied to the ideas and images in myths and rituals that

have stood the test of time. This may be discouraging to game designers, but then again, creatives can never quite know whether what they are doing will have any kind of staying power. What is a bit more troubling, though, is that the psychological resonance of myth and ritual was usually not the work of a single author. Psychological resonance of myth and ritual is achieved through a process of *cultural transmission*. According to Goodwyn (2016), "'cultural transmission' is not a mere carbon-copying of stories, rituals, and belief systems across generations, but a complex process that is influenced by universal psychological principles" (p.33).

Cognitive anthropology teaches us that there are systematic biases in the way we humans think. Some concepts are cognitively optimal, meaning they are easier for us to think than others. We gravitate towards the easy ones, even if we know better. Due to these biases towards certain concepts, some cultural representations are also more likely to persist than others. Recurrent motifs are thus attractor points, to which deviations are self-corrected in subsequent transmissions. If some ambitious storyteller wanted to lend an existing tale their own spin and their creative tweaks were not compatible with what's intuitive for people to think—what rings true on a deeper level—the story gravitated back to its previous attractor points. (Goodwyn, 2016).

In other words:

> Those resonant images, stories, and rituals will tend to have the curious property that even though they have been created and modified by individual humans at various points, the criteria by which they survive generations are not. Such resonant expressions are therefore neither entirely created nor entirely given, but a combination of both (Goodwyn, 2016, p. 36).

Unfortunately, we do not have the time or power to conduct longitudinal playtests over hundreds of years, with thousands of people, to iterate our creations towards empirically measurable psychological resonance. That does not mean our undertaking of creating existential, transformative games is doomed, though.

I want to posit two hopeful arguments that we can design for psychological resonance. First, Goodwyn (2016) states that resonant expressions, "can

be thought of as 'utterances' of the collective element of the psyche" (p. 36). If this element of the psyche is "collective," we ALL have access to it, individually. What gets in the way is our personal stuff, muddling up the pool. The symbols and concepts that are uniquely ours are floating around in there together with the human universals. When we fish for creative, resonant expressions, we can't know what we're dragging up. But just because we don't know, doesn't mean we're failing. We might just as well have hooked the big Kahuna of collective imagery (leading to a very resonant game), as the crummy, old shoe that symbolizes a quite particular childhood embarrassment (leading to a vapid experience for others). To become clearer in regard to what is twitching on our line, and whether it's worth keeping or throwing back into the depths, we can do a search for similar imagery in mythology, folklore, and other symbolic communication. If our "catch" pops up elsewhere and has a meaning there that matches what it means for us, chances are we are onto something that transcends the purely personal. In *The Neurobiology of the Gods*, Goodwyn (2012) investigated the neurobiological basis of recurring, mythological imagery such as gods /goddesses, animal spirits, or even landscapes. He discussed a whole list of pervasive archetypes in a manner that makes it clear to understand how they are anchored in our perceptual system and brain circuitry. My two main takeaways from this read are that it is by no means arbitrary why certain images pop up across cultures to symbolize similar things and an understanding of what prompted these images to arise—e.g. the mapping of FEAR and SEEKING brain circuitry on the imagery of the snake-can guide the creation of new ones. We can then further distinguish "shoe" from "Kahuna" by referring to key criteria of psychological resonance. But what are the criteria of resonating images? Goodwyn (2016), drawing extensively on folklore studies, provides us with a list:

> I propose that the most resonant expressions are likely to have some or all of the following:
>
> 1. Minimal counter-intuitiveness (Barrett 2007), meaning that they have only a few unusual or strange elements and so stand out, rather than have too many or too few counter-intuitive elements. Examples: talking animals, flying carpets, dragons (...)
> 2. Emotional evocativeness (Panskepp 1998). Examples: stories

> involving basic human attachments, or evoking basic emotional responses such as fear, anger, lust, and so on.
>
> 3. Sensual vividness, with a tendency towards extremes. Examples: castles of gold, mountains of crystal, brilliant lights, absolute darkness, and so on.
> 4. Indeterminacy of time and space. Examples: "long ago in a far-away land"—evocative of an oceanic feeling.
> 5. Biasing toward middle-level categories. Examples: "sword" rather than "weapon" (too abstract) or "quillioned pattern-weld blade with Brighthampton scabbard and cross" (overdetailed)
> 6. Low complexity of characters and motivations. Examples: the most beautiful in the land, the king, animal gods, the thief, the beggar.
> 7. Rhythmic and prosodic/musical elements. Examples "magic mirror in the wall."
> 8. Simple plots with reversals and / or irony. Examples: nothing is as it seems, plot twists, the slow animal beats the fast animal, and so on.
> 9. Apparent interconnection of events. Examples: things always occurring "just in the knick of time", and so on.
>
> Non-resonant expressions will be: overly counter-intuitive or overly mundane, emotionally detached or frustrating, sensually vague or abstract, specific in time and space, contain over-specific or over-general categories, be internally complex or ambiguous, will lack any rhythmic or poetic qualities, will lack a clear plot (...) (pp. 37-38).

It is important to stress that this criteria list of psychologically resonating imagery should not be taken as gospel for game designers—it is just something to keep in mind when aiming for a "mythical feel." Looking at the game *Journey*, however, with this criteria list in mind explains a good deal of its thus far quite established "stickiness." It is also a list that lends itself well to games as a medium in general, with their focus on action rather than character's inner motivations, basic motivations, or potential for sensual vividness.

The second argument for why we do not need to despair at the fact that psychological resonance requires cultural transmission is that we don't have to interpret, or aim for it, as an absolute. It is a phenomenon that in people's individual experience comes in degrees: something can resonate

more or less. It is only the empirical version of it that sets the standards very high to achieve without the mechanisms of cultural transmission. We all know from our personal experiences with books, movies, graphic novels, games, etc., that we can handle (and often appreciate!) when an author's personal, idiosyncratic voice comes through. This is easy especially if we are tuned in to their frequency and ready to receive the message.

Finding New Myths in the Unconscious

Now with all of the above in mind, *how* can we create new myths? The following is concerned with a high-level discussion on the creative process conducive to mythical themes, resonant expressions, or symbolic communication and consequently existential, transformative games. It is not—at least in this paper—bothered by details of how to translate that into concrete narrative design or game mechanics.

Campbell (2004) states, "Myths derive from the visions of people who have searched their own most inward world" (p. 24). In *Creative Mythology,* Campbell (1991) unpacked that thought further, emphasizing the importance of tuning in to our own experiences for the creation of new myths:

> In what I am calling 'creative mythology' (...) the individual has had an experience of his own—of order, horror, beauty, or even mere exhilaration—which he seeks to communicate through signs; and if his realization has been of a certain depth and import, his communication will have the value and force of living myth—for those, that is to say, who receive and respond to it of themselves, with recognition, uncoerced (Campbell, 1991, p. 4).

The key to new myths, thus, is through deeply felt and examined experience. It is not enough, though, to provide a mere account of events and happenings. Note how Campbell plays on the concept of psychological resonance when he speaks about those who receive and respond to the experience "with recognition, uncoerced" (Campbell, 1991, p. 4). We have already established that this kind of transformative resonance of myth is due to myth speaking the language of the unconscious. That means the experience needs to be creatively rendered, or transformed, through our imagination into symbol and metaphor. Our task in existential

transformative game design, thus, is to reconnect with our experiences as understood and grasped intuitively by our unconscious mind. Entering the unconscious is not without risk and should not be undertaken lightly. There is a reason why parts of us end up there and dwell in the darkness. The unconscious is powerful and there is no way to foresee what might emerge. Once you open that gate, it can be hard to close it again at will. Have a friend who is experienced with inner work, or a therapist, at hand, in case things start to feel overwhelming. For one, dialogue with the unconscious will most likely surface the conflicting forces at work within ourselves. As Johnson (1986) notes:

> Who isn't plagued most of a lifetime by this duality of life? Masculine and feminine voices within, duty or desire, good or evil, this choice or that choice, follow my heart or follow my mind—we can go forever reciting the pairs of opposites that express the *yin* and *yang* of life (p. 38).

By exploring our different, competing inner parts—voices, viewpoints, goals, motivations, beliefs, and values—we are searching for meaning, purpose, connection, and unity within and without. By listening in on our inner workings, we are doing the inner work of "making sense" and actualizing our potential. Self-knowledge and conscious awareness of the patterns and energies that guide our decisions and behaviors, and underlie our moods and feelings, is the pre-condition to living authentically and with integrity. We know from the sections above that this is a key goal of existential psychotherapy and has long been the function of myth. It stands to reason that undergoing this process of self-inquiry for ourselves and using it to fuel creative expression facilitates setting transformation in motion for others through resonance. Hence, this is as much creative work as it is a personal growth process.

I want to be clear though: I am not saying that the way to profound and transformative games is through self-indulgent soul searching. Game design can be a therapeutic process for the designer, but this is not the point here. With the goal of creating games that contribute to a meaningful life (for players) in mind, we must make judgment calls about which themes, experiences, or conflicts lend themselves to more universal perspectives, and which ones are "just us." Games based on the latter can still be highly valuable for others, resonate strongly, and potentially induce

personal change. They are not, however, the kinds of games I am focusing on in this particular work. The stuff of myth is interpersonal.

Dreams and Active Imagination

So, how do we tune into the frequency of the personal and collective unconscious? Over the last decade, I found guidance to this in various sources both for creative work (Bonnet, 2006; Cameron, 2002; Conner, 2008) as well as psychotherapy (Goodwyn, 2018; Johnson, 1986; Moss, 1998). The two key strategies that pop up repeatedly are dream analysis and active imagination. This, of course, goes back to C.G. Jung (1997; 2002), but has been further developed by more recent therapists and researchers (Feinstein & Krippner 1988, 1997; Goodwyn, 2018; Johnson, 1986; Moss 1998).

While there are critical voices who want to dismiss dreams as merely "mind fluff" without any relevance to our lives, Goodwyn (2018) presents extensive evidence from clinical practice and psychology research that dream-imagery is non-random and that dreams transform our unconscious thoughts into a rich, symbolic language. Learning how to understand that language provides access to the unconscious thoughts, increases self-knowledge, and fosters personal growth through psychological integration. The simplest way to understand a dream is to use what Goodwyn (2018) calls, "The Number One Dream Hack." He recommends slotting the content—X—of any dream into this sentence, "The meaning of this dream is that you are living your life *as if* X" (p. 20). The phrase "as if" cues us into the metaphorical nature of the dream so that we don't try to understand it as literal events or memories. Our dreaming minds are veritable geniuses of condensing complex experiences, themes, and emotions into imagery and symbolism. Dreams can tell us quite directly what they want from us or what they are all about.

> When we are interpreting (...) we must be careful to be as naïve as possible, to have no prejudices in connection with the associations. Take the thing literally, concretely. How would you describe a mouse to someone who has never seen one? It is a tiny grey animal, hardly seen in the daytime, which disturbs one at night with disagreeable little noises; they eat all kinds of

> things and one must always be careful that they don't get at the good things in the kitchen (Jung speaking in McGuire, 1984, p. 535).

When working with a dream, we shouldn't go straying from what is there because then anything can mean anything. Whatever your dream image, explore its properties and behaviors to understand what it means, and why your unconscious fed you this image and not anything else. I recently dreamt of a magician who was performing astonishing tricks. If I wanted to see more of those tricks, he said, I needed to give him change. I have been studying the Tarot for many years (drawing mainly on Jodorowski's work (2004)) and there the magician represents a person's talents and potentials. This interpretation of the magician resonated with my experience of him in the dream. In the dream, the "change" the magician asked for were literally coins, but the metaphorical meaning – and what the dream told me about my real life – was that if I wanted to tap into the magician's magic, I had to change. In other words: to find my own magic, I had to stop holding back and tap into my potential. This example further goes to show that we should "stick to the image," as Jung strongly suggested.

It is further important to note that in order to understand a dream, we need to see it in the full context of a dreamer's (conscious) life. There is no (reasonable) way to interpret a dream from a set of ready-made dream symbols. Whatever pops up in a dream is our mind trying to make sense of a current situation: something that is going on in our lives right now. Even if we dream of a childhood memory, it is a commentary on something in the present. Identifying what that is will help reveal why our mind reconstructed that memory for us. When we work with our dreams, we must look at the whole picture, not just individual elements in the dream. Goodwyn (2018) proposes a list of nine dream characteristics whose exploration can help to make sense of a dream (as an extension to the one sentence dream-hack):

> 1. Resonance: (...) this principle tells us just how resonant this particular dream is, and how deeply it goes into universal themes. It tells us how "big" this dream is.
> 2. Context: recognizes that dreams do not happen in isolation, but in the context of a dreamer's current life situation. (...)

> 3. Characters: recognizing what characters in dreams represent, either as aspects of a dreamer's own mind/life experience, or as symbols for relationships (...)
> 4. Setting: from abstract to familiar, the setting tells us much about the dreamer's current life situation and overall emotional quality. The details of the setting tell us more precisely *what* these things are.
> 5. Scope: the overall narrowness of vision vs. expansive, comprehensive view, the scope tells us a lot about the state of the dreaming ego and just how well s/he is connected with his/her life situation.
> 6. Storytelling: recognizing the narrative aspects of a dream adds context and meaning by putting together events in a particular order. Asking "why *this* order?" opens the door to better understanding of the dream.
> 7. Conflict: the overall level of conflict tells us a great deal about how the dreaming ego is relating to the rest of the mind and to the waking world. High levels of conflict, and looking at the specific imagery used in the dream often show us aspects of internal conflicts previously unnoticed.
> 8. Intensity: besides conflict there is overall intensity, turmoil, and general "storminess" or emotional force. This can tell us the overall level of creative / destructive energy going on at the time of the dream.
> 9. Integration: this final factor involves the over-arching connection between dreams that occurred over a long period of time and how the dreamer is or is not changing to meet new challenges (p. 62).

Exploring and understanding our dreams in this manner can provide us with rich, creative fodder. Even if the dream doesn't translate directly into a game idea, paying attention to dreams attunes us to our inner world, its imagery, and its symbols. This strengthens the communication channel between "upstairs" and "downstairs." Insights and intuitions will then come more easily, and frequently, until conscious and unconscious mind collaborate in effortless and playful exchange, giving rise to potent, resonant expressions that we can use in our creative work. The other key strategy to coax unconscious material to the fore and tap into collective elements of the psyche, is active imagination. Originally developed by C.G. Jung between the years 1913 and 1916 (see Jung, 1997), active imagination

is a practice in which you enter into a conversation with the different parts of yourself while remaining fully awake. It is like meditation in that it is best conducted in a relaxed, receptive state in which the conscious mind can let its guard down to allow unconscious material to bubble to the surface. In active imagination, the conscious mind takes the backseat and acts as an observer to the workings of the unconscious. Plot developments are not brought about forcefully, but rather coaxed through questions that the unconscious provides answers to. It takes practice to hold this balance between dreaming and waking. It is not uncommon for active imagination to turn into a, "mythical adventure, a journey into the archetypal realm" (Johnson, 1986, p. 152). Like in dreams, whatever comes up is not mere fiction, but a symbolic representation of a present real-life theme or issue.

For both dreamwork and active imagination to be most productive and fruitful, certain conditions must be met. For one, we must signal to the unconscious that we are in "reception" mode. For active imagination this can be done, e.g., by going to a special place where we can be undisturbed, putting on a special piece of clothing such as a special jacket or scarf, lighting a candle, or clearing the clutter from your desk. Any *consistent* signal that you want to access the unconscious will help you ease into the right mindset. That means that ideally, you show up for this work every day at the same time and place. Next: set your intention. This even works for dreams! Throughout their 12-week program to discover one's personal mythology, Feinstein and Krippner (1997) propose dream incubation as a source of inner wisdom. To coax meaningful dreams, they suggest the following:

> With a tape recorder or a journal and pen next to your bed, write in your journal, slowly and mindfully: "I will sleep soundly and peacefully tonight while having a dream that sheds new light on (...). When I awake, I will recall my dream." Then, with deliberation, repeat several times before falling asleep, "I will have a meaningful dream, and I will remember it." If you don't recall a dream the first night, repeat the process each night until you do (p. 92).

Intention setting for active imagination can be supported by having a specific question or theme to explore. Conner (2008) suggests prompting questions like "what do I want?", "what relationship is bleeding?", and "what sends my stomach into knots" (p. 92).

It is important that to harness the full creative benefits of dreamwork and active imagination, they cannot remain on the level of passive fantasy or mere daydreaming. The unconscious needs to know we are willing to *do* something about the insights it gives us. Like the parent who gets tired of telling their kids the same thing repeatedly, you need to show the unconscious you give a damn. Johnson suggests performing a ritual that acknowledges the messages it sends us. These rituals don't have to be elaborate. The elements they use can either be directly inspired by the unconscious imagery or simply be a mindfully performed action intended to honor the insight, e.g. preparing and sipping a cup of tea. Ritual, in this sense, is "symbolic behavior, consciously performed" (Johnson, 1986, p. 102). For example, after my dream of the magician who had asked me for change, I buried a small bill at a special place in our garden and "watered" it with a sip of coffee. Symbolic actions such as these make the unconscious feel acknowledged and more likely to cooperate in the future.

CONCLUSION AND OUTLOOK

This is as far as the journey towards an existential, transformative game design framework goes for now. We investigated how we can create games that contribute to a meaningful life through the lens of existential psychotherapy. We started with a discussion of the concept of transformational game design and proposed an approach that emphasizes intrinsically motivated, uncoerced change as an alternative to a transformational games model that determines the kind of change the player should be subjected to. We argued that by broadening our idea of games' transformational potential, we could purposefully design for profound experiences that impact players deeply, lastingly, and on their own terms, facilitating players' personal growth and their coming to terms with the Givens of Existence: death, meaning, identity, isolation and freedom of choice. By exploring salient goals of existential psychotherapy, particularly those revolving around "meaning" and "purpose," we aimed to spark ideas for existential games. This led to a discussion of the function of myth to provide guidance for people's lives and how we, as game designers, could go about harnessing the power of myth for games that impact players by way of psychological resonance. Since myth, with its imagery and symbolism, speaks the language of the unconscious, it stands

to reason that this is where we need to go if we want to generate new myths. As techniques to access the unconscious as a creative source, we proposed dreamwork and active imagination.

A future step on this journey is to explore the power of symbolic enactment inherent in gameplay. This is going to entail a close look at ritual used in experiential psychotherapy to understand why and how symbolic actions can act upon us like "magic" and what we have to consider if we want to harness this power for games. More of that, though, in another paper. It is my hope that the ideas presented here inspire more games that contribute to a meaningful life, thus expanding what games can be and broadening our conception of their transformational power beyond measurability.

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CHAPTER 2

Systems at Play: Game Design as an Approach for Teen Self-Expression

MATTHEW FARBER, MIA KIM WILLIAMS, LETHA MELLMAN, AND XUN YU

ABSTRACT

The purpose of this mixed methods study was to analyze the impact of a facilitated game design experience on teens' awareness of systems thinking and self-expression of their lived experiences. To investigate how teens incorporated issues that are important to them through the processes of game design and systems thinking during a summer program, a concurrent nested mixed methods design was used (Creswell, 2003). Using qualitative data and analytic procedures, participant-created artifacts and observational research notes were examined. A pre/post survey provided descriptive data, as well as ordinal data, that allowed us to investigate any statistically significant change in participants' awareness of systems thinking. The findings inform how game design can be used as an approach for teen self-expression and developing an awareness of systems thinking. Findings suggest that through constructionist game design teens did make the connection between systems in their daily life. The findings also suggest that the teens were not necessarily cognizant of this awareness.

INTRODUCTION

In a recent study, 70% of teens aged 13 to 17 years (*n* = 970) reported anxiety and depression as top concerns for their generational peers (Horowitz & Graf, 2019). Teens in this study felt personal anxiety about how their academic success in school and would impact post-graduation goals (college acceptance, eventual career happiness) (Horowitz & Graf, 2019). These anxieties were reported much more than other stressors teens may encounter such as teen pregnancy, bullying, drug use, alcohol consumption; 61% of teens reported pressure to succeed academically, while 4% reported personal pressure to use drugs (Horowitz & Graf, 2019). These findings draw attention to what issues are important to teens in their day to day lived experiences.

During adolescence, when teens are navigating these issues, neural networks in the teen brain experience heightened plasticity, making social and nonsocial information processing more adept (Blakemore, 2018a; Knoll et al., 2016). The teen brain develops socially, based on adult and peer interactions (Blakemore, 2018a, 2018b). Peer interactions can exacerbate negative risk-taking behavior amongst teens (i.e., smoking, texting while driving) but also can influence teens to take positive risks (i.e., auditioning for a school play) (Blakemore, 2018a; Do, Moreira, & Telzer, 2017). Teens may be unaware of the systems that they inhabit, or how these systems function (Blakemore, 2018b), and likely even less aware of how the interactions they have with peers impact their development. However, the importance of these interactions with peers to their brain development warrants a better understanding by teens of their impact and awareness of the systems in which they live.

Systems thinking describes a worldview, or understanding, that all actions are interdependent and interconnected, and do not behave linearly (Salen & Zimmerman, 2003; Sellers, 2017). When teens explore and make meaning about the systems that they inhabit, they can feel empowered to affect positive change in their own lives (Senge, Cambron-McCabe, Lucas, Smith, Dutton, 2012). Games, which model simple and complex authentic systems in lived experience, provide a space for teens to explore and use systems thinking.

Games can be used as a practice space for teens to develop thinking about systems (Peppler, Danish, & Phelps, 2013; Rufo-Tepper, Salen, Shapiro, Torres, & Wolozin, 2011; Sellers, 2017). Games are "systems where players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome" (Salen & Zimmerman, 2003, p. 80). Further, some games can engage players in the process of metacognition; players hypothesize how designers think in order to solve well-ordered, meaningful problems (Gee, 2007; Squire, 2011).

Playing games is pervasive throughout U.S. households: 70% of families have a child who plays games ("Essential Facts," 2019). Playing digital games online increasingly provides a digital landscape where teens cultivate friendships (Anderson, Duggan, Lenhart, Smith, & Perrin, 2015). Fifty-five percent of frequent gameplayers report that playing games helps them connect with others ("Essential Facts," 2019). Amongst teens, girls tend to connect with others on social media, while boys play digital games together as a way to spend time and to interact with their peers and friends (Anderson et al., 2015). Further, 78% of people who play games report that games provide relaxation and stress relief ("Essential Facts," 2019).

Games not only model real-world systems, they can also evoke "deep, socially based emotions triggered by choice and consequence" (Isbister, 2016, p. 10). In games, players can feel guilt, complicity, pride, or shame as consequences to their actions (Hunicke, LeBlanc, & Zubek, 2004; Isbister, 2016). For instance, Braithwaite's *Train* (2009), part of the Mechanics is the Message series, included game pawns, railroad boxcars, and broken shards of glass as playable components. The rules instruct players to move pawns that represent train passengers from the boxcars. It is eventually revealed that boxcars are destined for Auschwitz, the Holocaust concentration camp. In *Train*, player interaction with mechanics drives a dynamic system that makes players feel complicit, an emotion that is complicated to achieve in non-interactive forms of media like books or film (Isbister, 2016). In playing *Train*, players explore why people blindly follow rules, as well as why people become bystanders, doing nothing in the face of tragedy (Romero, 2019).

Constructionist gaming describes the cycle of playing followed by game making and sharing (Kafai & Burke, 2015, 2016). The Sackboy Planet

community in *LittleBigPlanet 2* (Media Molecule, 2011) is an example where players make, share, and play user-designed game worlds (Rafalow & Salen, 2014). Making games is artifact production (Hunicke et al., 2004; Kafai & Burke, 2015, 2016; Rusch, 2017; Yang & Chang, 2013), a process that involves active engagement of making, reflecting upon, and sharing an external artifact (Kafai & Burke, 2015, 2016; Resnick, 2017). The meaning-making that happens through making is central to the tenets of constructionism (Papert, 1980).

In this study, we examine how playing and making games can be used as an approach for teens to self-express the systems that they inhabit and the issues that matter to them. This study analyzed games produced by teens during a two-week summer program. The program had been piloted before with varying alterations in curriculum and learning goals. Previous pilot studies elucidated issues that teens face. Findings informed further codesign sessions and the creation of new games that draw on teens' experiences and preferences to support them in achieving and maintaining their social and emotional well-being (Rivers & Rappolt-Schlichtmann, 2017).

The purpose of this research is to describe how game design relates to teens' awareness and self-expression with regards to the systems that impact their lived experience. Three primary questions guided the research:

1. How do teen participants in a game design program connect their game prototypes to issues that matter to them?
2. Do teen participants in a game design program become aware of different systems thinking components by making games?
3. In what ways do teens engaging in game design become aware of systems thinking components?

Theoretical Framework

The Mechanics Dynamics Aesthetics (MDA) Framework (Hunicke et al., 2004), widely used both for designing games and analyzing games (Ralph & Monu, 2014; Schrier, 2019; Walk, Görlich, & Barrett, 2017), served as

the theoretical framework for this research. Fundamental to the MDA Framework is a systems-focused concept that games are not transmissive media like film and books are, but instead they are "interreactive," describing the two-way interaction between game and player (Smethurst & Craps, 2015, p. 273). In games, the player consumes what the designer creates in a dynamic system (Hunicke et al., 2004). Through this lens, games are "artifacts, not media," as the behavior of games changes based on player actions (Hunicke et al., 2004, p. 3).

The MDA Framework considers games from the perspective of both the players and the designers around three lenses: mechanics, dynamics, and aesthetics. Designers create mechanics that cause the game as a dynamic system to behave a certain way. Players experience the aesthetics of the game system when they interact with it (see Figure 1). It is the game's dynamic system that evokes aesthetics, manifesting as players' emotional sensations (Hunicke et al., 2004). When playing a game, players may sensate challenge, connection, fear, guilt, or pride.

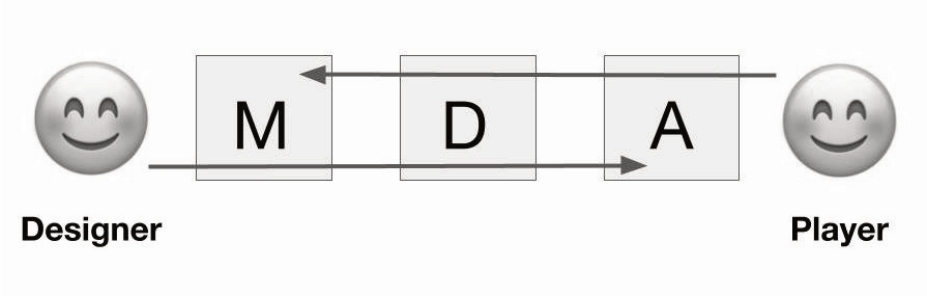

Figure 1. Designer and player perspectives (Hunicke et al., 2004, p. 2).

In the MDA Framework, mechanics refer to *all* components of games, digital or tangible; mechanics include game pieces, rulesets, and core mechanics, or repeated actions players take (e.g., Salen & Zimmerman, 2003; Sicart, 2009). As a concrete example, in the tabletop word-building game *Scrabble* (Hasbro, 1938), the mechanics are the game board, letter tiles, the letter tile tray, as well as all of the rules that guide or constrain what players can or cannot do when they place tiles on the board. Mechanics remain static until play begins; they sit stored in a board game box, computer algorithm, or in the players' minds (e.g., mechanics of

charades). It is not until players place letter tiles on the *Scrabble* game board that the dynamic system emerges, and the game becomes more than the sum of its components. The dynamic system of *Scrabble* includes, for example, a player's knowledge of the accumulating scores of each player, which then can influence player strategy.

In games, players have a sense of agency to make meaningful choices (Murray, 2017), which can lead to emotional investments and inconsequential outcomes (Isbister, 2016). As the dynamic system is driven, mechanics are set in motion by "active player choice," resulting in many emotions unique to games (Isbister, 2016, p. 9). Within the context of designing games, Hunicke et al. (2004) suggest using the MDA Framework backward, starting with the aesthetics, making player experience the initial design goal. Next, a dynamic system (or game engine) that can accomplish the aesthetic should be considered, which is finally followed by the mechanics that will set the dynamic system into motion.

Other game analysis frameworks have emerged in literature, adding or changing some of the MDA Framework's three lenses. For instance, Schell's (2008) Elemental Tetrad views games in terms of mechanics, aesthetics, story, and technology, where story affects emotions, and technology affords different types of dynamic systems (Ralph & Monu, 2014; Schell, 2008). The Design, Dynamics, and Experience (DDE) Framework is another extension of MDA, in this case, specific just to digital games (Walk, Görlich, & Barrett, 2017). Our study involved participants in playing, analyzing, and making both digital and analog games. After reviewing competing frameworks, we decided to use the MDA Framework because it can be used for analysis as well to inform design tool of both digital and analog games.

Systems Thinking as a Habit of Mind

Compared to a linear mental model of the world represented by a series of causes-and-effects, systems thinkers view the world dynamically, as interconnected with interrelated components (Assaraf & Orion, 2005; Norman, 2013; Salen, Gresalfi, Peppler, & Santo, 2014; Senge, 1990/2006; Shute, Masduki, & Donmez, 2010). In *The Fifth Discipline: The Art and Practice*

of The Learning Organization, Peter Senge (1990/2006) proposes systems thinking as a mindset, and as a teachable skill.

To become a systems thinker, one needs to pause and reflect on mental model assumptions of causes and effects in the world, and then rethink how each element of that mental model may be a component of a larger system. In dynamic systems, the actions of the components within that system can result with intended, but also unintended, consequences (Senge, 1990/2006). As an illustrative example, Senge (2006) described military retribution to terrorist attacks as a linear, cause-and-effect way of thinking, which does not consider unintended consequences or competing points of view. When seen through a systems thinking lens, responsive military attacks can make one nation seem more threatening to its enemies, thus leading to insurgencies and the possibilities of future terrorist attacks (Senge, 2006).

In the framework of 21st century skills, or The P21 Framework, systems thinking describes how problem solving occurs when students can analyze how parts of complex systems interact ("Framework for 21st Century Learning," 2019). According to Shute et al. (2010), people with systems thinking skills demonstrate the ability to "(a) define the boundaries of a problem/system, (b) model/simulate how the system works conceptually, (c) represent and test the system model using computational tools, and (d) make decisions based on the model" (as cited in Shute, Sun, & Asbell-Clarke, 2017, p. 146).

While desirable as a 21st century skill, research suggests that teaching students to shift mental models and schemas from linear thinking (cause-and-effect) to non-linear, or cyclical thinking (thinking in systems) is a persistent pedagogical challenge (Cabrera, Cabrera, & Powers, 2015; Hung, 2008; Wilensky & Jacobson, 2014). Unlike an assemblage of unrelated parts (e.g., a bowl of fruit), systems are characterized by being dynamic, comprised of components that each affect the overall behavior of the system as a whole (e.g., a bicycle's gears, chains, handlebars, and tires). In true systems, if a component is added or removed, the entire system changes (Salen & Zimmerman, 2003).

Research suggests that students should first learn how to distinguish

systems from non-systems; doing so will better prepare them to parse out underlying components (Assaraf & Orion, 2005; Kali, Orion, & Elon, 2003; Salen et al., 2014). Students can further understand systems through analyzing positive and negative feedback dynamics between smaller, individual parts (Kali et al., 2003; Watson, Pelkey, Noyes, & Rodgers, 2016). One method for analysis is the use of concept maps, where boxes (or nodes) visually represent components, and arrows indicate directionality of the feedback relationships. Concept maps are visual representations of the causal feedback loops of systems and are also effective as an assessment tool to measure students' systems thinking abilities (Watson et al., 2016).

There are few studies about shifting habits of minds from linear thinking to systems thinking. Of note is a longitudinal study at Quest to Learn, a New York City public school that uses games and a systems thinking curriculum (Kafai & Burke, 2016; Rufo-Tepper et al., 2011; Toppo, 2015). Students were assessed on their systems thinking abilities at four intervals across 20 months through questions about dynamic relationships (e.g., lack of sleep to drinking coffee for next day fatigue that leads back to lack of sleep). Students also were asked questions about complex social systems that they may experience in school, such as perceived peer pressure competition to wear and collect Silly Bandz (animal-shaped rubber bands; Shute, Ventura, & Torres, 2013). Results indicated that students, with teacher facilitation and support, demonstrated a significant improvement in systems thinking skills (Shute et al., 2013).

Systems thinking is narrowly defined as a problem-solving skill, while the related skill of computational thinking (Shute et al., 2017), describes the ability to cognate a mental model that aligns to the branched logic of computer code (i.e., if-then statements, decision trees; Papert, 1980; Salen & Zimmerman, 2003; Weintrop et al., 2016). Berland and Wilensky (2015) compared two groups of students who were tasked to learn about computational thinking and systems using robotics. One group programmed computer-simulated virtual robots, while the second group interacted hands-on, using physical robots. Findings suggested that computational and systems thinking skills may be dependent on the medium that students use to learn about those systems (Berland & Wilensky, 2015).

Teaching Systems Thinking with Games

Games model self-contained systems (Peppler et al., 2013). Each game component influences the overall state of the system (Fullerton, 2018; Salen & Zimmerman, 2003; Sellers, 2017). Games situate learning as players must consider how components, events, characters, and other parts of games relate to the overall system (Gee, 2007; Kaufman, Flanagan, & Belman, 2016).

In games, players have perceived control over choices and then experience the consequences of their actions (Isbister, 2016; Murray, 2017). Players make meaning from interacting with the affordances after receiving feedback from the game as a system (Cardova-Rivera & Young, 2013). For instance, the game *PeaceMaker* (Impact Games, 2007) simulates the ongoing Palestinian-Israeli conflict, while promoting perspective-taking by players playing both sides of the issue (Cuhadar & Kampf, 2014). Players of *PeaceMaker* make choices and then must react to the consequences that follow (Cuhadar & Kampf, 2014).

SimCityEDU: Pollution Challenge! (GlassLab Games, 2014) explicitly tests players' systems thinking abilities using embedded psychometrics. Evidence-centered design (ECD) in the game's code measures players as they balance virtual city systems by creating efficient school bus stop routes and low pollution cities that also have low unemployment. In one study, during play player mastery of positive and negative relationships in interconnected systems was assessed (Mislevy, et al., 2014). Among students in grades 6 through 8 (n = 400), there were significant improvements in systems thinking skills as measured during play (vs. pre- and post-play) with effect sizes from 0.47 to 0.87 standard deviations (Cohen's d) (Mislevy et al., 2014). While promising, there remains limited empirical evidence that playing games can lead to long-term observational changes in habits of mind (Wu & Lee, 2015).

In addition to playing games, game authorship can be an effective way to teach systems thinking (Fullerton, 2018; Kafai & Burke, 2015, 2016; Sellers, 2017). For instance, the process of creating games about climate change

engages youth in understanding how biomes as dynamic systems function (Puttick & Tucker-Raymond, 2018).

When making games, designers consider how tangible (dice, pawns) and digital (onscreen avatars, non-playable characters) components, as well as the players, interact in the game as a designed dynamic system. Components, which are mechanics in the MDA Framework, provide game authors with "objects-to-think-with" (OTTW; Brady, Holbert, Soylu, Novak, & Wilensky, 2014; Holbert & Wilensky, 2019; Papert, 1980). Holbert and Wilensky (2019) suggest that OTTW can be more transformative than games alone, as they facilitate meaning-making in systems experientially. By using digital design tools such as Gamestar Mechanic, which includes drag-and-drop blocks that have unique functions (each block is an OTTW), as well as allotting time for playing and discussing different tabletop games, youth have been shown to develop systems thinking skills (Bell, 2018).

Akcaoglu and Green (2019) studied how game design can promote systems thinking amongst middle school students (n = 19) enrolled in a game design course. Participants began the course by using coding tools to recreate culturally popular games (e.g., *Pac-Man*; Namco, 1980). Student-produced causal maps (concept maps and flowcharts) were used to illustrate the systems authored in those games. The causal maps "not only aided in their understanding of the relationships that existed in a system; but these external representations may have also helped students overcome a difficulty inherent to the design process: visualizing concrete relationships among multiple variables" (Akcaoglu & Green, 2019, p. 15).

In addition to authoring games based on subject-specific content, game design can engage and raise youth voice, choice, and agency (Danilovic, 2018; Sellers, 2017). When authoring games about one's lived experience, parts of the designer's life can become symbolic components, or OTTW, of their game as a designed system. This may prompt youth to identify and share issues that matter to them. These issues can be anything from what it means to have mutually respectful relationships with adults to how it feels (and what they need) to handle daily stresses, among many other topics (Danilovic, 2018; Rusch, 2017).

While literature is emerging on how game design practice teaches systems thinking skills (e.g., Akcaoglu & Green, 2019; Bell, 2018), there remains a deficit in the literature at the intersection of game design as a means of self-expression. This paper explores how teens can use game design as a medium for self-expression while also fostering systems thinking skills.

Game Design Studio

Game Design Studio (GDS) was a multi-session game design program created to teach teens design thinking, systems thinking, reflection, and social and emotional skills (Rivers & Schlichtmann, 2017). GDS had been field-tested and refined with approximately 50 youth, ages 13-18, since its inaugural pilot in the spring of 2017. For the current study, 16 teens spent 45-hours in the program, which took place over two weeks (9 days; week 1: Monday-Friday; week 2: Monday-Thursday), 5 hours per day. The setting was at a public university campus in the Rocky Mountain region of the United States.

GDS focused on narrative game design, defined for our purposes as telling story through game systems, which aligned with curricula around self-expression. Narrative games are less goal-driven and sometimes present narratives nonlinearly (Upton, 2018). In addition to learning systems and narrative game design, GDS participants were led in activities related to social systems (not dynamic systems). These included drawing a racetrack with obstacles that represented challenges participants face in their everyday lives. Participants also participated in a facilitator-led brainstorming activity about issues that youth face locally and nationally.

Participants began each day playing tabletop and digital games curated by GDS facilitators. Tabletop games included: *Jenga* (Hasbro, 1986), *Happy Salmon* (North Star Games, 2016), *Fluxx* (Looney Labs, 1997), *Forbidden Island* (GameWright, 2010), and *Tsuro: The Game of the Path* (Calliope Games, 2006); digital games included: *Super Smash Bros. Ultimate* (Nintendo, 2018), *Never Alone* (E-Line Media, 2014), and *Mario Kart* (Nintendo, 2014). The goal of these play sessions was to boost fluency about games as systems by analyzing their mechanics, dynamics, and aesthetics. Participants analyzed some of these games into five distinct

parts: components, challenge, goal, space (tabletop, computer screen), and rules. These sessions evoked emotional responses from players (e.g., cooperative mechanics in *Forbidden Island*; frivolity and social fun from the fist-bump mechanic in *Happy Salmon*). Teens were explicitly instructed to consider ways of remixing played mechanics into their team's game prototypes.

The first week of GDS focused on analog game prototyping using an array of components such as blank hexagon game tiles, assorted die, graph paper, colored pencils, and wooden cubes. GDS facilitators led participants through narrative design lessons, including one-hour workshop sessions on character design and world-building. These sessions utilized design document worksheets that included prompts (i.e., describe your game world's environment, draw a map of the continents in your world, what are the languages, beliefs, and values in your world). GDS facilitators asked participants to switch their worlds with others, and then to author a story in which the characters they designed interacted in others' designed worlds. Participants completed activities individually, while daily game development time involved teams. Team dynamics varied, with a few participants voluntarily changing partners.

In the second week, GDS facilitators introduced Twine, an open-source writing tool used to author interactive hypertext fiction. GDS facilitators helped teen participants to use Twine, guiding participants to create nonlinear narratives controlled when players click on-screen hypertext. In Twine, text and hypertext are visually represented as square cards or nodes; these nodes are then coded to connect and interconnect according to hypertext rules. As a design tool, Twine affords authors to write using the second person voice ("you"), which invites emotional storytelling (Salter, 2016; Tran, 2016).

Teen participants were given design prompts to inspire the games they would design, assigned randomly by die roll, using a 10-sided die (see Table 1). The design prompts were written to encourage teams to design first for aesthetics, then to work backward, considering the dynamic system and then mechanics (components, rules) that would evoke the prompt's aesthetics (e.g., Hunicke et al., 2004). Four of seven teams created game prototypes based on these prompts.

Table 1.

Game Prompts Randomly Assigned Through Dice Roll to Design Teams.

Roll (d10)	Prompt
1-2	Design a game about a change you want to see in the world. How can the player be part of that change?
3-4	Design a game that reflects core values (or a core value). How can the player accept, embody, or reject those values during gameplay?
5-6	Design a game that advocates for a community or person. What do they need and how can we help?
7-8	Design a game that inspires confidence or rewards strengths and personal growth in someone who plays it. How can the game mechanics make someone feel good about who they are?
9-10	Design a game that conveys teamwork to solve a "world problem." What kind of problems in the world require teamwork?

METHOD

The purpose of this study was to investigate how teens incorporated issues that are important to them into processes of game design during a GDS program. We were interested to know how and to what extent teens' self-expression, awareness of systems thinking, and understanding of the interplay between game spaces and personal lived experiences would be reflected in games they designed.

Mixed Method Design

A concurrent nested mixed methods design was used in this study (Creswell, 2003). Qualitative data and analysis procedures were the dominant method, which relied on information generated through participant-created artifacts and observational research notes. A pre/post survey provided descriptive data as well as ordinal data that allowed us to investigate any statistically significant change in participants' awareness of systems thinking. A concurrent nested mixed method afforded us the ability to collect information at different levels and to provide corroboration of findings within the study.

Participants

Participants (*n* = 16) were male youth with an average age of 15 years (range = 13-18 years), from suburban and rural areas in the Rocky Mountain region, who voluntarily enrolled in GDS. All attendees were invited to participate in the study; one chose not to consent to the study but still participated fully in the program. His individual artifacts were excluded from this analysis. GDS was not gender-limited and was marketed to local school districts and after school organizations; however, only male youth signed up to participate. Eleven of the participants identified as Caucasian, 6 as Hispanic or Latino, 1 as Asian, and 1 as Hawaiian/Pacific Islander; several of the participants identified as more than one race. While this number adds to more than the participant number, it is possible some answered more than once, as they may identify with more than one category. All participants had prior gameplay experience with digital and analog games; 12.5% (*n* = 2) of participants reported any prior game design experience.

Data Collection

Multiple data were collected during this study to answer the research questions, including observational notes, a subset of Likert-like responses from a pre- and post- survey, and two artifacts: game prototypes and game pitches. All participant-created data were activities that were part of the GDS curriculum for all participants. At the conclusion of GDS, data generated by research participants were separated and non-participant artifacts and survey data were discarded. All data were anonymized in compliance with human subjects' protections.

Observational Field Notes

Two researchers participated as observers during the program's duration. Each collected ethnographic-style notes to capture descriptions of day-to-day happenings, comments and actions of participants, and comments and actions of facilitators. We also collected perceptions through reflective field notes (Bogdan & Biklen, 2007).

Pre- and Post- Survey

A pre- and post- survey was conducted on Qualtrics that included demographic information, seven open-ended questions, and 16 Likert-like scale items with five response choices (strongly agree, agree, neutral, disagree, strongly disagree). The survey questions focused on participants' perceptions of gaming, gameplay, systems, and teen issues. For this paper, three Likert-like scale items were used to identify any change in participants' perceptions about gaming and teen issues. Questions about systems thinking competencies were adapted from Shute et al. (2013) which had validated its interrater reliability of systems thinking scores. Questions about teen perceptions were adapted from validated and reliable studies about youth attitudes towards educational games as well as sociocultural issues (e.g., Çankaya & Karamete, 2009; Chen, Lien, Annetta, & Lu, 2010; Hedden & Zhang, 2002).

Artifacts

The game prototypes and game pitches were created by the participants as part of the GDS activities. We collected images of the games as well as paper or digital prototypes. Game pitches were captured on video; the slide decks that were used by participants during the pitches were also collected as artifacts. All were used in the analysis of the games.

Teams were given bounded time each day to prototype games based on their design prompt. Paper and digital prototype games were created and the final prototype was used as the artifact in this research. The prototyping process was iterative throughout GDS based on facilitators' and other teams' feedback during playtests. Games were early prototypes; rules were not always yet written and components not fully completed.

The "Game Pitch" was the culminating activity of GDS and took place on the final day of the program. It focused teams on a delivery date for prototypes and supported the teen participants' process to think about the design as one entity to be shared. Participants were given a Google Slides deck template and a list of requirements. The goal of pitch preparation was for participants to practice talking about their design, and how it connects to

their design prompt, while not spending too much time developing slides. Game prototypes were pitched to professionals in the field. The Game Pitch was not competitive, but the experts asked probing questions and offered notes for further shaping the games.

Data Analysis

Consistent with a concurrent mixed method design, various data were analyzed simultaneously and brought together to develop findings.

Qualitative Data Analysis

The game design artifacts were coded and analyzed for a deeper understanding of teens' lived experience, the systems that impact their lived experience, and their ability to express and experiment with those systems through the act of making games. Data analysis follows an interpretivist approach, a paradigm that gleans meaning from observed experiences, artifacts and actions (Corbin & Strauss, 2008). Utilizing a constant comparative analysis of the data collected (Corbin & Strauss, 2008), artifacts and observation field notes were read and viewed as they were generated and again at the end of the data collection period.

The MDA Framework was used as a lens to analyze systems in participants' games. According to Hunicke et al. (2004), first mechanics should be analyzed, followed by dynamics, and then aesthetics. As these were prototypes and not finished games, aesthetics shared by teams were what the designers intended, and were not necessarily fully realized. Time constraints limited teams' ability to iterate on ideas to create playable completed games. Each team's planned aesthetics were captured in a slidedeck as well as a video recording of their presentation given during the pitch session. Reliability of the qualitative analysis was established by repetitive analysis by at least three of the researchers.

Survey Analysis

Participants' pre- and post-survey responses were compared to determine

whether there was any significant change in perceptions about connections between game design and life experience. This comparison was completed for a subset of Likert-like items on the survey. A paired *t*-test was conducted with the level of statistical significance set at .05. The analysis presented three critical pieces of information: (1) the mean pretest score, (2) the mean posttest score, and (3) the *p* value. A *p* value less than the specified level (.05), indicates there was a statistically significant difference between the pretest and posttest score. A *p* value larger than .05 suggests that participation in the GDS had no statistically significant impact on participants' perceptions. A two-directional analysis was made.

Null Hypothesis

- There was no statistically significant difference between participants' responses on the pre- and post-survey. (H0: $\mu 1 = \mu 2$)

Alternative Hypothesis

- There was a significant change in participants' responses on the pre- and post-survey. (H1: $\mu 1 \neq \mu 2$)

The statistical analysis in this mixed method study was conducted with the small sample size of teen participants' responses ($n = 16$). It does not imply statistical generalizability but provides insight into the change in perception of the participants and supports the qualitative measures.

FINDINGS

The findings in this section share descriptions of games participant teams prototyped by the end of the second week of GDS, game prototype analysis using the MDA Framework, and a comparison of the pre/post responses from the survey.

Team Prototypes

The following are descriptions of game pitches given by the seven teams

who created the game prototypes, supplemented by collected observational field notes, and data from the recorded presentations and the slidedeck participants created. Each subhead is the name of the team, which had between one and four members. Four of the seven teams created prototypes inspired by the design prompts; three created their own prompts on which they built their game. Teams are listed alphabetically.

The Banana Boys

The Banana Boys was a three-member team. Their design prompt was, "Design a game that inspires confidence or rewards strengths and personal growth in someone who plays it. How can the game mechanics make someone feel good about who they are?" To address this, they created *Delta 97*, a character-driven game prototype. In *Delta 97*, character cards became central; players are given information about weapons and character "life points," but no narrative wrapper.

The Banana Boys originally planned a digital "non-Euclidean" first-person shooter game; however, the team pivoted during week two to design a card game called *Delta 97*. The team considered this a paper prototype for an eventual digital game. *Delta 97* was intended to be played as a "free-for-all," where the last player remaining wins, or as a collaborative multiplayer game. In the game pitch, one of the designers remarked that free-for-all is stressful, which is why it was included as a play mode. In the Game Pitch, the designers described decisions around inclusivity:

> Each character has a role so each player feels important. It is important for people to identify with characters and feel confident about who they are and what they are doing. So, we also decided to mask our characters to allow the players to decide the gender and race of these characters.

During the pitch, the team was asked by the panel of experts why their diverse characters still appeared as humanoid (all were described as human except for one cyborg who has wheels for legs). One team member responded that it was "easier for players to project themselves on a character that is humanoid." Characters also lacked facial features, which

the design team said was due to constraints, "it makes it easier for us to model."

The game starts with players deciding play mode (free-for-all or multiplayer). Players then choose a character and perform several actions per turn. First, they attack by rolling a 20-sided die, then they draw a new weapon card. The number on the card correlates to a type of weapon. When a player kills an enemy, they discard their weapon card and take their enemies' weapon. The game ends when only one player or team remains.

Chicken Nuggets

Chicken Nuggets was a two-person team: a collaboration between one GDS participant who had been part of a team but opted to leave the group because of creative and team dynamic differences, and one GDS facilitator who assisted the participant in design. Chicken Nuggets designed *Rotate,* a two-player, cooperative board game. Each player is one of two twins who must work with the other player. It was designed around a theme not part of the design prompt die roll: "To make a collaborative game that is fun."

Rotate included a narrative wrapper about twin angels who are split apart at birth, but need to reunite to defeat a monster. The game's board consisted of paper tiles adorned with curved lines (see Figure 2). Paper tiles resembled tiles in *Tsuro: The Game of the Path*, where lines on tiles form a path. *Tsuro: The Game of the Path* was played and analyzed by this participant earlier in the week (led by a GDS facilitator).

The goal of *Rotate* is to line up tiles to enable players to move towards the center, the place where they fight the monster. Players roll a six-sided die (a d6), which lets the player know how many spaces to move. Players can move their token in any direction from one tile to another. They may also rotate a tile their character token is on, as well as surrounding tiles.

Figure 2. Chicken Nuggets prototyping Rotate.

If a player gets to the center (the opposite end of their tile game board), the monster attacks. That player then rolls the monster die (a d6 die) and subtracts that from his/her/their life points. The players then attack with a d6.

Each player starts the game with 50 life points, and the monster starts with 100 life points. Players can only attack when they reach the center; if one player is in the center, and the other is still working through the tiles, only the player in the center battles the monster. This constraint gives the monster an advantage over fighting a single player; this condition becomes equalized if both players fight the monster together.

HD Studios

The Comedian is a murder-comedy Twine story from HD Studios, a team of two GDS participants. The player is a detective who must solve a murder.

To continue playing, the player must choose "OK," and avoid dark humor options. If the player does click a dark humor option, the player dies and it is revealed that they are the murderer. None of the non-playable characters react positively to the jokes the player makes (or selects, from presented choices). The narrator is actually unreliable; the player is actually the murderer. The team stated that the game is "basically about Karma: you make a bad joke about someone, you get Karma." The Twine story will then loop back to the start of the story.

Originally a paper prototype during week one, the team pivoted to Twine in week two. When they switched, they changed the prompt. Instead of the design prompt from the die roll, the team decided they wanted "to find a good way to make murder funny." To accomplish this, they used Google Search using search terms "dark humor jokes." After reading the search results, they altered the jokes to fit the story (e.g., "someone falling off a building for someone falling [in love] with them"). During the pitch, the team stated they searched "dad jokes," too.

The game was decision-tree based, built in Twine, where the player must choose the correct dialogue and choices to win. Penalties include death or jail. The player cannot hit the back arrow on Twine, which is stated in the rules. The narrative advances as the player makes choices by answering questions.

The Memes

The Memes, who had three team members, designed *Broken Violin*, a Twine horror story, with added humor in the narrative. The team's design prompt was, "Design a game that advocates for a community or person. What do they need and how can we help?"

Their Twine story begins as the player meeting a homeless individual. Players are given a choice to give him money. The team explained, "You can choose to give money to a homeless man or not to. [The homeless man] is really a wizard, but you will only find out if you give him money." This decision affects the further gameplay outcomes.

This branched narrative continues as players hear a playing violin. Players

then must choose to go outside into the forest to follow the violin's sound, or to remain inside. If players go outside, they die immediately. In the Game Pitch, the designers self-critiqued the strength of their narrative.

The story advances as the player makes choices by answering questions. The player cannot hit the back arrow on Twine, which was done intentionally as a set-back penalty for wrong decision-making. In *Broken Violin*, the player will always die.

The goal was to be kind prior to being rewarded. According to the team, "You don't need to know who you are helping to help." In the story, it is revealed that the homeless person is actually a wizard, and the player only discovers if he or she gives him money. The team stated that homeless character is always present when the player returns home, which one of the youth designers found humorous.

Purgatory Gaming

Purgatory Gaming had four teammates, but only three members presented. Their prototype, *War with the Demons*, was built using Twine, addressing the prompt, "Design a game about a change you want to see in the world. How can the player be part of that change?" The team interpreted the prompt, stating, "Our change in the world is how war can change the world. When someone who you know who is in the service dies and you have to go through a rough grieving process (i.e., WWII, etc.)." One participant stated that the team struggled writing a nonlinear story that also had to be unique. Another challenge of their creative process was trying to make a fully playable prototype within two days; the team had pivoted from a tabletop role-playing game to Twine.

Players control Soap, a 21-year-old who "has been in the humans' military for 3-years ever since the wars around the world between all the different races started happening." This protagonist is "quite skilled all-around when it comes to shooting any kind of weapon." Soap lives at home with his/her/their mom and pet *pegacorn* (fictional animal).

War with the Demons was inspired by the *Call of Duty* (Activision, 2003)

wargaming franchise. The narrative wrapper was from a participant who had written it before GDS. Titled, *The Never-Ending Legacy*, he wrote,

> Humans, elves, orcs, giants, dwarfs, and necromancers all lived in harmony until the demon nation attacked. The attack caused all the nations to fight amongst each other. For safety and protection, you joined the military and moved you, your mom and pet *pegacorn* into the military base.

The Twine story starts as Soap awakens, selects a weapon, gets dressed, and eats breakfast. All seems normal and calm until the player opens the front door. There is a battle raging outside that "pulls the player from a typical day and thrusts the player into an intense battle." One minute the player is telling his/her/their mom "I love you," just as though "he or she were going off to school, just like every day." In that instant, the player realizes that the daily routine is a battle for self and world preservation.

The player moves through the narrative by selecting choices such as: "Do you stay and fight with your military buddies, or do you retreat?" These choices inevitably lead players to die with honor or as a coward. If the player feels that Soap has died prematurely, they may restart the story. When Soap's captain dies, the player has the choice to "do as they taught you or try to get revenge." Purgatory Gaming said that is was an intentional design choice, stating, "Players deal with grief through this character because war can drastically change somebody's life and even their whole world depending on what happens."

Sly Games

Sly Games, who had two team members, designed *Gaming Has Saved Me*. It was based on the prompt, "Design a game that advocates for a community or person. What do they need and how can we help?"

Gaming Has Saved Me is a Twine story about a boy who plays *Fortnite* (Epic Games, 2017) and *Playerunkown's Battleground* [*PUBG*] (PUBG Corporation, 2017) to "get through his tough home life." The team stated that their prototype was "meant to show how one day your life can be near perfect, and the next day you have many struggles, but there is always a way to get through it." This was also part of their slide deck: "What inspired our game

was showing how video games can be used for good, some kids don't have a good life and they rely on video games to keep them comfort when no one else can." In the pitch, one team member remarked, "Some kids don't have a good life and they rely on video games to keep them comfort when no one else can."

This game intended to show players how their lives can have "many bad turns that put you in a bad situation." The team stated that this affects many people and felt that it "needed to be known that video games can help people get through challenges." *Gaming Has Saved Me* was designed to show other teens that they "are not alone and many people go through what they are going through."

The Twine story advances as the player clicks choices that are a series of questions. The narrative has a looping structure; no matter what happens, parents remain fighting, people continue to yell at the player, and the player always escapes to play video games. Parents fight over topics such as the player's grades in school and money earned from mowing the lawn. Regarding the inclusion of arguing parents, the team stated, "it happens all the time."

The Twine story concludes as the player, who is playing video games, declares, "Video games saved my life."

Taem Meme

The End is a Twine story from a one-participant member team, Taem Meme. The player-protagonist is a Robot named Axe who works for the evil Lord Puguinie. Instead of using a randomly determined design prompt, this participant decided to "take the characters in the game authors(s) head and write a story and game about them that other people would like."

In the Game Pitch, Taem Meme explained his narrative, character interactions, and character development expanded as he implemented his ideas through various GDS activities. He had conferred with GDS facilitators, sharing ideas and thoughts.

During week one, *The End* was prototyped on paper; Twine used in week 2 (see Figure 3).

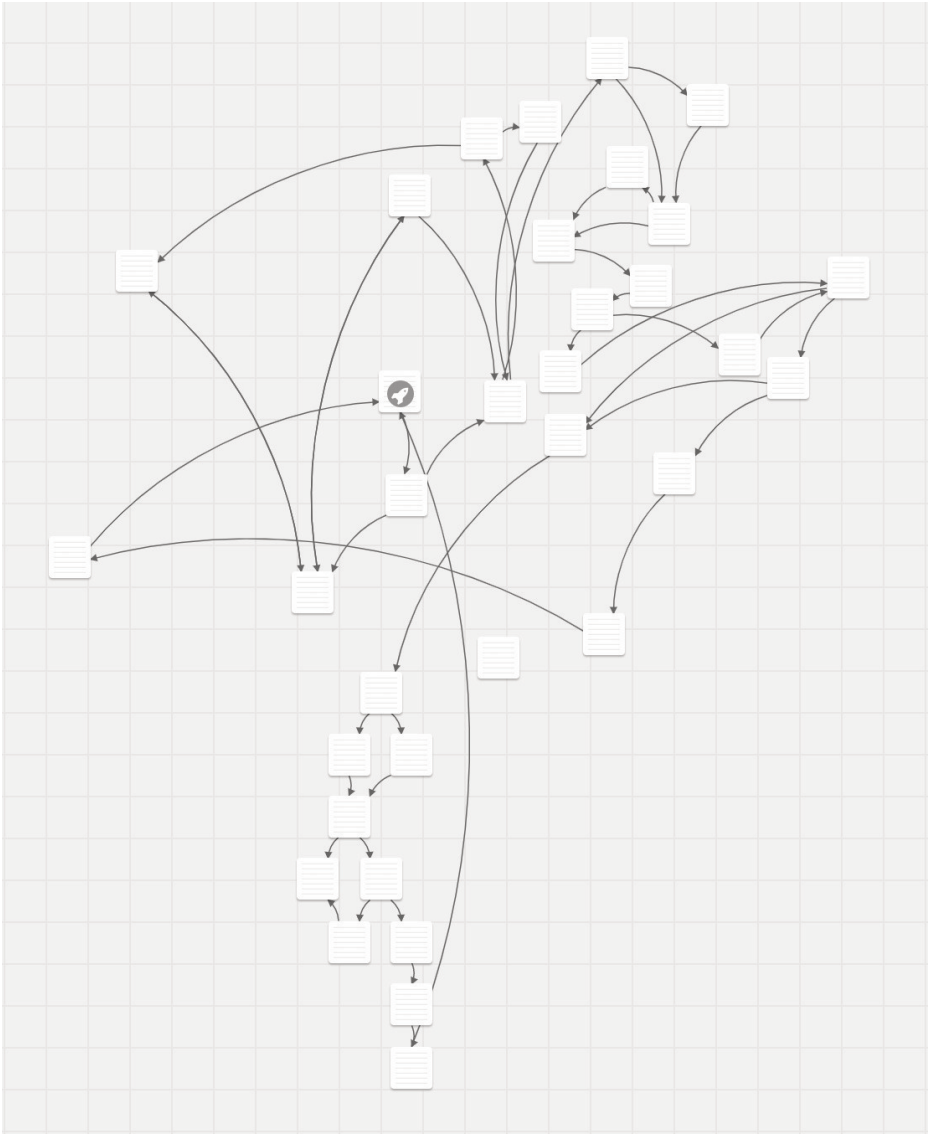

Figure 3. Twine node map of Taem Meme's The End.

The story begins as the player wakes up in the castle's medical bay, finding Lord Puguinie fighting an enemy in the throne room. Lord Puguinie tells the

player to find his minions again to take over the world, stating, “Puguinie wants to destroy the universe!” During the Game Pitch, the participant asked, “Will you trust your gut? Or will you disappear into a void of endless suffering?”

As the robot Axe, the player discovers that he/she/they are the first robot infected by the Puguinie Virus. As a result, Axe became an evil robot who only can obey Puguinie’s commands. However, Axe can still choose his actions.

As the narrative develops, Axe finds clues about the Puguinie Virus. Axe eventually meets Sammy, the hero of the world, and then interacts with him in the story. Finally, Axe realizes Puguinie’s evil plan: The player learns that Lord Puguinie is planning to destroy the universe and everyone in it. Axe decides to save the universe instead. To do so, Axe must find three “important items.” The narrative concludes with a plot twist near the end: Axe was the first robot created by Puguinie, and is “actually a good robot in disguise. She was discarded after losing one battle.”

Issues that Matter to Teens

One of the early activities in the camp was a brainstorm discussion that generated issues that were important to the teen participants. During this session, they focused on global issues and general categories including drugs and alcohol, lack of appreciation, misinformation, teen-parent issues, generation gap, lack of control/rules, friendships, and popularity. Participants were eager to share these ideas. After many minutes, the conversation became somewhat personalized when one participant offered, “using violence, like suicide” and said “I have a friend…” as he identified the topic as being important to teens. This prompted some additional issues such as violence at home, parents, specifically parents who don’t get along, and depression. However, the participants did not reveal if they had personal experience with an issue they shared. This is in contrast to the talk around the issues that appeared in their game prototypes and pitches. In conversations with the facilitators, team members talked more openly about personal experience by self or others they knew as reasoning for why a game component was approached with

a particular aesthetic in mind. An example of this was a conversation with participants who revealed that home life was challenging, and thus identified it as a teen issue they shared among members. "We found out that we have in common that our parents fight all the time so we wanted to have humor in our game," stated one participant. "Gaming is a way to get away from it… I put on headphones."

Table 2 lists major issues identified by teen participants in the game prototype or during the pitch.

Table 2.

Teen Issues Identified in Prototypes by Teens

Team Name	Prototype	Issues in Game	Issues in Game Pitch
The Banana Boys	*Delta 97*	Struggle to be comfortable with who you really are	Need for gender equity
Chicken Nuggets	*Rotate*	Struggle between good and evil	Impact of your actions on others
HD Studios	*The Comedian*	[not directly included in the game mechanics]	Using humor to deal with hard situations, Karma
The Memes	*Broke Violin*	Need for kindness	[No additional issues identified by team members during pitch]
Purgatory Gaming	*War with the Demons*	Impact of war Uncertainty of life	Dealing with grief
Sly Games	*Gaming Has Saved Me*	Challenging home life	Video games have good qualities and can be a support to teens (perception of games)
Taem Meme	*The End*	Struggle between good and evil	Making the right choices

Other participants shared stories of similar struggles at home more openly in their game pitch and how that impacted the unpredictability of the gameplay in their prototype. Some teams were more open about sharing personal stories and some were more aware that they were purposefully using their experiences as mechanisms for how players might interact within their game. Some appeared to be purposefully selecting the aesthetic, but participants did not offer this information; some found it difficult to respond to prompting questions from facilitators about the origination of ideas or aesthetics.

MDA Analysis

We used the MDA Framework to analyze systems in participants' prototyped games (see Table 3). When analyzing games, we considered the mechanics first, as mechanics create the dynamic systems that can evoke aesthetics (Hunicke et al., 2004). One prototype was a tabletop role-playing game and one was a tile-based board game. The remaining five prototypes were hypertext fiction built with Twine. Teams added rules to their Twine story prototypes, stating that players were restricted from clicking the back arrow to select alternate choices.

In hypertext fiction, aesthetics connect to descriptive storytelling ("game as drama;" Hunicke et al., 2004, p. 2; Salter, 2016). In interactive fiction, player empathy may be dependent upon the strength of the narrative (e.g., Castano & Kidd, 2013). Player emotion may be evoked from feeling agency to select story choices (Isbister, 2016). Players may also feel agency in how they mentally interpret written text, even though they may not actually control the narrative (Mendelsund, 2014).

It is recognized that in formalist terms (e.g., Juul, 2005), hypertext fiction (Twine) is not a game, even though the narrative is driven by player decisions. Twine stories are interactive, not interreactive (Smethurst & Craps, 2015); the system reacts to player choice but does not itself change based on those choices (Juul, 2005). As a web-based application, Twine translates passages on a web browser. Subsequent story web pages do not exist until (or unless) the player-as-agent interacts with hypertext, thus creating the story as they click, mouseover, or otherwise provide input.

As these were prototypes, the descriptions in Table 3 are based on the Game Pitch presentations, not from observing player responses. Instead, teams described their prototyped games in terms of mechanics, dynamics, and desired aesthetics, or emotional outcomes.

Table 3

Team Game Pitch Prototypes Analyzed Through the MDA Framework

Team Name	Prototype	Mechanics	Dynamics	Aesthetics
The Banana Boys	*Delta 97*	Cards, character sheets, dice, pencil, paper, tabletop. Two play modes: "free-for-all" and multiplayer. Rules: when an enemy is killed, players have to discard weapons and take the enemy's weapon. Players have actions based on die roll.	Impending attack from other players; randomness of die roll	Narrative: Game as drama. Fantasy: Game as make-believe. Challenge: Game as an obstacle course.
Chicken Nuggets	*Rotate*	Character and monster tokens; players' and monsters' die; action cards; game-board of moving tiles; Rules: must stay on continuous line to move token; players can either move the character one tile or rotate a tile to move onto; player can only move or change tiles the number rolled on the die; monster cannot attack until one twin is in the center.	Player cooperation; randomness of die roll	Fellowship: Game as social framework. Challenge: Game as an obstacle course.
HD Studio	*The Comedian*	Branched narrative. Added rule: players may not click back arrow.	Hypertext fiction	Narrative: Game as drama. Dark humor. Frustration.
The Memes	*Broke Violin*	Branched narrative. Added rule: players may not click back arrow.	Hypertext fiction	Narrative: Game as drama. Self-awareness, Integrity.
Purgatory Gaming	*War with the Demons*	Branched narrative. Added rule: players may not click back arrow.	Hypertext fiction	Narrative: Game as drama. Fantasy: Game as make-believe.
Sly Games	*Gaming Has Saved Me*	Branched narrative. Added rule:: players may not click back arrow.	Hypertext fiction	Narrative: Game as drama. Submission: Game as pastime.
Taem Meme	*The End*	Branched narrative. Added rule: players may not click back arrow.	Hypertext fiction	Narrative: Game as drama.

Survey Responses

A paired, or dependent, *t*-test was conducted with the level of statistical significance set at .05 for a subset of responses on the pre/post survey. There was no significant difference in the scores for the pre (M = 4.31; SD = 0.70) and the post (M = 4.00; SD = 1.03) responses to *I think about the messages in the games I play,* $t(15) = 1.58$, $p = .14$ There was no significant difference in the scores for the pre (M = 4.13; SD = 0.89) and the post (M = 3.81; SD = 0.98) responses to *I think about how games represent different kinds of people,* $t(15) = 1.43$, $p = .17$. There was also no significant difference in the scores for the pre (M = 4.19; SD = 0.66) and the post (M = 3.94; SD = 0.85) responses to *I think about how games represent different kinds of life experiences*, $t(15) = 1.73$, $p = .10$.

In all three pairs, the null hypothesis was retained. However, it is of note that the mean in all three pairs was lower, which represents that participants agreed less with the statements on the post-assessment.

DISCUSSION

All the participants in this study made a transition from gamer to game designer, including learning about game mechanics, world-building, design, and narrative construction. Participants noted differences of awareness about systems and how systems exist in games and in lived experiences.

Game Prototypes as Teen Artifact

There was a lack of connection between game prototypes and the systems inhabited by participants' life experience. Six teams gravitated towards global themes that affect youth (i.e., war, good vs. evil) rather than issues or systems that may affect participants personally or directly. Sly Games's *Gaming Has Saved Me* theme of arguing parents was one exception, as it was set in a home environment populated by arguing parents.

It is unknown if the mechanics in prototypes were inspired by facilitator-led discussions, autobiography, or remixed fiction because participants were not forthcoming with this information. While HD games shared common

experiences among teammates related to challenging home life, we do not know if the arguing parents in Sly Games's *Gaming Has Saved Me* was based on participants' homes, or whether the idea was from the design prompt, or in a GDS brainstorming activity. We also do not know if Purgatory Gaming's *War with the Demon's* violent backdrop represented the neighborhood where participants live or if it is a video game trope weaved into their prototype's narrative.

Symbolism was often not exhibited: participants were not abstracting components and rules of their lives into prototyped games. In other words, participants did not break down issues that affect their lives into playable OTTW (Brady et al., 2014; Holbert & Wilensky, 2019). Yet, participants were able to discuss their prototypes as systems during the game pitch session.

Abstracting may be more of a cognitive challenge to some teens than writing narrative. It is possible that more explicit instruction was needed for participants to abstract their lives into their prototypes if games had less of a narrative focus.

Awareness of Systems

The short answer to the second research question, "do teen participants in a game design studio program become aware of different systems thinking components by making games?" is yes. For example, Chicken Nuggets demonstrated awareness of the affordances collaboration and cooperation give to gameplay in *Rotate*. It is impossible to win alone, privileging working together in a battle to defeat a common enemy. A player must think about how an action they execute impacts the other player, as well as their own character, and how that action contributes to or detracts from the common goal. This demonstrates awareness of the relationship among components within a system and parallels lived experience. Taem Meme also showed awareness of this relationship through the interplay of characters who represented good and evil in *The End.*

Participants demonstrated systems awareness, but not systems fluency, in the survey responses. Participants showed no statistically significant

change in understanding of systems. But, it is important to remember the parameters of the study, which includes 16 teen males during a two-week game design program. It is more interesting to note that participants' average responses indicating their awareness of the connection between lived experience and games dropped about three-tenths of a point for each question. As teen participants develop awareness of this connection, their knowledge of what they do not engage with, or their lack of awareness, becomes more prevalent. Thus, this could account for the lower average during the post-survey.

In the GDS, facilitators and participants worked with the understanding that most things are complicated. We worked with a value-added group dynamic launched by the improv game *Yes, And*. The findings indicate participants were aware of systems. Their depth of understanding, application of systems to game design, and transfer of knowledge about systems in the game to understanding of systems related to teen issues were significantly individualized, even among group members. In conversations with facilitators, team members had different rationales for particular narrative components or game mechanics. More analysis of the qualitative findings is necessary to understand the complexities of their individual levels of awareness of systems and is outside the scope of this particular paper.

With the exception of Chicken Nuggets' *Rotate*, prototypes were either hypertext fiction or tabletop role-play. As games, tabletop role-play are "borderline cases" of games (Juul, 2005, p. 28), as they can have flexible rulesets. Five teams used Twine, a hypertext interactive (not interreactive) writing tool. Hypertext fiction breaks down narratives into smaller parts, which became story paths, or nodes. Their resulting branched stories were visual, represented on-screen as "node maps" (Salter, 2016, p. 2), a web of connected boxes (see Figure 3). While not dynamic or interreactive, node maps visually resemble concept maps, a useful tool in teaching awareness of systems thinking to youth (e.g., Watson et al., 2016).

Nodes in hypertext differ from abstracting components and rules to be symbolic. In hypertext fiction, nodes represent threads of a story, not symbols that abstract larger concepts. As a comparison, in Braithwaite's *Train* (2009), boxcars, yellow pegs, and rulesets work together to create a

dynamic system that evokes an aesthetic response from players (complicity and dread) (Isbister, 2016). In most participants' prototypes, narrative design took precedence over mechanics and dynamics. While GDS activities included lessons on character, narrative design, and world-building; games do not require a narrative wrapper, and games do not always tell stories (e.g., Bogost, 2017; Flanagan as cited in Farber, 2017). In GDS prototypes, rather than aesthetic responses to dynamics, player choice within branched narratives were often used to evoke emotional responses from players.

Four of the GDS prototypes were developed character sheets, sometimes with detailed drawings. Character sheets are common in tabletop role-playing games such as *Dungeons & Dragons* (Arneson & Gygax, 1974; Wizards of the Coast, 2014). In *Dungeons & Dragons*, players take on different identities and then make decisions in a guided system, led by a dungeon master (DM). *Dungeons & Dragons* is a collaborative storytelling game where players' power may directly relate to gender, gender representation, race, racial distrust, and racism (Garcia, 2017).

None of the GDS prototypes were playtested to the extent that a dynamic system emerged. While *Rotate* had a clear goal and moveable tiles, the other GDS prototypes lacked a dynamic system where mechanics could interreact with player choice and evoke aesthetics. It is possible that more time may have led to an emergence of dynamic systems.

We note here that there are social science models that share the same name of "systems," such as Bronfenbrenner's (1979/2006) ecological systems theory model. His model suggests that individuals develop as a function of their interactions with people, objects, and symbols across several nested and interactive contexts (home and family, school, parents' workplaces, mass media, laws, and cultural ideals, etc.) over time. Systems thinking differs in that it describes a worldview about causal relationships. Perhaps narrative design (e.g., hypertext fiction, tabletop role-playing games) is a better approach for modeling social systems than authorship of games that have true dynamic systems. Hypertext fiction and tabletop role-play design may afford narrative over dynamics.

Gameplay as Learning Space

Using games as a medium for teen self-expression was valuable in establishing a learning space. Teens engaged in meaningful conversations about issues that were important to them during both gameplay and game design. The opportunities that GDS afforded teens proved to be an outlet for social and emotional processing and allowed participants to personalize issues and ideas or keep them in a neutral space, where they could project the ways that they see the world. In transitioning from player to designer as a mechanism for understanding systems, game prototypes became a vehicle for sharing ideas about their life issues (personal or not) in a way that allowed others (players of the game) to experience the issue the way the designer wanted. It was a way of communicating. However, the level to which participants were purposefully making decisions to connect lived experience and teen issues with player experience is unclear.

There was value in having participants play games and talk about them before creating prototypes. Playing games provided a mentor text (Newman & Fink, 2012) for the teens' game design process. For instance, Chicken Nuggets's *Rotate* had a similar tile-turning mechanic as *Tsuro: The Game of the Path*, a game played during GDS. All the participants entered the camp with ideas about games and some vision of what they thought they would design in the camp. Playing games and identifying game mechanisms, narratives, aesthetics allowed them to think about how the game parallels (or does not parallel) lived experience. Participants were introduced to Twine through playing a hypertext fiction horror story, *the uncle who works for nintendo* (Lutz & Parker, 2014). Following the story, participants were led in a discussion about how the strength of narrative, as well as the inclusion of other elements (e.g., sound effects in the story such as thunder and a clock chime) created an aesthetic of dramatic tension. (We note the use of sound to build suspense is not unique to games; it is a dramatic technique also used in film, radio, and theater.) Learning happened about systems without content being direct or presented as a dominant activity or expectation of the camp. Playing games, talking about games, and making games created an environment where teens could talk about issues they wanted to and learn about systems thinking. They applied both in their game prototypes. This finding

sparked many additional questions about game design as a formal pedagogy.

Directions for Future Research

The constraints of this study (size, duration, setting) provide results tethered to this specific camp environment. However, the potential for similar results of systems awareness and design development in participants need not be bound by the same constraints. It would be interesting to observe how GDS activities manifest in an English language arts class as a multimodal composing approach. Alternatively, learning could focus on abstracting narrative elements and literary devices as game mechanics for a design project that could be studied in both formal and informal learning settings. Another possibility could engage participants in game abstraction exercises using political cartoons or symbolism in historical fiction and apply these elements as game mechanics. This twist on the GDS curriculum engages learners with the process of game design as a way for unpacking and constructing complex content-driven concepts scaffolded with gaming.

The sample included in this study was 13-18-year-old males who self-identified as gamers. It is intriguing to consider what results may have emerged if different demographics of teens participated. How would issues important to female teens differ from the males? What types of game prototypes would evolve with the change of culture or location of participants? We noted throughout GDS that participants may have been biased to create games according to the types of games they like to play. Player identity and profiling might be beneficial to this type of research and add additional insights to participants' reasoning for prototype creations. Further research in a variety of formal and informal learning settings is crucial to exploring how teens best interact with their world through game design.

Conclusions

The purpose of this study was to explore the relationship between game design and teen's awareness of systems in games and those in their lived

experience. Game design was selected as an approach to investigate this relationship in part due to the mechanics and aesthetics that exist in games, which parallel the mechanics and aesthetics that exist within human life. Commercial games are often designed to promote awareness of a particular issue or topic, and games are something with which many teens engage. In GDS, gameplay proved to be a vehicle for teens to communicate about issues that mattered to them. GDS also provided tools and opportunities for participants to share their perceptions of teen issues and lived experiences in an informal environment while designing games. We explored how the game design process became a mechanism for participants' awareness and knowledge development about systems in games and the spaces in which they live. The GDS and prototyping experience allowed participants to create something meaningful and reflective of themselves, while also giving them a tool to communicate things that are important to them with others.

Our findings suggest that through constructionist game design teens did make the connection between systems in their daily life, and yet they were not necessarily cognizant of this awareness. Deepening this knowledge of awareness for teens in the future, through methods such as game design, may lead to better self-expression and allow teens a substantial outlet for public awareness regarding issues that matter to them.

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CHAPTER 3

Physical Death, Digital Life, and Post-Self: That Dragon, Cancer as a Digital Memorial

GARETH. R. SCHOTT

ABSTRACT

That Dragon, Cancer represents one of the first notable biographical documentary games to address terminal illness and personal loss. This article highlights how the actionable properties of games are repeatedly reversed to generate a thoughtful reflection on the impact of medical jurisdiction over the dying and its regulation over the end of life. Liberating the medium's reliance on certain commonplace and overused design principles, *That Dragon, Cancer* seeks to foster empathy, and urge care, hesitation and preservation rather than progression, advancement and winning states. The resultant game is a poignant digital commemoration of the game creator's son, Joel, whose life was affected and curtailed by cancer. In addition to being a document of parental grief and loss that offers an emotionally resonant and candid articulation of the effect of disease on the trajectory of life and biography of a child, this article also reasons that the game comprises Joel's constructed post-self, allowing his life to be extended post-mortem.

INTRODUCTION

This paper introduces *That Dragon, Cancer* (Numinous Games, 2016) as a noteworthy game text for the manner in which it both stimulates compassion and sympathy for an expiring (digital) life and shares the emotional burden of contending with an approaching death, whilst confined by medicalized procedures and settings. In straying from industry preoccupation with entertainment, which has made the medium such a "driving economic force" (Spiegel, 2009, p. vii), *That Dragon, Cancer* instead seeks to capture the debilitating effect of, and weariness caused by, the control exerted by the medical profession over the end of a life once a medical diagnosis is affirmed. *That Dragon, Cancer* constitutes a personal experience game in which players accompany the Green family as they experience the hold that both cancer and medical processes occupy over their life, and the (contracting) life of their five-year-old son Joel. The game voices the ruminations of Joel's parents, Ryan and Amy Green, in coping with the experience of being removed from their domestic life and placed in a transitory clinical space that incites feelings of isolation and loss of control.

Structurally, *That Dragon, Cancer* is comprised of a series of gameplay vignettes in which the player participates in an assortment of family moments characterized by diverging sentiments (articulations of love, hope, joy, despair). The player inhabits a curtailed world comprised of medical treatment, consultation, and patient rooms in which they adopt different roles and perspectives (harbinger, comforter, sitter, or witness) that play a part in the Green family experience of treating Joel's cancer. Across the game's 14 chapters, the player forms a relationship with Joel (Bread on the Water), is present at his medical procedures (On Hospital Time), given access to intimate and devastating medical consultations (Sorry Guys, It's Not …), experiences exasperation attempting to comfort Joel (Dehydration), shares Ryan and Amy's hope (End of Treatment, Waking Up), despair (Drowning), and confronts Joel's passing (The Temple of God). Penetrating the more sober moments of the experience are flashes of abandon and play. Play is best used to describe the Mario Kart-style wagon ride through the hospital corridors (that simultaneously recounts the volume, range, and cost of prescription drugs used for Joel's treatment) and

the medieval platform mini-game that pits Joel the knight vs. (that) dragon, for player progression never hinges on success or winning such contests. Indeed, *That Dragon, Cancer* repeatedly embraces the processes of play converging on player's acquiring attitude and constructive desire to unravel and resolve setbacks and hindrances, only to deny the player agency and control over the final outcome.

In enabling players to share the thoughts, feelings, and experiences of a family contending with death and dying whilst institutionally subjugated by medical professionals, *That Dragon, Cancer* provides an everyday account of the experience of dying in the present day. The game highlights the impact of a set of procedures and practices that have otherwise served to hide and remove the dying from everyday life, thus contributing to perceptions of the West as a death-denying culture (McManus, 2013; Walter, 1994). This existing state of affairs commenced in the 17th century when the medical profession first extended its jurisdiction over the body to include end of life care (Vanderpool, 2015), and in doing so, fundamentally altering the nature and human experience of dying. As Ivan Illich (1975) argued,

> We have seen death turn from God's call into a 'natural' event … Death had paled into a metaphorical figure, and killer diseases had taken his place. The general force of nature that had been celebrated as 'death' had turned into a host of specific causations of clinical demise (p. 139).

As doctors replaced priests in presiding over the end of a life, the final stages of life also lengthened with individuals now accustomed to living with the prognosis of death while its symptoms are suppressed. Although the medical profession has grown adept at reading the body for causes of malfunction, disease, and decline, it is not always necessarily able to prevent or halt its advancement.

As a brief aside, further control over the body ensued with the establishment of the funeral industry in the mid 19th century, which gave rise to death care professionals who undertook the role of caring for and preparing the dead for interment or cremation. This had the effect of displacing roles otherwise performed by family or members of the local community (Kelly, 2015). As a result of the professionalization of dying and death, and its now customary physical removal from everyday life

(O'Gorman, 1998; Walter, 1994), individuals in the West today are typically characterized as estranged from, and consequently fearful of, death (McManus, 2013).

ENVIRONMENTAL STORYTELLING

Players of *That Dragon, Cancer* gain an insight into the way a life-threatening disease can trigger the surrender of regular life to the schedules and processes of medical care and treatment, including confinement to medical spaces that trigger feelings of isolation and helplessness. In an interview, *That Dragon, Cancer* creator (and Joel's father) Ryan Green described the experience of Joel's hospitalization as being, "alone with 500 families" (Schott, 2017). As Gibbs et al. (2015) also note, "the dying are typically removed from daily life … [while] the dead are removed to funeral parlours and cemeteries" (p. 257). Maddrell and Sidway's (2010) edited collection, entitled *Deathscapes*, reflects on the spaces allotted to death and associated states of dying. Yet, within this significant volume, only a small selection of work is devoted to consideration of the spaces in which dying occurs, underrepresenting the private and public tensions that exist between life and death spaces (Grant-Smith, 2012). The stark realism of the Green family's sequestration from regular life is ably rendered in *That Dragon, Cancer* through their confinement and the lack of freedom proscribed by a medium based on rule systems. The game opts to confine them, and the player, so that they linger in a range of emotionally provoking hospital-based scenes that reflect hope, setback, grief, and loss. The Green family remains largely submissive to the choices and decision making of medical specialists throughout the game experience.

While space typically affords freedom and movement, the dynamics of place serve to communicate a space with a particular meaning. While Joel and his family initially enter medical settings seeking what O'Connor (2004) refers to as a transition in status from illness to wellness. During the game emphasis shifts from restoration of health to pain management (i.e., palliative care). The player learns, with the family, that the disease has given Joel a time-defined life (Small, 2009), in which he will remain in a sanitorium setting dominated by clinical intrusions. Ryan Green signalled his recognition of the spatial affordances of games when he stated that,

> unlike any other mediums, [games] allow you to linger in spaces … looking back at the time we spent with Joel it wasn't what he said or it wasn't the event that we remember but those spaces between … I think videogames [sic] allow you to rest in that space better than anything else (Green quoted in Schott, 2017, pp. 6-7).

Indeed, one of the core ways in which the game serves to invert the medium is the way it inflicts inactivity and immobility within an otherwise interactive medium. This adequately serves to emphasize the way hospitals are places where autonomy is relinquished, illness is often a barrier to activity, and where the physical environment is designed for confinement, holding, or waiting.

Typical portrayals of death in games as temporary suspension only serves to make light of its irremediable nature and the associated grief felt by those who suffer loss. *That Dragon, Cancer* avoids reducing death to a gameplay mechanic, something that can be repeatedly experienced, avoided, or defeated. Representations of health and death as damage points, energy bars, or infinite respawns are therefore discarded. Instead, death is reinstated to a definitive event as the core theme of the game, a portentous presence to be resisted and approached with trepidation. Myers (2009) stated that, "human experiences are accessible only as they are represented and valued by the video game mechanics" (p. 52). As a game about dying, and the unwelcome attendance of death, *That Dragon, Cancer* firmly rejects the medium's over-reliance on screen death to tutor players, induce suspense, or punish failure. Temporary death that allows life to be restored, is also highly player-centric. The intent of *That Dragon, Cancer* is not to modify or reverse events, but as Ryan Green has stated: "We wanted to … invite other people to mourn with us" (Biggs, 2016). As Oliver and Bartsch (2010) noted, the largely insignificant nature of death in games to-date has done little to encourage "the perception of deeper meaning, the feeling of being moved, and the motivation to elaborate on thoughts and feelings inspired by the experience" (p. 76).

A PARENT'S ANGUISH

The access *That Dragon, Cancer* grants to what was unquestionably the most distressing and devastating news for a parent to receive was not the

initial intent of the game. The Greens began game production in November 2012 when Joel was approaching four years of age. At that point, Joel and his family were becoming accustomed to life with cancer, as Joel had been diagnosed shortly after his first birthday (Tanz, 2016). *That Dragon, Cancer* evolved into a game that captured the distress and grief associated with the inescapability of losing a child to cancer. To this effect, the progression of Joel's illness during development highlights the documentary nature of the project. Also, because *That Dragon, Cancer* tells the story of a five-year-old impaired by a rare form of brain cancer (that had already left him partially blind and inhibited his speech development), the game heavily relies on the anguished articulations, thoughts, and dilemmas of his parents through their journey, articulated via letters, voiced thoughts, everyday phone messages to deep truth-seeking discussions.

Woodgate (2006) describes the death of a child as, "living in a world without closure" (p. 78). Compassion for the Greens is hard-wired into the game as it never offers a satisfactory gamic resolution for the player, or capacity to liberate Joel and his family from his disease. As Ryan Green has stated, "so much of life isn't so much about the answers, but about walking with each other in the midst of not knowing the answers" (Schott, 2017, p. 8). Indeed, Green has traced the impulse to make *That Dragon, Cancer* to a definitive moment during Joel's illness that is also recreated in the final game. In a *Wired* feature article on the game Green describes, "a process you develop as a parent to keep your child from crying, and that night I couldn't calm Joel" (Tanz, 2016). Green likened this experience to, "a game where the mechanics are subverted and don't work" (Tanz, 2016). This describes the nature of the game he went on to produce.

During the course of the game, Ryan is portrayed surrendering to the bleakness of losing his child by allowing himself to sink in a deep body of water. While the player is able to command Ryan to resist the urge to succumb to the hopelessness by swimming, the impact of a button command is short lived and quickly diminishes, resulting in Ryan descending towards the bottom. Recurrent action and persistence are required by the player to eventually help Ryan return to the surface. In this way, player instinct is exploited repeatedly in *That Dragon, Cancer* to generate effort and action from the player. The player is repeatedly

deceived into thinking that the causal nature of player input leading to achievable outcomes remains applicable in this game. In another scene, the player is required to guide a soaring Joel, elevated by party balloons, through a hovering mass of black spiky cancer cells. This is one of several discrete game play scenarios that evade the representativeness of the hospital setting, transporting play into a surreal domain. The scene successfully triggers the gamer instinct, leading players to attempt to dodge the spikes and keep Joel afloat. The task given to the player, like that performed by the medical professionals or sought by Joel's parents, is ultimately unattainable and Joel eventually falls regardless of the player's best efforts. Unlike failure, in which a player is typically sent back to repeat until completed, the experiences offered by *That Dragon, Cancer* draw more on early coin-operated arcade games which involves sustaining life and keeping the moment alive for as long as possible.

The game induces a mindful approach to play as it deviates from the known formulas employed in other game experiences. The player is often ill-prepared for what each new scene or chapter will disclose and the requirements and demands that will be placed on them (as is evident in narrated playthroughs posted online). To this extent, *That Dragon, Cancer* echoes the different forms of uncertainty attached to the medical outcome and the confounding experience of submitting to medical processes and practices. Jose Zagal (2011) cites the director of *Heavy Rain* (Quantic Dream, 2010), David Cage, in highlighting the industry's pre-disposition toward formula, "when you look at most games you see today, they are based on patterns, on loops: you always do the same thing, whether you shoot, drive, or jump on platforms," (p. 58). In *That Dragon, Cancer,* ambiguity of the player's role is amplified by being present in and around the situation but never fully adopting a defined role. The player adopts various perspectives throughout the game, beginning the game as a duck that is being fed by Joel (allowing the player to overhear Ryan and Amy explaining the association between Joel's illness and his developmental delays to his siblings), then as doctors, Joel's parents, or an unspecified person (most likely a medical professional) available to offer Ryan some respite from caring for Joel, play with Joel, or simply on hand to listen to Ryan and Amy and bear witness to their experiences. The game's unfamiliar states create

an uncertainty that somehow mirrors and communicates the broader unease and apprehension germane to the context.

PRESENCE AND COMPANIONSHIP

Prevented from changing the course of events, the *That Dragon, Cancer* player is instead present throughout, sometimes as a silent witness or observer, and also is available to provide relief and support to the family or act as a playmate and companion to Joel while his parents are engaged with medical professionals. In accepting the award for Games for Impact at the 2016 Game Awards, Ryan Green declared,

> You let us tell the story of my son Joel. In the end, it was not the story that we wanted to tell. But you chose to love us by being willing to stop and to listen and to not turn away. To let my son Joel's life change you because you chose to see him and to experience how we loved him.

A good example of the way players are encouraged to simply be in the company of the family in *That Dragon, Cancer* is found in the chapter entitled, "Waking Up." In this chapter, the player simply is with Amy as she cradles Joel as he slowly arouses post-treatment. In this scenario, the player may be occupying the form of a nurse, physician, or consultant at work in the "everyday spaces of terminal illness" (Watts, 2010). Being in Amy's presence, it is possible to overhear her telling Joel that one day in the future, cancer will only constitute a small chapter in his life. She claims hopefully that, "cancer will be such a small part of all you could grow to be. You will tire of hearing about it. You won't want to see the cards and notes I saved. I'll hold the memories of this hard day. You, just leave it behind." At that moment, the player's attention is drawn to the cards and handprints that fill the room. Should the player inspect the handprints or pick up and read the cards they discover that each one is a eulogy to other individuals that have battled cancer. As Ryan pronounces later in the game (within the arcade-style knight mini-game), "Joel isn't the only one to ever fight that Dragon." The handprints and cards serve to acknowledge how "so many people have gone before Joel and too many more will follow after" (Green, 2015). Indeed, the eulogies and memorials included in the game represent the stories of the game's Kickstarter backers, providing a mode of digital memorial.

Belman and Flanagan (2010) recognize the power of games to "affirm human values" (p. 5) and the feasibility of empathetic play, which elicits both cognitive empathy (in which the player understands the thoughts and feelings of another) and emotional empathy (an emotional response to the situation). In addition to the subject matter and the manner in which the player is absorbed within a family drama, the structure of *That Dragon, Cancer* also is a likely contributor to an empathetic response. As Lankoski (2011) argues, players "experience positive affects when moving forward, or reaching a goal" (p. 298), conditions *That Dragon, Cancer* does not afford. Remaining with the family throughout their experience, the player develops an attachment to Joel. To this effect, *That Dragon, Cancer* provokes affective empathy (Stotland et al., 1978) as the player endures the moments in which strong emotions are experienced and expressed by the Greens and play is performed with the knowledge and anticipation of an approaching loss. Commenting on the physiology of sadness, Russell and Lemay (2000) note that the emotion is characterized by motor inactivity. Distinct from entertainment, *That Dragon, Cancer* addresses a cognitively effortful subject (Cole et al., 2015) providing an atypical articulation of interactive sadness that challenges the notion that sadness is "an avoidant or unnecessary emotion" (Zagalo et al., 2006, p. 48). Morbid design (Kera, 2013) accepts the impermanence of life.

As *That Dragon, Cancer* progresses beyond the punishing realities of treating cancer in its early chapters, both the family and players are forced to reflect on the shadow of death in terms of what it means for a defenseless dependant to leave the family and pass over and depart the world. In the chapter "Sorry Guys, It's Not …", Amy and Ryan receive the news that Joel's treatment options have been exhausted. A surreal flooding of the consultation room ensues, effectively conveying the weight and uncontrollability of the news presented. As the hospital consultation room fills with water, the scene transitions to Joel alone, separated from his family, adrift on open water in a rowboat. While Joel is safe, he is nevertheless alone. Bearing witness to these scenes again serves to invert the otherwise customary desire and pleasure of progression by instilling in players a disinclination to advance or hasten the game and deliver this vision.

DIGITAL REMEMBRANCE

While the medicalization and professionalization of death and dying redefined the borders between life and death, so too has digital technology. In contrast to the way dying and death has been eschewed, hidden, and made private, today the separate states of life and death intersect more now than ever before thanks to the considerable number of ways our self is saturated (Gergen, 1991), extended, and dispersed via our networked and digital presence and the creation of digital assets that constitute online footprints that eventually form a digital legacy. We exist in the age of the post-self, in which Walter Benjamin's (1936) oft-cited assertion that, "dying has been pushed further and further out of the perceptual world of the living" (p. 93) has now been realized. Shneidman (1973) first posited the concept of post-self to acknowledge human concern with how others will see us and continue to think of us after we have gone. Such considerations typically relate to "the concerns of the living individual" (Schneidman, 1973, p. 45), thus reflecting future-oriented thinking and conscious thought, effort, and planning. In the case of *That Dragon, Cancer*, Joel was a young child oblivious to adult concerns that typically drive the construction of a post-self. However, the game stands as a testament to his experience and permits Joel to continue to affect the lives of others. Joel's public post-self is contained within and conducted via the game in which the occasion of his life is captured and survives via a dematerialized, re-embodied version (Belk, 2013). While players are granted access to what is undoubtedly a tragic moment in the Green's family history through a digital artifact, it is intimate in its preservation of the memory and representation of their son and the period in which they fought hardest to hold on to him.

Society has grown accustomed to the digital representation of a life prior to its physical arrival. Expectant parents associate digital ultrasound images with the concealed activity of a new life growing inside the body. Moncur (2016) states that when such images are then shared with family, friends, and/or acquaintances it will "kick-start the baby's social life, creating a social presence for it before physical birth" (p. 109). At the opposite end of life, when an adult's social life reaches its end, digital death is often much harder to conclude, for there is "no universal off-switch for digital death" (Mancur, 2016, p. 109). Given that dying commonly is more gradual and

protracted, death in the modern era is now typically more anticipated (Carr, 2012), triggering a greater level of participation in a digital perpetuation of the self. For digitally connected individuals who routinely participate in an online "reputation economy" (Zimmer and Hoffman, 2011) the construction of a digital after-life has become inexorable. Faure (2009) has commented that, "As people spend more time at keyboards, there's less being stored away in dusty attics for family and friends to hang on to." Goffman's (1959) dramaturgical metaphor that acknowledged the way people are performers that attempt to convey and manage a certain impression, has become heightened with social media. So much so, that digital adjuncts to a life also are planned and supported by online services. LegacyOrganiser will curate a life online, mygoodbyemessage.com can schedule communications and messages to loved ones and friends "after you are no longer able to," and Eterni.me is able to create a virtual self, powered by artificial intelligence, that offers an enduring digital presence for those with a fear-of-missing-out and "desire to stay continually connected with what others are doing" (Przybylski et al., 2013, p. 1841).

Even prior to a digitally distributed self, a typical response to a prognosis that foregrounded the end-of-life for an individual also would trigger actions to preserve a personal identity (Fulton, 1965). Marshall (1980) states that impending death often will increase self-reflection and the "conscious construction of a coherent personal history" (Carr, 2012, p. 188). Such actions serve as an attempt to transgress looming rituals of separation (Murray, 2010), in which committal of the body often is presented as a final farewell and subtraction of the individual from everyday life. Relative to being remembered and the universal desire to leave a mark on the world, being forgotten can generate significant fear and psychological impact (Ray et al., 2019). In *Death: A history of man's obsessions and fears,* Wilkins (1996) claims: "Fear of being forgotten after death is one of man's deep-rooted anxieties" (p. 14). Today the decoupling of body from data (Graham et al., 2013) is no longer a barrier to a digital post-self, digital persistence and presence combats physical removal from daily life.

David Joselit (2000) distinguishes two models of identity: "one in which subjectivity is immanent to the body, and one in which the architecture of

selfhood is imposed from without" (p. 27). Indeed, symbolic interactionist George Herbert Mead (1934) assigned the term *generalized others* to describe a social reference group whose presence and conjectured opinions serve to shape an individual's sense of self and reputation. With the intensification of self-presentation online, Russell Belk (2015) argues that the self is now more actively co-constructed. No longer simply the consequence of reflection and presumption, the digital self can be initiated by others via everyday acts such as posting and tagging an image of another person on social media that remains present and viewable online and can illicit reaction and response from others. In this way, there is a distinction to be made between individual desire for symbolic immortality and an externally executed post-self that is directed by others actions.

Germane to the responsibility others assume for effecting post-self, Moncur and Kirk (2014) discuss modes of digital memorialization, following an "ubiquitous human practice which is increasingly intersecting with our digital lives" (p. 1). They stress how, today, "memorial is bound up with cultural modes of practice" (Moncur & Kirk, 2014, p. 1) permitting a growing range of artefacts to be applied in the memorialization process. Contemporary modes of memorial typically find charming means of accessing digital residua that exploits digital activity and the assets created. Walker (2011) attempted to illustrate the extent of our collective digital productivity as:

> five billion images and counting on Flickr; hundreds of thousands of YouTube videos uploaded every day; oceans of content from 20 million bloggers and 500 million Facebook members; two billion tweets a month. Sites and services warehouse our musical and visual creations, personal data, shared opinions and taste declarations in the form of reviews and lists and ratings, even virtual scrapbook pages. Avatars left behind in World of Warcraft or Second Life can have financial or intellectual-property holdings in those alternate realities. We pile up digital possessions and expressions, and we tend to leave them piled up, like virtual hoarders.

Moncur and Kirk (2014) highlight the example of Hadas Arnon's Digital Cemetery, which replaced gravestones with USB-sticks containing personal data of the deceased. Such actions transform and imbue everyday material objects and actions with dedicatory significance and meaning (Walter, 2010). Gibbs et al. (2015) have remarked on how little scholarly attention

has been given to the way everyday media platforms currently intersect with traditional mourning practices. Just like a post-mortem social media presence, a roadside memorial, or a diamond created from the remains of a loved one, the production of *That Dragon, Cancer* serves to reposition the deceased "back within the flow of everyday life" (Gibbs et al., 2015, p. 257). *That Dragon, Cancer* permits, what is an otherwise personal loss, to be communicated within the formal system structures and contemporary aesthetic of what Gibbs et al. classify as the platform vernacular of a prevalent medium. That is, in its expression of grief, loss and memorialization, it exploits the structuring force of a common platform. In the case of *That Dragon, Cancer,* it has exploited game rule systems and the particular practices of its users to communicate a parent's love and the weight of grief. This has permitted Joel's life experiences to continue to make an impression after death via a post-self that engages individuals beyond his lifetime capable of "new circulations, repetitions, and recontextualizations to variously constituted publics" (Graham et al., 2013, p. 133).

CONCLUSION

This paper has examined how *That Dragon, Cancer* offers a courageous and confronting depiction of ordinary death and dying as a medicalized process. *That Dragon Cancer* highlights the frequent inadequate handling of death in games as a solemn subject worthy of sincere consideration. Cultural preoccupation with dramatic violent depictions of death are misleading and do little to further our experiential knowledge and acceptance of a universal life experience. The subject matter of *That Dragon, Cancer* is thus, on the one hand, unremarkable as the nature of the death portrayed is all-too-common and routine, but made remarkable on the other hand, for the way the player is invited into a family experience and the intimacy it permits. The game offers an authentic statement and experience of coping with death and dying that functions to challenge what has been termed the emotional invigilation (Walter et al., 1995) of death referring to its re-appropriation as a non-serious entertainment form. It instead serves to represent medicine as a "social institution intrinsically involved in social control" (McManus, 2013, p. 46). The story of Joel's treatment is an account of the loss of control over "bodies, over illness

and pain, over emotions, over the passage of time, and ultimately over life itself" (Sourkes, 2007, p. 39).

The confronting nature of the subject matter of *That Dragon, Cancer* is attributable to the way that the game deals with one of the hardest categories of deaths to comprehend and transition through and beyond: child death. This is a form of loss for which the frame of expected response and behavior is narrower than loss of a loved one at more advanced points in the lifespan (Prigerson et al., 1999). The death of a child defies the *expected* order of life events. The perceived unnatural, untimely (Wheeler, 2001) and therefore socially unanticipated nature of child death also is reflected in the level of knowledge on the subject. It brings with it the loss of an assumptive world, in that the generalized sense of predictability and stability of the world is challenged (Emmons, Colby & Kaiser, 1998). As Green (2015) has similarly stated, "Joel didn't have the chance to make an impact." In this way Joel's post-self exists "to show the world how important Joel was to us. Loving him and losing him was the richest part of our life so far."

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CHAPTER 4

Experiential Depression and Anxiety Through Proceduralized Play: A Case Study of Fragile Equilibrium

ANDREW M. PHELPS, JOCELYN WAGNER, AND ANDREW MOGER

INTRODUCTION

In this article we examine the portrayal of depression and anxiety in games that seek to utilize an experiential, metaphorical approach to the representation of these conditions. We theorize that, in addition to games that address these topics through more traditional, literal narrative and avatar-based representations, there are effective design methodologies that utilize abstract, experiential designs to provoke an emotional resonance and understanding of these conditions rather than depictions of characters who are depressed or anxious. To explore this concept, this article examines *Fragile Equilibrium* (Phelps, 2018a), a highly emotive (and carefully crafted) game that evokes concepts and emotional states such as depression, anxiety, and melancholy entirely without the use of characters, dialogue, or narrative. *Fragile Equilibrium* serves as a case-study for designed interaction that utilizes experiential gameplay. Its game mechanics seek to relate emotions, feelings, and perhaps even empathy through played experience. To date, *Fragile Equilibrium* is one of very few games that engages with mental health through experiential gameplay

rather than narrative development, and thus it provides a unique point of reference when addressing complex issues of mental health through games and interactive media.

In considering this design methodology and its use in *Fragile Equilibrium*, this article first explains the concept of experiential, metaphorical games in general and why they might be effective given relevant design and learning theory. Then it examines the design and development of *Fragile Equilibrium* as an example of this kind of game. Following that examination, this article compares and contrasts how this game works similarly or dissimilarly to other games that have attempted similar representations of mental health. Finally, it examines player reactions to the game to determine whether this portrayal was effective in conveying the message to players beyond the design team. By examining *Fragile Equilibrium* through its gameplay, mechanics, and aesthetics, the authors argue that such experientially focused designs can be effective in portraying nuanced depictions of mental illness in ways that differ from more literal representations and can be effective in creating a sense of emotional resonance as a way of engaging players in these topics.

APPROACH, BACKGROUND AND TERMINOLOGY

Emotional resonance is, in itself, a form of education. It builds appreciation and understanding for others' experiences, including with depression and anxiety. Games that draw on emotional resonance can engage players in self-reflection and consideration of their relationship with these themes and topics. In this manner, *Fragile Equilibrium* represents a kind of game that is of increasing interest in the field: an experiential educational game. This kind of game is premised on the notion that players can gain an understanding of and empathy for a given scenario or subject matter merely through the act of playing it, and specifically through the act of *interacting* with it. Examples of such games include exercise games that require players to engage in cardiovascular exercise (Rusch, 2017), exploration games that take place in geographic regions such that the geography is assimilated rather than explicitly taught (Davis, 2020), or games such as *Splattershmup* (Decker, Egert, & Phelps, 2016) where players construct a painting simply by moving around and thus learn about motion

as it relates to action painting. Experiential educational games are in contrast to more traditional games for learning in which specific subject matter is represented more literally through the content of the game, often overtly so.

In considering the design methodology of emotional resonance and the representation of mental health in such games, the question becomes: to what extent can a game convey the feelings of various mental disorders to players and what would this mean if it were effective? Rather than having a player know more about a given condition from the perspective of clinical knowledge or fact-based recall, to what extent can games help to convey the actual feelings associated with disorders such as depression or anxiety? To explore these questions, this article examines *Fragile Equilibrium* as a case study from a design perspective, in the structure and format of design literature. It presents the background issues and motivations to consider these questions, examines the issues and themes that informed the design of the game, describes the design of the game itself, compares and contrasts the design of the game with others that are similar in one form or another, and explores the reception of the game and its effect with an audience. In this manner, this article offers a working example and post-mortem, examining the research question of whether such portrayals can be effective towards the goals just articulated.

Depression, Anxiety, and Mental Illness

It should be noted that the authors of this article are neither clinicians nor experts in mental health; they are game designers and developers. In considering their examination of this subject, and the perspective from which they examine it, it is important to establish working definitions of the terms depression, anxiety, and mental illness. This will help to more accurately dissect how *Fragile Equilibrium* functions with its portrayal of these concepts and how this portrayal is and is not similar to other such efforts in video games.

Depression is a mood disorder which can disrupt daily life. Those who suffer from depression experience persistent and recurring feelings of sadness and hopelessness over time, and may lose interest in activities

they previously enjoyed engaging in (Barnhill & APA, 2014; Mayo Clinic, 2018; Roehr 2013). Aside from the emotional problems caused by depression, individuals also can present with physical symptoms such as chronic pain or digestive issues. Although depression as a diagnosis embodies more specificity of these symptoms and the precise symptomology and rubrics for identification and evaluation have evolved over time (Bech, Gram, Reisby, & Rafaelsen, 1980; Fried, Epskamp, Nesse, Tuerlinkx, & Borsboom, 2016; Jablensky, Sartorius, Gulbinat & Ernberg, 1986; Zimmerman & Coryell, 1987), the above tenets are generally understood by the public as facets of depression. Depression and sadness are not synonymous. Persistent feelings of hopelessness and loss of interest and engagement for extended periods are symptomatic of those that suffer from depression (Parekh, 2017). These characteristics can therefore be used to explore depression as it functions within games aimed at a popular audience, both as a narrative device and as an experiential tool.

Although depression is the main theme of *Fragile Equilibrium*, anxiety is a condition that is often experienced in conjunction with depression (Alloy, Kelly, Mineka, & Clements, 1990). As such, it is useful to analyze the presence of anxiety in games about depression in order to deconstruct the different components of the two disorders and how they tend to function together. Anxiety, or Generalized Anxiety Disorder (GAD), can be described as persistent and excessive worry that interferes with daily activities, is present for an extended period of time, and is accompanied by physical or cognitive symptoms such as restlessness, fatigue, impaired concentration, irritability, muscle aches or soreness, difficulty sleeping, and more (APA, 2013; Glasofer, 2019). Again, while the nuances of symptomology, subclassification, and diagnosis are not always well-popularized, there exists enough of a public understanding of these basic symptoms and associated feelings that games engaged with these topics can resonate.

While depression and anxiety are specific conditions, mental illness is an umbrella term that encompasses both as well as a wide variety of other disorders. How mental illness is referenced in this paper is closely related to the National Institute of Mental Health's (n.d.a) definition of *Any Mental Illness* (AMI) as, "a mental, behavioral, or emotional disorder. AMI can vary

in impact, ranging from no impairment to mild, moderate, and even severe impairment." Importantly, this definition adopts a clinical, analytic lens. Mental illness is often referenced in media as a caricature that embodies a hodge-podge of inflated symptoms, often relying on stereotypes, tropes, and characterizations that are damaging both to the public understanding of mental illness and destructive to inclusion for individuals suffering from such conditions (Shapiro & Rotter, 2016). The authors of this article want to make clear that this stereotyped image of mental illness is not the one being referenced throughout this work.

Experiential Games and Learning Theory

While there are multiple narrative-based games about depression on the market, many of them use a slice of life tactic, in which players engage and grapple with the topics of mental illness through the eyes of the character they play or through the surrounding characters in their world. The narrative in these games is arguably sympathetic (in that the player sees depression through the eyes of their character) rather than empathetic (in that the player feels the constraints of depression and anxiety through experiential gameplay). *Fragile Equilibrium* is unique in that it examines depression and anxiety through an experiential lens—players must practice balance between internal repair and external defense in addition to operating within an environment that increasingly becomes more hostile and decayed. In this sense, *Fragile Equilibrium* is evocative. Perhaps the player will not exit the game with a fundamental understanding of depression and anxiety as medical terms, or even societal concepts, but they likely will experience the emotion, constraint, and pressure designed into the game's system, and ideally reflect on their own experiences as modeled within the gameplay. From a design perspective, whether or not the player makes the connection between *Fragile Equilibrium* and depression is not as important as the feelings elicited by the game. It is, after all, the varying interpretations of art which weave a wider, more nuanced cultural narrative. *Fragile Equilibrium* gives the player the tools to empathize with depression without explicitly relating the theme to the player, thus allowing players to draw their own conclusions from within their own experiences.

The experiential gameplay model utilized by *Fragile Equilibrium* stems from the concept of experiential learning, which has been used as an effective teaching tool in education (Kiili, 2005). More recently, experiential learning has been studied in conjunction with games. The potential of this tactic in the medium is rife with possibility. This model was initially proposed by Kristian Kiili 2005), who attempted a synthesis and/or integration of traditional experiential learning models in education with the concept of "flow", (as put forward by Cziksentmihalyi (1990) and discussed below. He then applied this notion to the field of gaming to theorize an experiential gaming model. In order to understand the precepts of experiential gaming, it is important to understand its roots in both learning models and its connection to the phenomenon known as flow.

Although the concept of experiential learning as defined by Kolb, Boyatzis, and Mainemelis (2001) has been in practice for some time, its applications to interactive video games are relatively new. Traditionally, experiential learning models utilize four steps that help to cement concepts and ideas in the minds of those using the model: concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb, Boyatzis, & Mainemelis, 2001). According to Kiili (2005), "the model stresses the continuous nature of learning and the appropriate feedback which provides the basis for a continuous process of goal-directed action" (p. 17). In other words, the experiential learning model promotes uninterrupted engagement with certain concepts, cementing them through repetition and iteration within the learner's own experience. It allows learners to discover the concept on their own terms, rather than focusing on rote memorization or regurgitated theories. This idea of self-directed learning and self-actualization along a non-predetermined path of knowledge acquisition and reflection also has roots in both constructivism (Campbell, 1999; Papert, 1991; Powers & Powers, 1999; Puntambekar, 1999) and constructionism (Brooks & Brooks, 1993; Edwards, 2005; Vygotsky, 1987). But experiential learning on its own faces some shortcomings, primarily in that it is not inherently, or not necessarily by definition, deeply engaging. Kiili (2005) suggests that the solution to this problem lies in *active* gameplay and the careful cultivation of an environment which encourages flow. The application of flow to educational learning environments has been utilized

before and has shown positive trends in human computer interaction learning contexts (Webster, Trevino, & Ryan 1993).

While more recently applied to experiential learning models, the concept of flow is well established. Psychologist Mihaly Cziksentmihalyi (1990) proposed term "flow" as "the psychology of optimal experience," a concept that has informed the literature on games, play, and education (Cowley, Charles, Black, & Hickey, 2008; Kiili, de Freitas, Arnab, & Lainema, 2012). In Kiili's (2005) theory, he sums up Cziksentmihalyi's concept of flow as an *optimal experience*, one which completely captivates the mind and body, such that one becomes singularly focused on a goal and the exhilaration which accompanies the pursuit of that goal. Flow is often referred to as "being in the zone," and in some sense can be said to compound experiential learning in that it drives the learner to continually cycle through the four steps outlined above in order to reach their goal. It ensures that activities do not become boring or too repetitive. Cziksentmihalyi (1990) postulated that activities can be designed to promote flow by ensuring that levels of skill and challenge were equally matched; too much challenge causes anxiety while a lack of sufficient challenge causes boredom (Kiili, 2005).

Both this notion of effectively balanced challenge and of cycling through the stages of experiential learning are specifically applicable to designing experiential gameplay. Experiential gameplay is all about problem solving and discovery learning (Kiili, 2005). This means that ideas and procedures are uncovered through repeated effort. Discovery learning doesn't just happen. In order to fully engage the player and reinforce concepts within a game, games must directly provide clear feedback, and offer well-defined goals and challenges that are on par with a player's skill level at any given point (Cziksentmihalyi, 1990; Kiili, 2005). This mirrors the learning concepts as put forward in the idea of the zone of proximal development (Vygotsky, 1987). This is further explored by Gee (2004) in the context of networks of players, and also by Squire (2003) in the context of the engaging nature of video games as a medium.

From a design perspective, the more interactive the game, and the better the game situates itself to the position of the player on a balance of repetition, challenge, and reward, the more a player has the opportunity

to encounter concrete experiences, reflectively observe the circumstances, abstractly conceptualize solutions to obstacles that arise, and put those concepts into practice with active experimentation. Numerous successful role-playing games demonstrate these active choices over and over again throughout the course of play. But these precepts only provide the foundation for the experiential gameplay model. As experiential gameplay seeks to conjoin gameplay and experiential learning to foster flow, such games must also seek to acknowledge both cognitive and behavioral exercises as applied to learning, a notion which acknowledges constructivist (Phillips, 1995) and pragmatist (Kivinen & Ristelä, 2003) theories (Kiili, 2005). In order to foster the previously mentioned four phases, experiential games create three scenarios through which these edicts are performed: ideation loops, experience loops, and a challenge bank (Kiili, 2005). In other words, the game regularly presents new challenges, the solutions to which are not immediately evident to players. Players must then conceptualize new and innovative solutions to these challenges (resulting in the ideation loop) and put them into practice.

Once an idea has found purchase and has been successfully performed, players can continue to use this solution for a short while, thus lingering in the experience loop. Kiili (2005) notes that the challenges presented must continue with regularity and incrementally increase in difficulty to force players back into the ideation loop. If players spend too long in the experience loop, the game becomes too repetitive, and thereby less engaging (Kiili, 2005). In addition, Kiili (2005) also suggests that games must have good storytelling, provide balanced gameplay, and furnish an attuned cognitive load in keeping with earlier notations by Squire (2003). In short, experiential games should be immersive and balanced without overwhelming players with too much information or providing too little information to be interesting. With all this in mind, it is important to note that while experiential gameplay is pivotal in cementing concepts in the minds of players, experiential gameplay alone does not inherently make games meaningful or emotionally resonant. For a game to truly be impactful in this context, for it to challenge the preconceived notions brought to the experience by the player, and for it to resonate within them, games must also be deep.

Towards a Deeper Design Approach

Before fully analyzing the nuanced definition of deep games, it is necessary to break down the preconceptions surrounding both authorial intent and meaning derived from media. It is certainly possible to argue that meaning can come from a variety of sources and that any game can become significant to specific players. And this, to some extent, is true. Because individual players are informed by their own lived experiences, their experiences may resonate with any number of factors within a game. However, this is wildly difficult to quantify when designing games—it is impossible to know, for instance, that a player may have a fear of the ocean. This could turn a relatively benign game, such as *Subnautica* (Unknown Worlds Entertainment, 2018), into a horrifying experience. This does not mean that the extrapolations of players are incorrect, or should be dismissed out of hand, it is only to suggest that when designing a game, designers should focus on honing their intent such that it is imbued in the game directly as much as possible, while still allowing for the individual lived experience of the player to inform their interpretations.

Hedonic gratification focuses on the pleasure derived from gameplay in all its multi-faceted forms (Oliver et al., 2015). This notion of gratification, while an important component for games in general, does not inherently make a game meaningful in and of itself. To put this more bluntly, pleasure derived from gameplay is certainly important in the design and experience of games, else why play them, but it is not necessarily a factor that contributes to meaningfulness. Studies have shown that media can fulfill innate psychological needs, such as autonomy, competency, and relatedness (Huta & Ryan, 2010). Additionally, Oliver et al. (2015) determined that eudaimonic gratification, which can be characterized as appreciation rather than pleasure, is also a necessary component for meaning derived from games. The more a player can become engaged with the game, from mechanical representation to the connection they have to the themes within the game, the more meaning can be derived from the game itself. The concept of eudaimonic gratification represents the meaning and insight that comes from the game and is thus able to solicit emotion and raise questions about the "human condition" (Oliver et al., 2015). By cultivating insight and appreciation within players through their games,

designers can attempt to stimulate the minds of their players and hopefully impact them on a deeper level. With this in mind, one can begin to create systems for eudaimonic gratification within games in order to foster meaning.

Furthermore, it is not sufficient as a design paradigm to superimpose meaning on a game in the middle or tail-end of production. Deep games must intentionally establish what experience they wish to convey—they must firmly institute a theme, a point of reference which informs all else right at the beginning (Rusch, 2017). It is from this point of reference that meaning originates and trickles down through the game. This happens from code to mechanics, from art to worldbuilding, and from individual elements to cohesive design. Deep games rely on themes to create resonance with the player, drawing on their experiences with culture, past experience, shared mythology, purpose, and humanism to create a context from which to experience the game world. Doris Rusch (2017), games scholar and author of *Making Deep Games: Designing Games with Meaning and Purpose* posits that metaphor can be used to imbue meaning in games. The use of metaphor in gaming lends itself to the framework of experiential gameplay since it is meant to stimulate reflective observation and active conceptualization. Metaphor veils its true meaning for us to discover through our own participation.

The construction of metaphor lies in the linkage between what is concrete and what is inferred. Rusch (2017) specifies that "[s]tructural metaphors are no imaginative flights of fancy. They constrain the meaning of abstract experiences in a very precise and coherent manner, by virtue of their mutual, unified structures" (p. 54). The use of metaphor thus serves as a cognitive tool used as reference and inference in order to transform the abstract into something tangible, something that has reference within the real world. It is the notion of actively engaging with embodied experience, which Rusch (2017) describes as taking place in the body or the mind, that makes sense of metaphors. Games provide an interactive embodied experience—the presentation of choice and the element of skill in games creates an immersive environment through which players can simulate this phenomenon. Practically, this functions through the representation of abstract concepts by way of mechanics. Rusch (2017) argues that

mechanics are a vehicle for metaphor in games, referencing many examples in order to support her claim, including the grappling mechanic in *God of War* (Sony Interactive Entertainment, 2016) as metaphor for periods of transition, the exponential falling tetrominos of *Tetris* (Pajitnov, 1984) as an analogy for overwrought Americans struggling under the weight of capitalism, or the slingshot mechanic in *Angry Birds* (Rovio Entertainment, 2009) as alluding to anger, repression, and vengeance. These instances allow player agency in the game to be mapped onto the experience through the tangibility of real-life circumstances (Rusch, 2017).

Situating Fragile Equilibrium as a Designed and Authentic Experience

It is through experiential metaphor that *Fragile Equilibrium* strives to tell its story: while the in-game mechanics serve to provide balance and challenge, they are also used as a metaphor for depression. Andrew Phelps (2018b), designer of *Fragile Equilibrium*, notes in his artist's statement:

> [*Fragile Equilibrium*] is not a game that teaches someone about depression, it is not a game that aspires to educate someone or empower someone or God-forbid claim to cure someone. It is not a game that directly addresses its subject: it intends instead to evoke a feeling, a nostalgia, a sense of something... (2018b, para 19)

This "sense of something" is meant to evoke a sense of depression as defined above through the experiential metaphor model (Rusch, 2017). It is through the use of mechanics within *Fragile Equilibrium* (described in detail later in this article) that the player participates actively in the metaphor and creates connections to their own lived experience. It is also these mechanics, in concert with a variety of other elements, that serve to establish *Fragile Equilibrium* as a meaningful game. However, *Fragile Equilibrium* also draws from the conventions of games that traditionally have ignored or dismissed deeper readings. It is also important to take Phelps' (2018b) statement in context with the aforementioned discussion of learning theory: he is challenging the notion that educational intent must be realized in overt learning objectives, in facts or figures presented in a formalized way with associated assessment. He is implying the notion that the game is intended to be *felt* rather than to be *read,* and that the learning is thus experiential and emotional.

While all of the elements above foster a sense of challenge, and a meaningful base for the narrative, it is important to remember that the vehicle for these concepts is a game and should present itself and function as such within its medium. But what does it mean to function as a game? The potential and possibilities of games are continuing to expand almost daily, with designs that challenge the status-quo continuing to reach new and more varied audiences all the time. Indeed, the entire notion of deep games springs from experimental work at the edges of more traditional game design, and as will be explored later in this article, games increasingly are exploring difficult concepts such as mental health in new and unique ways. And yet, how deep games that explore mental health are viewed by audiences is also increasingly complex, and the ways they are experienced and reflected upon by players is sometimes sharply divided. *Night in the Woods* (Holowka, Benson, & Hockenberry, 2017), for example, was acclaimed by players, fans, and critics alike, whereas *Depression Quest* (Quinn, 2013) was well reviewed critically, but audience reaction was divided sharply as the game sought to expand the role of games and their potential space for art and intervention. Indeed, *Depression Quest* was singled out as a case example of a non-real game during the GamerGate debacle (Johnston, 2014; Salter & Blodgett, 2017; Smith, 2013) in ways that were toxic and destructive not just to its primary developer, Zoe Quinn, or the idea of engaging with the topic of depression and anxiety through games, but even to the medium as a whole (Grant, 2014; Kluwe, 2014). Both of these examples are discussed further in the following sections.

The term "real game" stems from the constitutive rhetoric surrounding video games as a medium. By using the term "real game" in the context surrounding games, gamers, and game culture, the prefix of "real" presumes that there are games that do not qualify as games, at least for some groups, creating dissonance within the larger gaming community (Consalvo & Paul, 2019). The designation of real or not real often affects the reception a game receives within the community from both players and critics; it can cement a game's status in the community or embroil it in contention and debate. There are a number of societal factors that go into the determination of what makes a real game, and what qualifies a game as not real, such as the prestige of the developer, the platform on which it was released, the content of the game, and even the game's

cost (Consalvo & Paul, 2019). Further, there are many genres and facets of games that more or less fall on one side of the "real game" spectrum. For instance, Consalvo and Paul (2019) note that narrative-focused games, such as walking simulators, are often points of contention within the larger community; reviewers and players alike can be at odds with the notion of narrative-heavy games as real games. While the authors of this article do not take the position that walking simulators, mobile games, or games by certain publishers should not automatically qualify as "not real" games, we wondered whether more "traditional" game genres, tropes, and mechanics could facilitate the expression of deep, meaningful experiences. Additionally, the use of less controversial mechanics, as seen in *Fragile Equilibrium,* potentially have a better chance of reaching a wider audience.

As an arcade shoot-em-up ("shmup"), *Fragile Equilibrium* is fast-paced, challenging, and was released on a variety of notable platforms (namely XBOX One and Steam), all qualities which do not push the current boundaries between "real" and "not real" games. Again, it should be noted that its narrative is told through mechanics and aesthetic design rather than written or oral storytelling. It draws deeply from the history and design aesthetics of older games in the genre from which it springs. In this way, *Fragile Equilibrium* stays within established conventions of its genre. At the same time, it is also a deep or meaningful game. For more astute players, this may inspire a further line of thought about what constitutes a real game, and what games can aspire to. As Consalvo and Paul (2019) have written, "testing the boundaries of an established category changes how we conceptualize the category in the first place" (p. 117). By establishing itself as a new type of game that builds upon the traditions and mechanics of a traditional genre, *Fragile Equilibrium* challenges the design space of what such games are capable of and their extended purpose.

THE DESIGN AND DEVELOPMENT OF FRAGILE EQUILIBRIUM IN DETAIL

With a fundamental understanding of the factors that shaped *Fragile Equilibrium* and the approach and background to its design, it is useful to examine the game itself: how it is played, the context surrounding its creation, and the inspiration behind the specific design elements within the

game. In addition to being unique as an experiential game that engages with topics regarding mental illness, *Fragile Equilibrium* is also uncommon in that it was created in a classroom environment. *Fragile Equilibrium* was the third major studio project at the Rochester Institute of Technology Center for Media, Arts, Games, Interaction and Creativity (MAGIC) with the help of students, faculty, and employees of MAGIC Spell Studios (RIT MAGIC Center, n.d.). It uses unique shoot-em-up ("shmup") elements in novel ways that are carefully balanced and that help reinforce a unique metaphor for depression and anxiety.

We note the fact that *Fragile Equilibrium* was developed academically, in a classroom environment, for two significant reasons relative to this larger discussion. First, this was the first time that several of the students who aided in the development of the game had considered how to encode specific themes of depression and anxiety in a design of their own, even though some had played other commercial games that incorporated these themes. Second, several students self-identified that they either suffered from depression and/or anxiety themselves and/or knew friends and family members that did so. This meant that the design was informed not just by Phelps' vision, but also the backgrounds and experiences of several members of the design and implementation team.

Mechanics and Metaphor

Fragile Equilibrium is styled like a traditional shmup. The player controls a ship that makes its way from left to right through a scrolling world while navigating an ever-increasing onslaught of enemies (flying at the player from the right side of the screen) throughout gameplay. Survival depends on the player's ability to dodge, weave, and return fire with a variety of the ship's weapons. If a player's ship is hit, the player loses health. Heretofore the gameplay is pretty standard, but *Fragile Equilibrium* introduces an uncommon mechanic: enemies that get past the player crash into the left side of the screen, first shattering and then breaking off portions of the playable area. In a game that calls for constant movement, the detriment to the playable area greatly impacts play and the odds of a player's survival. To this end, *Fragile Equilibrium* has a *mend* mechanic, in which players can face backwards and repair their world, slowly restoring

the playable area and giving themselves room to maneuver again. Additionally, repairing the screen recharges the player's weapons, which then creates a strategic dilemma: players that have taken little damage to their screen must allow for some damage so that they can refresh their power levels. The balance to this mechanic is that players cannot mend the screen and continue to fire at enemies concurrently: they must focus their efforts on what is most pressing at the time and continually make judgement calls regarding the best tactic at any given point in the game.

This balance between external defense and internal focus and repair is meant to challenge the player's expectations of constantly fighting incoming projectiles. It pointedly differs from the normal shmup practice of having enemies arrive from a single direction, and it provides a secondary survival mechanic that is ever-present and needs constant monitoring and attention. As noted previously, this mechanic, along with other elements of the game, is meant as an experiential metaphor (as described by Rusch, 2017) for depression, mental health, and self-care. Players must at once both 'deal with' the normal 'shmup world' (i.e., the incoming and persistent external enemies and projectiles as shown in Figure 1), but also with the need to (literally) turn around and focus on their own view of the game world that is literally breaking apart, as shown in Figure 2. In this sense, the game invites players to reflect on external and internal conceptualizations of the world.

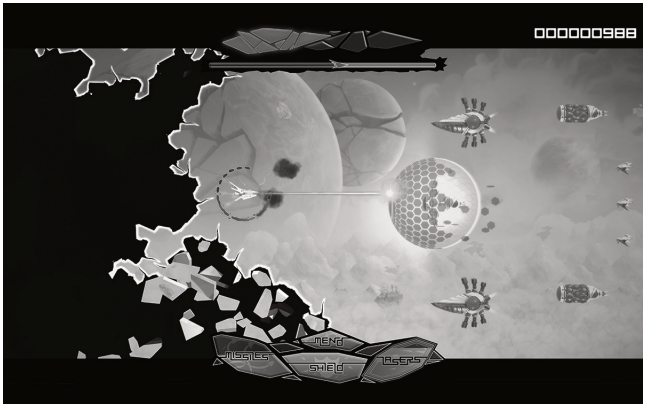

Figure 1: Fragile Equilibrium in both shmup mode.

Figure 2: Fragile Equilibrium in repair mode.

Both the shmup and mend mechanics, which are heavily repeated throughout the game, exemplify the amplification of metaphor through repetition (Bogost, 2007). The game's shmup mechanics are contrasted by the calming color palette and serene (although still energetic) music. These elements serve to accentuate the harsh and brittle reality of the world breaking around players and the chaotic dance they are forced into as the game goes on. This further stimulates reflection on the external vs. internal dynamic: something may appear calm and scenic at the outset but can quickly evolve into internal pandemonium. In this manner, the game effectively uses the navigation (and compression) of the environment to stage a dramatic and repeatable story that has similarities to the way that space is often used in conjunction with more traditional game narratives (Fernández-Vara, 2011). The elements of the game work in concert to reinforce the parallel with depression and anxiety: there is a constant need to self-regulate and self-repair, as well as address continual attacks from outside forces, a harsh juxtaposition to the soft colors and serene music that provide a backdrop. The feeling of anxiety is heightened as, inevitably, more of the screen is eaten away and the player's movements are restricted over time.

Development and Release

Fragile Equilibrium was released on Steam, itch.io, and XBOX One in January 2019 after a development period of nearly two years. It was also shown at Miami@Play (Filmgate Miami, 2018), the ICA Games "Ante-Conference"

(International Communication Association, 2019), and Adobe MAX (Adobe, 2018) in regards to its inventive use of Adobe XD during the design process. It was shown at the Open World Arcade (Akron Art Museum, 2019) in connection as a part of the Open Worlds: Video Games and Contemporary Art exhibit at the Akron Art Museum. The game was the winner of the Award for Visual Excellence at the art showcase at the 2019 International Conference on Interactive Digital Storytelling (ICIDS, 2019). The game is rated E for Everyone by the Entertainment Software Ratings Board (ESRB) and is free to play on every platform for which it is available.

Design Inspiration and Artistic Intent

The inspiration for the game came from a number of seemingly disparate sources, and through these design elements, the designers attempted to create a post-apocalyptic nostalgia (Fuchs, 2016) for the time where shmups peaked in popularity. Artistically, the game draws heavily from 1980s fantasy art and music, other shmups such as Treasure's *Ikaruga* (Sega, 2001), Kaihatsu's *Rai Den* (Temco, 1990), and Irem's *R-Type* (Nintendo, 1987), as well as the artistic style of Roger Dean album covers (Dean, 2008; Dean, 2009). Additionally, the game features a nod to the Wabi Sabi aesthetic (Koren, 2008), which is "loosely translated as 'the recognition of the beauty of the imperfect'" (Phelps, 2018b, para 22). The enemies and levels of the game itself become imperfect over time, in addition to the more literal decay of the screen itself. All of these influences work together to create an odd tranquility, even as the world crumbles around the player. It is this passive sense of serenity, beauty, and decay that positions *Fragile Equilibrium* as a vehicle for melancholic reflection. It is meant to evoke emotion and contemplation through every aspect of the world. The player is meant to find beauty and meaning within the confines of the game.

Phelps' (2018b) extended artist's statement yields further insight to the game's genesis, as well as its intended outcome. In the statement, Phelps notes that the game is supposed to straddle the line between calm and chaos, a constant balancing act between self-reflection (which repairs the world around the player and replenishes supplies) and active engagement with the present (which protects the repairs the player made and supports progress through the game). Phelps notes that the game provides a sense

of power, agency, and control in this balancing act: depression is often characterized as solely a negative function, but some artists, musicians, and philosophers claim that their depression has informed their creativity and empathy. It is this sentiment of self-reflection as a tool for growth and healing that is pivotal not only to those with depression, but anyone who engages with the nuances and tribulations of life (Phelps, 2018b). This forms the basis of the mend aspect of the metaphorical action in the game. For the purposes of this analysis, it is perhaps enough to suggest that self-reflection in the face of adversity is a common ground for humanity, a place where one can draw empathy and relate to those who face different challenges. Phelps (2018b) concludes with his interpretation of this melancholic reflection in the game:

> Of all the things I've read and considered as a part of this work, perhaps the one that sticks with me most is (from Wikipedia) "Mono no aware" (**物の哀れ**), literally "the pathos of things", and also translated as "an empathy toward things", or "a sensitivity to ephemera", [which] is a Japanese term for the awareness of impermanence (**無常** mujō), or transience of things, and both a transient gentle sadness (or wistfulness) at their passing as well as a longer, deeper gentle sadness about this state being the reality of life." Hopefully this game conveys some small aspect of that lingering awareness, that sense of empathy, that awareness and gentleness of form (para 22).

Both the Wabi-Sabi aesthetic and the larger, deeper aesthetics of Mono no aware have deep roots in the Japanese traditions of self-reflection and cultural wistfulness ("Japanese Aesthetics," n.d.). The juxtaposition of action within an environment that is not only tranquil, but specifically slower and more serene than would be typically presented in a similar game, is both deliberate and was tested repeatedly with target audiences to ensure that it was noticeable. In this sense, the design of the game is specifically attempting to engage players in noticing the theme of balance between disparate elements. It also encourages reflection on how a multitude of elements can at one time be either positive or negative in context, and thus can ultimately create experiences that are in many ways both.

SITUATING FRAGILE EQUILIBRIUM IN A LARGER REPRESENTATIONAL CONTEXT

The representation of mental illness in video games has been the topic

of an increasing number of academic works (Rivers, 2018) and industry discussion (Sinclair, 2019). Despite these efforts, more work in the field needs to be done. For our purposes, there is some framework on which to build. In their study of the most financially successful games from 2011 to 2013, Shapiro and Rotter (2016) found that 24% of financially successful games contained depictions of mental illness, and about 69% of the characters in these games that were identified as having mental illness also were violent. They directly contrast these representations with research studies that indicate the, "general prevalence of violence among mentally ill persons is low and associated with other factors such as co-occurring substance use disorders" (Shapiro & Rotter, 2016, p. 1594). Shapiro and Rotter (2016) conclude that content linking violence and danger to persons with mental illnesses furthers stigmas, calling for a greater production of video games that, "build empathy and understanding of sufferers of mental illness" (p. 1595). We might also conclude from this that, in general, the depiction of mental illness in games is unrealistic. As noted earlier, such depictions often rely more on tropes and stereotypes than any form of realism or nuance. Thus, the call for a more realistic, empathetic, and informative representations of mental illness in games and interactive media is important.

This discussion of *Fragile Equilibrium* aims to position *Fragile Equilibrium* as one of these new types of games that employ and advocate for positive engagement with topics of mental illness. We theorize that *Fragile Equilibrium* and games similar to it exist within a representational spectrum that can be thought of along two intersecting axes, as Figure 3 shows. The horizonal (x-axis) ranges from wholly literal to abstractly metaphorical in their depictions of mental health. The vertical (y-axis) examines the representation of character and self, ranging from ephemeral and abstract representations to realistic and customizable avatars. These concepts aid in analyzing the intent and effects of these video games as well as illustrating the many design choices game developers might consider when engaging with the topic of mental health. To illustrate, in this section, we analyze a set of games and where they fall along these axes.

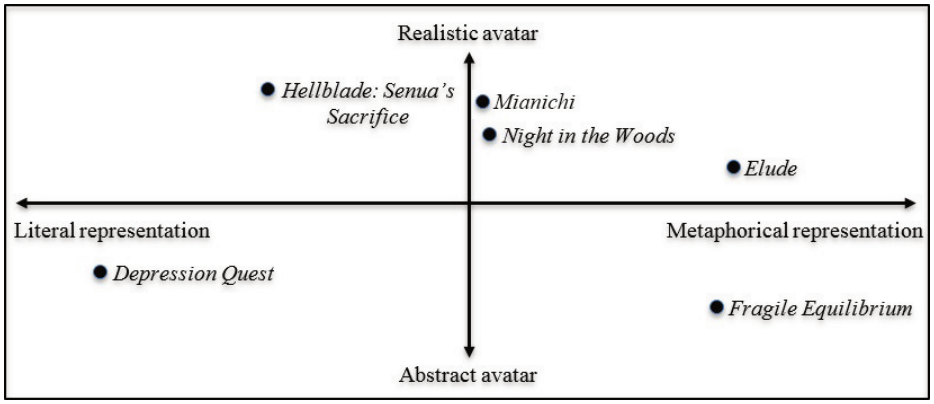

Figure 3: A two-axes plot analysis of design elements of recent games with sophisticated depictions of mental illness, examining a range of games from the literal to metaphorical, and from realistic to abstract avatar representation.

Depression Quest

On the far-left end of our representational spectrum is a category for wholly literal games like *Depression Quest* (2013), developed by Zoë Quinn, Patrick Lindsey, and Issac Schankler. *Depression Quest* is a text-based game originally published online as a browser game. Quinn later submitted it to Steam Greenlight, a resource for independent video game developers to get their projects accepted and distributed through the Steam platform. After receiving harassment, she removed it from the platform and later resubmitted it (Hoffman, 2017). Unfortunately, as previously noted, Quinn later received even more harassment for her game from the online GamerGate movement (Parkin, 2014).

Depression Quest has an intentionally simple and accessible design. It opens with a message from the designers stating that their goals for the game are, "[t]o help people without depression understand what the experience is like and to let people who do suffer from depression know that they are not alone" (Hoffman, 2017). As they play the game, players read very brief short stories from the protagonist's life and select from a list of choices on how to respond to each scenario. Usually, some options are crossed out, enabling the player to see them but preventing the player from choosing

them. These crossed out choices are often the healthier or most beneficial choices for the character to make. As Kyle Orland (2014) discussed in his response to the game, this is an emotionally powerful mechanic because "[i]t's not as if these common-sense moves and solutions to get out of your funk are hidden or unknowable. In *Depression Quest*, they are just *unavailable*."

As the protagonist's mental state deteriorates from the choices the player has made for them and from the actions of the other characters, more options become crossed out. Orland (2014) points out that "[e]ventually, the lack of choice becomes so crippling that you're trapped among choices that will only drag you down further, embedding a powerful statement on the spiral of depression in a simple game mechanic." Players ultimately reach one of the game's five endings, which cover a range of states of the protagonist and the protagonist's depression. The important takeaway is that none of these are "tidy ending[s]" because living with and managing depression and other mental illnesses is not a straightforward process where one can find a "cure for depression" (Hoffman, 2017).

We have placed *Depression Quest* at the literal end of our representational spectrum (left-hand side) due to its direct and purposeful engagement with the topic of depression. The game's telling of the narrative in the second person perspective, and therefore direct addresses, puts the player in a position to more readily identify with the protagonist (Hoffman, 2017). Zoë Quinn and her fellow designers explicitly state the goals of this game are to promote engagement with depression. *Depression Quest* is one of the most literal representations to be found in the medium. That said, it is interesting that the visual representation of the game is mostly text-based. It has been packaged on Steam and similar platforms with a few live-video clips of individuals seemingly suffering from depression, but the game itself is played by clicking on hyperlinks in a text-based environment. In one sense, this allows the player to more easily envision the protagonist in any way they choose, but it also can be seen to reduce the direct one-to-one nature of the body-as-self in relation to the player-as-avatar within the game world, i.e., that their actions are physical as well as cerebral. As the player is not directly represented, we have plotted the avatar as

abstract, since their ultimate representation is purely a matter of player interpretation.

Hellblade: Senua's Sacrifice

Hellblade: Senua's Sacrifice (Ninja Theory, 2017) is another game that attempts to represent a more nuanced depiction of mental illness. The game, developed by Ninja Theory, places the player in control of a Pict warrior named Senua who must travel to Hel to rescue the soul of her murdered lover. During her journey, Senua suffers from various symptoms of psychosis that impact how her character, and the player, proceed through the world and narrative (Lloyd, 2018). The game itself, and its story, are a metaphor for her mental illness (Gordon, 2019). According to the National Institute of Mental Health (n.d.b, para 1), the term psychosis "is used to describe conditions that affect the mind, where there has been some loss of contact with reality." Symptoms of psychosis can include delusions, auditory or visual hallucinations, "incoherent or nonsensical speech, and behavior that is inappropriate for the situation" (National Institute of Mental Health, n.d.b). Senua regularly experiences hallucinations during the game, often seeing symbols that help her solve puzzles or hearing non-existent characters that give her advice.

Although *Senua's Sacrifice* is not attempting to portray depression and anxiety, like the other games included in this section, we include it as an example because it both portrays mental illness more generally and it is one of relatively few large-budget AAA games to have done so in a way that is not reliant on tropes and stereotypes. The scale of development and scope of the game is a further contrast to other, smaller efforts. Yet, it still deals with many of the same design decisions around interpretations and avatar presentation that are relevant to this analysis.

Senua's Sacrifice is one of the most widely and critically acclaimed games included in this analysis. It won the G4C + Polygon Choice award at the 2018 Games for Change festival and has received strong, positive feedback on its depictions of psychosis. Much of this has been attributed to the developers' decision to work with mental health professionals, in addition to persons who experience psychosis, to design a game that destigmatizes

mental illness (Gordon, 2019; Lloyd, 2018). Some criticism of the game's depiction of mental illness has been focused on the lack of social context in which Senua's psychosis is framed and how her character seemed to be only defined by her mental illness and past traumas (Greer, 2018; Lacina, 2017).

We have placed *Hellblade* a little bit farther to the right from *Depression Quest* on the representational axis, but still closer to the literal representation end than the metaphorical end as Figure 3 shows. This is because the game, like *Depression Quest*, approaches mental illness directly and explicitly through its depictions of Senua's psychosis and its creators' engagement with the mental health community. Beyond just depicting psychosis, *Hellblade*'s gameplay and narrative function as thinly veiled allegories for psychosis beyond the depictions of the main character. Due to these allegorical elements, *Hellblade* can be viewed as slightly more metaphorical than the direct and focused narrative interactions of *Depression Quest*. With regards to the avatar (vertical axis), the game more directly links the representation of Senua's psychosis to the physical, as the human avatar of the main character physically reacts to these elements with sight, sound, and touch within the game in ways that ask the player to reflect on these touchpoints between mind and body. Thus, given its use of a more realistic avatar, we place this game in the upper quadrant.

Night in the Woods

Another recent game with a sophisticated representation of mental illness is *Night in the Woods* (2017). *Night in the Woods* is a platformer adventure game that follows an anthropomorphized cat named Mae. After dropping out of college, Mae returns to her hometown of Possum Springs, a former mining town that is slowly sliding into greater and greater economic decay. Mae attempts to resume her small-town life and restarts her friendships with some of the other anthropomorphized animals of Possum Springs. While doing this, she also works to figure out a local mystery and battles recurring nightmares. Mae and her friends each struggle with their own mental illnesses throughout the course of the game. She, for example, deals with issues surrounding depression and anxiety, even having experienced depersonalization in the past. Eventually, through growing

their friendships, Mae and her friends develop compassion for each other and validate their experiences with mental illness (Spencer, 2017).

Night in the Woods was received positively with commendations focused on its frank engagement with mental health issues, as well as its well-rounded characters (McElroy, 2017; Spencer, 2017). The latter point was touched on repeatedly with one reviewer noting that characters are not solely defined by their past traumas and mental illnesses any more than a "real person" would be (Ashley, 2018). Another reviewer discussed how the designers "wanted to make a game about people who experience mental health issues, not the issues themselves" (Spencer, 2017). The general consensus amongst reviewers has been that these fully fleshed out characters promote players' engagement with the characters' mental health issues by making the characters believable and understandable.

Night in the Woods can be placed in the middle of the representational spectrum in Figure 3. The game openly and intelligently depicts and engages with issues pertaining to mental health and does so in a much less direct way compared to the previous two games we have discussed. As Phelps and Consalvo (2019) argued, *Night in the Woods* "never explicitly foregrounds itself as a game about mental illness or depression" (p. 5). Rather, the mental health of Mae and her peers is largely left open to player interpretation. Phelps and Consalvo (2019) further argue that the rural, impoverished setting of *Night in the Woods* not only impacts the mental situations of every character, but also communicates to the player themes of apathy and despair. The game employs literal, but not necessarily explicitly stated, depictions of mental illness while also containing metaphors of mental illness through its environment and narrative.

It is also important to note that *Night in the Woods* engages in the topic of depression specifically through its core game mechanic—the loop of Mae's day. As Phelps and Consalvo (2019) note:

> Procedurally, the game's core loop is to take Mae through the day, from waking up in the attic of her parents' house, through talking with and hanging out with friends, exploring a bit of the town, and then returning home. Although Mae and a friend or parent will occasionally go to a different area or scene (such as a party, the mall, or an abandoned building) there are no secret areas to unlock, and the town does not get appreciably

> larger over time; the player as Mae does not gain access to more places or more abilities. Instead, the player's journey is repetition – day after day, the same places, and the same people. This can be comforting, frustrating, and boring, sometimes all at once. Yet that daily foray, engaged in over and over, serves at least two purposes if considered metaphorically. Mae's journeys through the town embody a form of self-care treatment for depression and anxiety with many parallels to [many layperson's descriptions of] current cognitive behavioral therapy techniques which often involve specific attempts at providing daily structure and reducing complexity and ambiguity by preplanning and compartmentalizing activity. Thus, not only is the repeated routine a statement on economic instability and lack of opportunity, the fact that this interaction is both comforting and frustrating is a poignant statement on depression itself and even the treatment thereof (p. 6).

This has several connotations from a design perspective: it uses repetition as a narrative mechanic to situate the player's engagement with a topic (Bogost, 2007) and it specifically thwarts the typical ways in which adventure games appeal to players who might be typically associated with the *explorer* in Bartle's (1996) player types. There is, ultimately, nowhere to go, as the town cannot be fixed and cannot be escaped. This deeply engages players in a monotonous existence.

From the viewpoint of avatar representation, while Mae is clearly not human, she behaves as such. The avatar of Mae engages the player in the human-like physicality of depression at every turn: players see her sigh, see her visibly frustrated, and empathize with her trudging up and down the same hill through the same neighborhood, day after day. Thus, we place *Night in the Woods* in the upper quadrant.

Mainichi

A game that operates in its use of the repetition mechanic somewhat similarly to *Night in the Woods*, and that actually precedes it in release date, is *Mainichi* by Mattie Brice (2012). *Mainichi* seeks to convey,

> some of the social struggles the developer faces daily as a mixed transgender woman by recreating the simple act of going to meet a friend for coffee. Once the player returns home, they wake again the next morning to do the same scenario, which subtly changes based on how they decide

> to get ready. It's a very short but very personal slice of life experience (Mainichi, n.d., para 2).

Indeed, the point of the game is to build within its players an empathetic resonance with the plight of the author, and the 'psychic toll' (Porpentine, 2012) that they endure by feeling different and alone. While the major focus of the game is not depression or anxiety, these themes are resonant to some players who empathize with the feelings of loneliness and apprehension inherent in the experience of the game.

Mainichi was well-received within the independent game development scene and was an official selection at IndieCade 2013, among several other shows and installations. From a representative standpoint, the game is very literal in terms of how player actions are performed, but it relies on players to interpret these experiences for themselves by representing its themes through a repeated slice-of-life tactic that draws the player towards reflection. Thus, we place it towards the middle of the x-axis of the design space as it is using repetition as a form of metaphor, but in more literal ways than some other games discussed. It is, however, one of the most personal games of all of the examples presented here. The game uses slightly more realistic avatars than *Night in the Woods*. The avatars in *Mainichi* are human, but they are presented in an 8-bit anime-styled cartoon version of human, which is typical of the tools used to construct the game. Thus, we place *Mainichi* in the upper quadrant.

Elude

Another game that lies within the metaphorical end of this framework is *Elude* (GAMBIT Singapore, 2010). *Elude* is a game that attempts to emotionally simulate aspects of depression. It is intended "to inform friends and relatives of people with depression about what their loved ones are going through" (Rusch, 2012, p. 1). The game begins with the player character walking through a forest which is meant to represent a neutral state of mind or mood. The player's goal is to climb up the trees to reach their canopy. While climbing the trees, players "resonate" with various "passions" that are symbolized by colorful birds. When players reach the

treetops, through elevating their mood and resonating with their passions, they are able to soar through the skies.

Once flying, the gameplay changes and players must maintain this happy state for the character by continuing to fly upward. At some point, the character's mood will fall and so will they, through the sky and back toward the lowest parts of the forest. The character is effectively dragged down by depression. Players must then resume climbing to find the character's "true passions" (Games for Change, 2010), a cycle that repeats itself. The actions of the avatar are metaphorical. The climbing, running, and flying mechanics are metaphors for experiences of depression and its contrasts—being pulled down and trying to climb out with all one's effort during a depressive episode, and feeling light and free when not having episode. The idea of *resonate* as an action has no specific real-world connotation—it is purely an analogy for recognition and reflection.

We have positioned *Elude* on the far right of the representation spectrum (metaphorical representation) since it deals with mental health entirely through metaphor. As designer Doris Rusch (2012), wrote, "[s]ince depression is an abstract concept, the design of 'Elude' relied heavily on the use of metaphors" (p. 1).

While the actions of the player are metaphorical for the feelings and experience of depression, the representation of the avatar the player uses in *Elude* is more realistic than abstract. The player avatar can be considered realistic in presenting a slightly stylized representation of a young boy, with certain liberties taken to present the character in a cartoon-like style as integrated with the hand-painted approach for the environmental art. Similarly, the character moves in a relatively realistic fashion with respect to the walk cycle and jumping action, although with obvious fictionalized elements for the flying sequences.

Fragile Equilibrium

In considering the metaphorical end of the representational continuum, we again examine *Fragile Equilibrium* in the context of our plot analysis. As discussed earlier, *Fragile Equilibrium* is a game about balance and the

difficulties surrounding the maintenance of that balance. This core element of the game is intended to function as a metaphor for living with depression (Phelps, 2018b). The designer, Andrew Phelps (2018b), discussed how depression changes the way someone "move[s] through life. It becomes a constraint." This is represented in the game by the enemies and their damage impeding the player's ship from moving in the play space. Just as the in-game damage consumes the game world, depression can feel like it is consuming a person's emotional and physical spaces. However, as noted earlier, Phelps (2018b) argues that there is sometimes another side to dealing with depression, writing that, "it is also a thing from which many artists draw their creativity, their spark, their empathy" (para 15). Seeking to understand oneself can be very empowering, similar to how, in the game, healing the world grants the player powers to fight off more enemies, and this plays to the overall notion of repair in the game, of putting the world back together and appreciating its beauty while recognizing its fragility. As noted earlier, players must constantly repair their playable area whilst fighting off incoming enemies, which is where the theme of balance arises. As Phelps (2018b) summarized,

> [*Fragile Equilibrium*] invites the player to understand what it is to feel squeezed between a need to focus on forward progress, on challenges, on obstacles, on goals, but also to focus inwards, to face 'the wrong way', to be constantly aware that they are looking not just at a virtual world, but at a purposefully re-rendered representation of one. It is a quest for a fragile equilibrium, and thus the name (para 16).

Much of this is present in the form of metaphor and is never explicitly presented to the player, and as such requires some reflection and interpretation on the player's part. Because of the more metaphorical method of representing the experience of managing life with depression, *Fragile Equilibrium* is much closer to the metaphorical end of the representational spectrum. Further, the game moves away from representing a player directly as an avatar, using instead the shmup tradition of presenting a ship as the playable character. There are no cut-scenes with the pilot, no dialogue from mission control, no element that attempts to humanize or personalize the craft in the game. Thus, we place the game in the lower right quadrant. In this sense, *Fragile Equilibrium* shifts

the focus on depression to the interpretation of and interaction with the environment as a more abstract approach.

Furthermore, the design of *Fragile Equilibrium* illustrates the way that experiential learning theory can directly inform game design with regard to mechanics and non-narrative elements. Each level of the game introduces a slightly new environmental twist. The first level slowly introduces the player to the shattering of the screen and the repair mechanic, first gently, and then in ways where the flow of the level begins to guide player towards patterns and strategies of moving back and forth between progression and repair activities. Thus, players are introduced to the core mechanic, and then practice it repeatedly in an experience loop. Level two introduces crystals that can be charged by shooting them with player weapons, which will then discharge this energy in huge bursts across the screen and clear many enemies at once. Enemies can use the crystals in the same way against the player, and thus this becomes another balance mechanic in keeping with the overall metaphor. It engages the player first in the exploration of the environment, (i.e., what is this thing that behaves differently from what they have already experienced), and then incorporates this concept through repetition until it becomes automated. Level three introduces lanterns that can be pushed by player weapons into enemies for incredible damage bonuses, but again enemies can do the same to the player, creating a push-dodge balance mechanic. Level four adds mines that can be triggered by player to damage enemies. But, if the mines are detonated with the player in range, the player is pinned to that spot for a certain length of time. This fits metaphorically in the representation of depression with certain events causing a kind of emotional paralysis and inability to move. It specifically causes a form of frustration where the core defensive ability of the player, dodging, is momentarily disabled. This comes full circle as these mines, should they pass by the player to the left of the screen, will shatter a huge chunk of the playable area. In this way the mines are more critical than the enemies themselves and serve to heighten anxiety and focus in a compound fashion. The game is ultimately about finding a balance to survive feeling squeezed and thwarted. Each level builds upon this theme in ways that are directly designed to reflect this core experience back at the player again and again.

Analysis of Representational Context

Now that we have an idea of what this mapping of the design space and the games within it looks like, we can move to exploring how depression and mental illness can function as a meaningful game mechanic. The usage of depression and mental illness as a game mechanic can also be thought of as existing on a very similar spectrum to that which we have just described. As a starting example, the protagonist's depression in *Depression Quest* serves as a rather literal mechanic in the game: as the depression and its symptoms become more severe, they physically prevent the player from making certain choices, while still knowing those choices are present. In *Night in the Woods*, Mae's depression and her friends' mental illnesses do not function so much as mechanics that literally impact gameplay like the previous examples, but they do impact her interactions with others, how she approaches activities and tasks in her life, and how the players see and interpret the game world as well as the mental state of the character. Elements of depression can be found in almost every aspect of *Fragile Equilibrium*. As described earlier, the fracturing and destruction of the screen is symbolic of the feeling of one's world breaking apart. The maintaining of balance between repairing and fighting off attacks is a metaphor for having to strike that balance in one's life while constantly feeling squeezed or under pressure. While these mechanics affect and alter the gameplay experience, they are not literally the symptoms of depression. They work as metaphors for these symptoms. *Elude*'s depression also works in metaphor. The mechanics that help and hinder the character are not actual passions and depression, but rather creative metaphors for them.

Similarly, the portrayal of the player in the games from the viewpoint of avatar raises many interesting design considerations. The issues surrounding the identification and personification of players and their avatars are extremely complex (Rehak, 2013; Waggoner, 2009), and well beyond the scope of the limited analysis presented here. Nonetheless, it is interesting to note that the ideas of literal and abstract form here a second distinct axis rather than a simple translation. *Elude*, for example, offers a realistic avatar, but uses a metaphorical representation of action and approach to depicting mental illness. It invites the player to consider the

humanity of its subject directly through personification with the player's avatar. *Night in the Woods* seeks to downplay certain elements of realism regarding avatar depiction through anthropomorphizing the characters, but quite literally approaches the topics of depression and economic despair. *Fragile Equilibrium*, on the other hand, includes a highly abstract avatar and a metaphorical representation, offering no direct representation of the player whatsoever (other than the ship the player controls).

In considering this framework, the overall point is consideration of the breadth of the design space and the potentiality for multiple competing approaches for representing mental illness in games. This is not to say that games plotted in one quadrant are more effective than those plotted in other quadrants, or that a given representative type is preferable. Rather, it is to contextualize the point that games are in their infancy both as a medium in general and particularly when it comes to nuanced representations of the complexity of the human condition. It argues that we should not allow either a stereotypical view of gamer culture, a commercial-centric focus on more literal forms of representation, or a static understanding of "what certain game forms are capable of" limit the ingenuity and innovation of designers seeking new forms of expression, a point which is strongly echoed by the author of *Mainichi* in their own post-mortem (Brice, 2014). It argues for artistic consideration of the entire design space and challenges the notion that learning or empathy can only occur in more literal simulations or with more relatable human-based avatars. In this way, it is a tool for designers to consider their own ideas and prototypes in a broader context.

Repetition as a Common Form

Given the breadth of the design space as just articulated and the need for creative diversity, it is worth noting that there is one common interaction mechanism in all of the games presented as examples here. Beyond a shared focus on a more realistic portrayal of mental illness in games, all of these games incorporate repetition as a core mechanic in their approach to player interaction. We argue that this form of repetition can further promote player engagement with themes and content within the

respective game as noted in the section on experiential learning. There are aspects of each of these games that cause semi-unconscious thought and reflection in players. When playing *Fragile Equilibrium*, for example, players must manage different pieces of gameplay in order to succeed. They must balance repairing the shattered screen, fighting off enemies from hitting the left side of the screen, and allowing some enemies to hit the left side of the screen so they may repair it and draw energy for their special powers, all while endeavoring to progress forward in the level. This occurs in a semi-unconscious state. After these mechanics are understood and practiced, they are quickly automated to a kind of background process while the player actively considers overall strategy, plans for the next wave, and seeks to balance offense and defense. They are aware of their need to maintain this balance, yet it also becomes so natural to them to the point where they don't have to always think about it. Players become suspended in this state of conscious/unconscious limbo and continually repeat these balancing actions while preserving this mental state.

Ian Bogost (2007) discussed how repetition of actions or rules in video games can function to inform us about something rather than it being told to us. Phelps and Consalvo (2019) argued that "repetitive acts in gameplay can function procedurally as metaphors themselves" (p. 2). The repeated, semi-unconscious balancing act of *Fragile Equilibrium* has the possibility of encouraging player reflection on the actions themselves and what they might symbolize. Earlier in this article, repetition was linked to a form of practice and sustained engagement, first in learning a new concept and then practicing that concept in the experience loop phase, and this was itself repeated in each level of the game in slightly different ways. Indeed, we theorize that this commonality of repetition as a mechanic in the representation of these disorders is likely because these disorders themselves have as a common element of their definition that they occur over time (i.e., that they are experienced over a significant period of time in order to be considered a diagnosis). Thus, almost by definition, this repetition-as-interaction modality is likely to recall and model real-world engagement. In this fashion, repetition can be its own form of didacticism, and used effectively as a design element in the portrayal of depression and anxiety.

CRITICAL RECEPTION AND PLAYER RESPONSE

Thus far we have carefully reviewed the relevant design theory, the design process, and the release of the game and associated materials. We have also compared and contrasted *Fragile Equilibrium* in context to other games, ranging from literal to metaphorical representations and realistic to abstract avatars. Our analysis of the design draws not only from a close reading of the game, but also Phelps' (2018b) statements about the game and the processes he followed. But how effective can abstract, metaphorical games be as tools to engender reflection and response in other players? For players that are not presented with additional materials, how well do they convey the themes inherent in their design?

In order to best study and gauge player engagement with *Fragile Equilibrium*'s themes, metaphors, and emotions, this section explores the user generated reviews and comments made on the various platforms on which the game is available. As noted previously, *Fragile Equilibrium* was released on Steam, XBOX One, the Microsoft Store, and the website itch.io. Users have commented and responded to the game on all of its release platforms except for the Microsoft Store. Overall, players have provided positive reviews of the game. Much of the praise has centered around the aesthetics of the game with multiple users complementing the beauty of the art and music, as well as how the two contrast with the action-oriented nature of the game (e.g., OuttaSite, 2019; pikappp, 2019; Verytex, 2019; ZerothShell, 2019). Multiple commenters also stated that the game was a unique and refreshing entry into the shmup genre (The Hooloovoo, 2019; Verytex, 2019).

While none of the reviewers of *Fragile Equilibrium* specifically commented on its metaphorical narrative of depression and anxiety, their responses still provided insight as to their levels of engagement with the basic concepts. One player commented on how they felt the need to balance the various aspects of gameplay (ZerothShell, 2019). Based upon a rough translation, it does appear that this player interpreted themes of despair or hopelessness, writing, "you can't avoid the fate that [the game world] will eventually be destroyed" and "[i]t's not clear if you can save the world" (ZerothShell, 2019).

Additionally, there were two individuals that had video responses to *Fragile Equilibrium*. One YouTuber, OuttaSite (2019), included the game in a video reviewing new and interesting indie games. Most of his comments on *Fragile Equilibrium* revolve around the art, music, and mechanics of the game, but there is one moment where he says that these elements work well with the game's "mildly philosophical message" (OuttaSite, 2019). He does not provide any additional detail outside this comment. As such, it is difficult to discern how much of the core message of the game may have been understood. However, his statement does show that he has understood that *Fragile Equilibrium* is intending to communicate something to its players, and perhaps a bit about how the designed elements of the game all work towards this goal.

The other individual, YouTuber Mr Skysen Games (2019a, b, c, d), posted a series of four "Let's Play" videos on *Fragile Equilibrium*. In these videos, Mr Skysen narrated his gameplay while also reflecting on the various aspects of the game. Like many of the other reviewers, he complimented *Fragile Equilibrium*'s art, music, and unique game mechanics. However, he also exhibited a deeper understanding of *Fragile Equilibrium*'s themes and indeed got very close to speaking about the core metaphor. In fact, he discussed mental health and alluded to the game as a metaphor for depression but stopped short of actually saying it outright. In one specific sequence he said, "what is this? Manifestation of all the bad feels going on? Cuz often times things like depression and whatnot are shown to be like goop like that, just sticky, icky bad feelings and all that. Bogs you down…" (Mr Skysen, 2019a). It would appear that he understood his gameplay experience as metaphorically depicting symptoms of depression despite not specifically calling out the metaphor. After losing one of his playthroughs of *Fragile Equilibrium*, Mr Skysen commented, "loss isn't always a bad thing. You can learn from it" (2019c). This comment would seem to have a double meaning to it. He was learning from his loss in the game but was also making a deeper statement about coping with setbacks in one's life, possibly alluding to the game's message. Another poignant statement came from his second video when he said, "…it's not just recreating everything, you're just pulling it all back into place. You're not creating a new reality; you're just fixing it. You're trying to hold everything all together as best you can in this crazy world…" (Mr Skysen,

2019c). Much like his other comments, this serves as a good example of Mr Skysen's engagement with the emotional response *Fragile Equilibrium* intends to provoke in its players.

Mr Skysen also repeatedly commented on the game's primary concept of balance. He even connected it to how people attempt to manage parts of their lives, further exemplifying his engagement with *Fragile Equilibrium*'s metaphorical nature. As one example, he connected the gameplay strategy of leaving parts of the screen shattered to managing one's life, saying, "…not every peril in life needs to be taken head-on and you don't always have to deal with everything…" (Mr Skysen, 2019c). Overall, Mr Skysen showed very clear engagement with *Fragile Equilibrium*'s role as a metaphor for depression. His own anxiety at parts of the gameplay, in particular the fourth level, are clear in direct observation. Thus, it is clear that a few users were able to connect with the thematic and emotional intentions of the game in an experiential fashion and in ways that are directly in line with the authorial intent of the designer. In this fashion, the game illustrates that such abstract depictions are capable of conveying the underlying emotion of depression and anxiety and begs the question of how other designs could extend this work further to even greater effect.

CONCLUSION

Mental health and mental illness representation in video games has recently been a topic of more significant discussion among academics, game designers, and players alike (Rivers, 2018; Sinclair, 2019). Generally, within popular media, mental illness is depicted in negative and stigmatizing ways, and games themselves are no exception. Such portrayals of mental illness vary from inexplicably violent characters to sanity meters that "measure" mental illness within the game in bizarre ways. In reaction to this, and other cultural elements, there has been a greater push to produce games with positive and destigmatizing portrayals of mental illness (Shapiro and Rotter, 2016; Sinclair, 2019). As we have shown, the games attempting these more nuanced and positive portrayals can be thought of as existing on a continuum of representation that range from literal to metaphorical, and that use avatars that range from realistic to abstract. Games closer to the literal end of the representation spectrum

usually have narratives and experiences that explicitly deal with mental health. Games that are closer to the metaphorical abstract end of the spectrum typically deal with mental illness indirectly through the use of metaphors.

As we have seen with *Fragile Equilibrium*, there are additional ways to engage with and depict anxiety and depression through experiential gameplay and metaphor, without the use of characters or narratives. By using mechanics, replication, and a careful attention to aesthetic conditions, *Fragile Equilibrium* constructs a metaphor for depression and anxiety without ever naming them outright. The evocation of the 1980s and the decaying ruins in the game work to further impress these feelings onto the player. These conditions work to create an element of melancholic reflection, which serves to foster eudaimonic gratification within the player, prompting players to turn inwards and evaluate the core tenets of the game. This is further evidenced by the gaming community's reception of the game. *Fragile Equilibrium* has largely positive reviews across multiple industry standard platforms and has inspired some reflection and debate amongst those who have played through the game. These factors work in concert to suggest that the multiple aspects of *Fragile Equilibrium* work to create a game which successfully communicates with its players and actively engages their observation and understanding. *Fragile Equilibrium* can thus serve as a successful model when attempting to implement these same principles in other games, and interactive experiences, which seek to create meaningful experiences via experiential metaphor and aesthetic design.

More broadly, in considering depictions of mental illness within games, and specifically depictions of depression and anxiety, designers should be encouraged to consider engaging with these themes in a broad and unrestricted way. While some members of the current gaming community may continue to struggle with what constitutes a real game experience, designers should be free to explore the myriad of ways that games can engage in complex and nuanced subjects regarding the human condition. It is only through experimentation and repeated design that games can continue to expand as a form of art and expression. More recent attempts to engage with issues of mental health through increasingly abstract and

experiential approaches are key to continue exploring how to better inform public understanding of these conditions and the emotional experiences they can have on affected individuals.

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CHAPTER 5

Mechanical Experience, Competency Profiles, and Jutsu

SASHA SORAINE AND JACQUES CARETTE

ABSTRACT

We look at players' mechanical experience of gameplay challenges. We consider mechanical experience as fundamental design knowledge: designers need to analyze the challenges they craft to understand the skills necessary from their players for success. One application of this study is to explain why some challenges may be inaccessible to certain players. There is currently no comprehensive framework for describing accessibility of challenge experiences. We also propose *challenge jutsu*, structured representations of challenge descriptions (via competency profiles) and player models, as a first step towards better understanding the mechanical profile of various game challenges and sources of difficulty.

INTRODUCTION

Different types of experience

Many have tried to understand the player's experience of a game. One method is to model the components of the game and relate them to

"experiences." For example, the Mechanics-Dynamics-Aesthetics Framework and associated Eight Types of Fun explores this (Hunicke, LeBlanc, & Zubek, 2004). Schell (2014) uses an Elemental Tetrad to model and describe games as having four types of components: mechanics, aesthetics, story, and technology. These views segregate game components into the interactive parts created by designers and the subjective aspects open to interpretation by the players. This dichotomy seems artificial.

We view games as designed systems of experience; designing games is an exercise in crafting holistic experiences. Games can be experienced *mechanically* (through gameplay actions), *aesthetically* (through the visual and audio design), *emotionally* (through the narrative and characters), *socially* (through the communities of players), and *culturally* (through a combination of cultural interpretations and interactions). The experience of a game is a combination of these *aspects of experience*. Table 1 maps them to the Hunicke et al.'s (2004) Eight Types of Fun.

Table 1

Mapping Hunicke et. al Types of Fun to Experiences

Kind of fun	Definition of fun	Experience Type
Sensation	Game as sense-pleasure	Mechanical and aesthetic
Fantasy	Game as make-believe	Aesthetic, emotional, and socio-cultural
Fellowship	Game as social framework	Socio-cultural
Narrative	Game as drama	Emotional and socio-cultural
Challenge	Game as obstacle course	Mechanical
Discovery	Game as uncharted territory	Emotional and socio-cultural
Expression	Game as self-discovery	Emotional and socio-cultural
Submission	Game as pastime	Mechanical and aesthetic

We can visualize these experiential modes similarly to the Elemental Tetrad (Schell, 2014), with all aspects of experience being able to interact with one another. Whereas the Elemental Tetrad shows the parts of games, we propose the *Experiential Tetrad* to delineate the aspects of experience. These aspects reflect how the individual's abilities and knowledge relate with the game elements. *Mechanical experience* comes from interacting with the gameplay. *Aesthetic experience* comes from understanding and reacting

to the aesthetic components. *Emotional experience* comes from relating to the story and characters. *Social and Cultural experience* comes from the player's personal interpretations of the game and their interactions with other people. The actual experience depends on the individual's point of view, context, interactions, and relation to the game.

We organize the Experiential Tetrad to show that different viewpoints change the experience (Figure 1). *Designers* have a comprehensive viewpoint, as they must craft and balance all aspects to create the experience of their game. *Observers* mainly witness the aesthetic, emotional, and socio-cultural aspects of games; while they may have an abstract understanding of the mechanics of the game, they do not experience the game mechanically unless they actually play the game. *Players* often first experience the mechanics, and then the other aspects after learning the mechanics. We focus on the player and designer viewpoints as they relate to experience design.

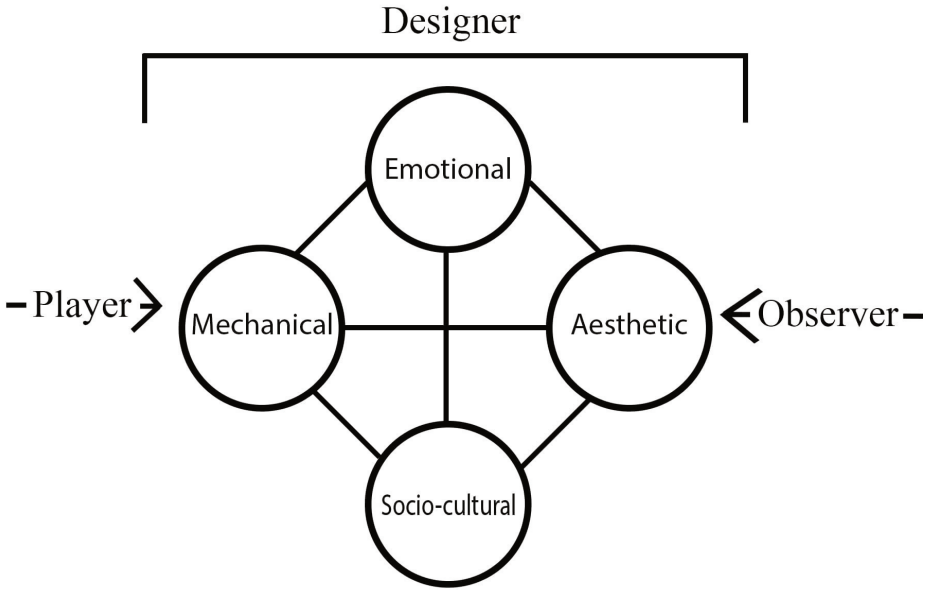


Figure 1: Experiential Tetrad. This figure illustrates the player experience as a tetrad with player, observer, and designer viewpoints.

For designers, crafting a game relies on understanding and managing how

the aspects of the game relate to each other. Designers often have a primary aspect in mind when crafting an experience. The other aspects are tuned to emphasize or support that primary aspect. Consider horror games: the crafted experience is primarily emotional, supported by aesthetic and socio-cultural experiences. Mechanics must be simple enough, so they don't distract the player from the atmosphere the developer has crafted. Games like *Silent Hill: Shattered Memories* (Climax Studios, 2009), and *Amnesia: The Dark Descent* (Frictional Games, 2010) are good examples: the control mechanics are simple navigation and object interaction. This simplicity makes it easy to play while also making the player feel vulnerable and limited. Complex mechanics would distract from the other aspects, stealing too much of the player's attention. For expert players of games like *Five Nights at Freddy's* (Cawthon, 2014) or *Resident Evil 7: Biohazard* (Capcom, 2017), the emotional experience becomes secondary to just beating the game. Unlike other forms of entertainment, no matter which aspect of experience games emphasize, there is always an underlying mechanical experience that impacts the reception of the other aspects.

For players, experiencing what designers have crafted depends on successfully engaging with the mechanical experience of the game. Players use in-game actions to complete gameplay challenges. Executing these actions and interacting with the challenges requires various cognitive and motor abilities. Successful interactions require that the players' abilities match up with what the game is asking them to do. If players are unable to complete challenges due to a misalignment of abilities, they are often unable to progress in the game. Lack of progress will limit how they can experience the emotional, aesthetic, and socio-cultural aspects of the game.

This barrier to engagement should be seen as a fundamental problem in game design. Thus, we need to systematize our understanding of the mechanical experience of players to make *mechanically achievable gameplay*.

What can we do?

The *mechanical experience* is a relation between the player's physical and cognitive abilities and the challenges within gameplay. It is crafted by the designer through the selection of challenges. Challenges and player abilities combine to create the mechanical experience based on whether the challenge is achievable or not. The mechanical experience must be interesting (in and of itself) to the target audience or invisible when it is meant to be a supporting actor in the overall experience. Currently, there is no framework for designers, players, and critics to talk about this, which is where we begin our work. We need to understand the relationship between the mechanical experience *as designed* and as *experienced by* the players.

We view mechanical experience design as a task modeling problem. Games have various gameplay challenges that the player must successfully complete to win (Adams, 2010). Modeling gameplay challenges as tasks, we can then describe them in terms of the abilities that players need to successfully complete them. This fits with Fleishman, Quaintance, and Broedling's (1984) idea of a *competency profile*, the set of cognitive and motor abilities that characterize a task. Identifying competency profiles would let us to model the *expected mechanical experience* as intended by designers. From there we can model *actual mechanical experience* by how the player's abilities compare to the ones required to complete the tasks. This will let us pinpoint which abilities are the limiting factor in completion of a given challenge. This lets use be concrete about *mechanical difficulty source*. By understanding expected versus actual experience and mechanical difficulty sources, we can design more mechanically achievable gameplay.

To create the vocabulary and framework of mechanical experience, we need a list of human cognitive and motor abilities along which individuals can be evaluated, and a list of archetypal gameplay challenges which are mutually exclusive along their intrinsic competency profiles as defined by those abilities to discuss. To this end, we assembled the required information into a structure that we call a *challenge jutsu*[1], to organize

1. Jutsu meaning method, technique, art, or skill in Japanese; used in different martial arts

challenge competency profiles and player profiles, and to show the impact that small changes in game mechanics has on each. The challenge jutsu lets us to predict how the *mechanical experience* will change for different player profiles. The effectivity of challenge jutsu crucially relies on understanding the *mechanical difficulty source* of each challenge. Challenge jutsu double as a design and critiquing tool for comparing the experience of a challenge by different demographics; thereby allowing us to spot unintentional sources of difficulty due to a mismatch of abilities. We first delve more deeply into player abilities and competency profiles before exploring our *Jutsu Framework*.

THE PLAYER

Players are incredibly complex to model. Player typologies are common in game studies to understand motivations for play and player satisfaction. The main idea of player typologies is to identify player archetypes based on sets of psychometric (Bateman & Boon, 2005; Bateman, Lowenhaupt, & Nacke, 2011; Stewart, 2011; Tseng, 2010; Zackariasson, Wahlin, & Wilson, 2010) or in-game behavioural characteristics (Bartle, 1996; Drachen, Canossa, & Yannakakis, 2009; Yee, 2007). Analyses and criticisms on the usefulness and validity of typologies are many (e.g. Bateman et al., 2011; Hamari & Tuunanen, 2014). Despite their utility in other contexts, these play typologies do not suit our purposes as they focus on understanding why players make decisions in games, not how they may physically interact with a game. Our goal is to model the psycho-motor aspects of players, or, in other words, the *mechanical player*.

Human-computer interaction (HCI) models divide a user into subsystems to evaluate processing bottlenecks and limitations – effectively viewing the player as a machine. This aligns more closely with our goal of modeling a mechanical player. Card, Moran, and Newell (1983) presented the Model Human Processor (MHP), which divides a generic user into three subsystems: motor, cognitive, and memory. Each subsystem has its own processor to handle tasks unique to that system. This division allows MHP to see which systems are the bottleneck for task completion. We adopt this

and fighting styles to describe the skills associated with that style that are required for competency.

approach, however we refined MHP's subsystems which were too abstract. To the best of our knowledge, the MHP viewpoint has not been applied to players. Here we detail the motor system as used to interact with games and analyze motor-focused challenges with respect to their associated motor abilities to find processing bottlenecks.

The Player Homunculus

We need to speak about players both specifically and generically. When we want to talk about a generic able-bodied neurotypical player, we will use the term *Player Homunculus*[2], an abstract representation of a player with normative motor and cognitive abilities.

Defining the Abilities of a Player Homunculus

We focus on the motor model in part because it is the simplest one to assess experimentally, but we cannot ignore all cognitive abilities. For the current homunculus iteration, we limit these to *perception, attention,* and *memory*, to align with the MHP model of users.

We investigated kinesiological models of muscle groups (Hamilton, Weimar, & Luttgens, 2011; VanPutte, Regan, & Russo, 2011), but found that individual muscles can belong to different groups when used to perform actions. We believe that this level of specificity would overly complicate our analysis, as different actions would nevertheless use the same muscle groups. For example, bending or rotating the wrist is used for both tracing a straight line or a circle with a stylus. Though the actions are different, they use the same muscles. Since actions are mediated by controllers, which are often offer limited means of interaction, we must distinguish between the actions performed by the player and the muscles used to perform them. Rather than muscle groups, we use controllers and actions possible through them.

We first look at controllers, focusing on standard controllers (e.g., Xbox

2. This is inspired by Penfield's Motor and Sensory Homunculus (Penfield & Rasmussen, 1950), which maps the relationship of information processing parts of the brain to various parts of the body.

One controller, Playstation 4 controller), handheld motion controllers (e.g., Wii Remote, Playstation Move), full body motion controllers (e.g. Kinect), smartphones, handheld consoles (e.g., Nintendo 3DS, Playstation Vita, Nintendo Switch), keyboards, mice, and fight sticks (arcade style controllers made for fighting games). We assume that the player is holding or interacting with them in the ergonomically intended manner. We list possible interactions (e.g., press button, pull trigger, shake controller) for each controller. We abstract from interactions to movement, so "pressing a button" becomes "pressing." Table 2 gives the motor interaction for each controller type. We further classify these abilities into fine or gross motor abilities but indicate when an action could reasonably fall into both categories.

Table 2

Motor Abilities for Video Game Controllers Categorized as Fine Motor, Gross Motor, or Both

Category	Motor action	Hardware context
B	Pressing	Fight sticks, handheld consoles, handheld motion controllers, keyboards, mat controllers, standard controllers
F	Bumping	Handheld consoles, standard controllers
F	Pulling	Handheld motion controllers, standard controllers
B	Moving	Fight sticks, full body motion controller, handheld console, handheld motion controller, mice, standard controller
F	Swiping	Smartphones/tablets, standard controller
F	Pinch-to-zoom	Smartphones/tablets, standard controller
B	Swinging	Handheld motion controller
B	Pointing	Handheld motion controller
B	Shaking	Handheld consoles, handheld motion controller, smartphones/tablets
B	Drawing	Handheld consoles, handheld motion controller, smartphones/tablets
G	Thrusting	Handheld motion controller
F	Tilting	Handheld consoles, handheld motion controller, smartphones/tablets
B	Flicking	Handheld motion controller, smartphones/tablets
G	Positioning	Full body motion controller
F	Tapping	Handheld consoles, smartphones/tablets
F	Speaking	Handheld consoles, smartphones/tablets
F	Making facial expressions	Handheld consoles, smartphones/tablets
F	Clicking	Mice
F	Scrolling	Mice

Table 2: Motor interactions available for each controller type: F = Fine motor, G = Gross motor, B = Both.

Refining the Homunculus for games

We eliminate redundant actions from the list in Table 2, and refine abstract interactions to concrete motor abilities. We thus separate actions by the body parts used in the motion and their context. This lets us combine similar actions into specific groups. Combining the body part (e.g., finger) and action (e.g., pressing) into (e.g., finger pressing) to create motor abilities.

We show our refinement of fine motor abilities, to illustrate our reasoning.

As the full list is long, the details for the gross motor abilities have been omitted.

Fingers

One approximation is that pressing, clicking, tapping, pulling and bumping are the same action. *Pressing* is done by bending a finger or thumb at the knuckle to depress buttons on a controller; it exists in the context of standard and handheld motion controllers, handheld consoles, keyboards, and fight sticks. *Clicking* is done by bending a finger to depress the button on a mouse; this is the same as *pressing* as the orientation of the fingers and wrist is similar. As the physical actions are similar, over a similar time frame, we join them as the same action. *Tapping* is where players use their finger to touch a designated spot on a touchscreen; the motion used is identical to clicking and pressing, with an experiential difference due to the feedback difference between touchscreens and physical buttons. Consider a game like *Impossible Jump* (UltraRu, 2015) where the player must tap the screen to make their triangle avatar jump. Compare this action to that of *Bit.Trip Presents Runner 2* (Gaijin Games, 2013), where the player must press a button to make their avatar jump. The haptic feedback of the button press gives the player more subtle information about how quickly inputs can be registered. As we are concerned with isolating the motor abilities, we consider this difference as negligible and so group them together. *Pulling* is done by bending a finger to depress a trigger button; it exists in the context of standard and handheld motion controllers. The most common example is firing a gun in a shooter game like *Halo: Combat Evolved* (Bungie, 2001) where the right trigger is mapped to the gun's trigger. Like *clicking*, the only difference between *pulling* and *pressing* is the orientation of the player's hand, so we again group them together. *Bumping* is done by bending a finger to depress the shoulder button on standard controllers and handheld consoles. Example: shooting in *Final Fantasy VII: Dirge of Cerberus* (Square Enix, and Monolith Soft, 2006) that links the gun trigger to the R1 button. The player's hand orientation matches *pulling*, as does the description so we group *bumping* with the others. We encapsulate all these actions as *pressing*.

Similarly, swiping, flicking, and scrolling are the same action presented in

different contexts. *Swiping* is when a player moves a finger or a stylus across an area of a touch-sensitive surface; it exists in the context of standard controllers, handheld consoles, and smartphones/tablets. *Flicking* is the interaction of quickly swiping across an area of a touch-sensitive surface; it exists on smartphones/tablets and handheld consoles. The difference between *flicking* and *swiping* is time; *flicking* is a rapid action, while *swiping* can be done at any pace. As we are looking to coarsely define actions, certain time differences are negligible. Therefore, we consider flicking and swiping to be the same (though an even finer model could separate them). *Scrolling* is where the player bends a finger to rotate a scroll wheel; it exists in the context of mice. We omit "scrolling" on touchscreens as it is really an adapted case of swiping. While *scrolling* involves finger bending motions like *pressing*, the mechanics differ. With *pressing* your finger is always moving inwards/towards your body, while *scrolling* moves both towards your body (moving the scroll wheel backward) and away from your body (moving the scroll wheel forward). *Swiping* similarly occurs both towards and away from the body depending on the direction of the swipe, and thus is closer to *scrolling*. *Swiping* and *scrolling* only differ in the choice of knuckle which bends; *swiping* motions tend to bend at the first knuckle (metacarpophalgeal joint, where the finger meets the hand), while *scrolling* tends to bend at the second or third knuckle. At our coarse level, there is no apparent effect on the time or experience of the motion due to this difference, so we group these actions together under the name *swiping*.

Pinch-to-zoom is the coordinated movement of two fingers to create a pincer-grip/pinching motion on a touch-sensitive surface. It exists in the contexts of smartphones/tablets and handheld consoles. It is independent from the other actions because of its motor coordination. This coordination can be measurably more difficult for different age groups; performing coordinated activities has been shown to increase cognitive load for older adults (Godde & Voelcker-Rehage, 2017; Lindenberger, Marsiske, & Baltes, 2000; Malcolm, Foxe, Butler, & De Sanctis, 2015; Papegaaij, Taube, Baudry, Otten, & Hortobagyi, 2014; Seidler, et al., 2010).

Single task coordinated actions (STCA), like *pinch-to-zoom*, differ from multi-task coordinated actions (MTCA). STCAs require movement coordination

to accomplish a single specified goal, for example using thumbs to press tiles in *Piano Tiles 2* (Hu Wen Zeng, and Cheetah Games, 2019), where each thumb is responsible for part of the screen. MTCAs involve two non-coordinated single task actions at the same time, like controlling an avatar with the left thumbstick and the camera with the right. MTCAs affect cognitive load (and thereby perceived difficulty) of challenges but may not affect the motor difficulty. This is because MTCAs are asking players to simultaneously achieve two sub-goals, but motor difficulty is fixed with each interaction (i.e., pressing a button is always the same level of intrinsic difficulty).

Wrist/Forearms

At a first approximation, wrist movements are all the same except for speed requirements. The wrist is an ellipsoidal joint, offering a limited range of motion. Furthermore, players' wrist motions tend to be accompanied by forearm movement. Here we examine the differences between *pointing, flicking, tilting, drawing, swinging,* and *shaking.*

Pointing is the controlled movement of the wrist (mainly) used in the context of positioning a cursor using a handheld motion controller. With *pointing*, wrist movements are limited to lateral (wrist flexion and extension as Figure 2 shows, like waving as a greeting) and vertical (radial and ulnar deviation as Figure 3 shows, like fanning oneself) due to how the controller is held. Occasionally players may incorporate forearm movements to increase their range of motion.

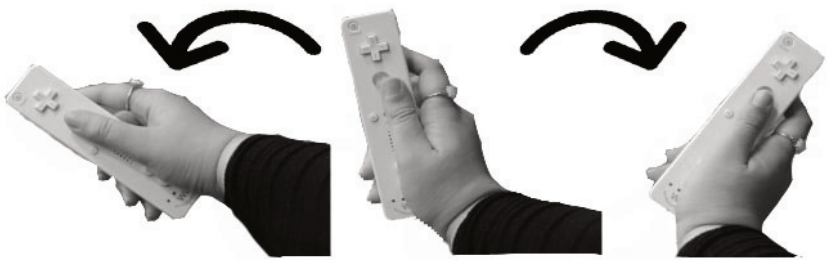


Figure 2: Lateral Wrist Pointing Movements. This figure illustrates wrist flexion and extension while holding a handheld motion controller.

Figure 3: Vertical Wrist Pointing Movements. This figure illustrates wrist deviation while holding a handheld motion controller.

In contrast to *pointing*, *flicking* is the quick lateral movement of the wrist used in the context of moving a cursor from one position to another with a handheld motion controller. However, *flicking* is discrete while *pointing* is a continuous action; this difference affects completion speeds and how/where these actions appear in a game. *Pointing* exists in accuracy tasks (e.g., archery *Wii Sports Resort* (Nintendo EAD Group No. 2, 2009)) and can be a challenge on its own. *Pointing* can also appear alongside pressing actions. *Flicking* exists as a supporting motion in many challenges. For example, serving the ball in table tennis for *Wii Sports Resort* (Nintendo EAD Group No. 2, 2009). As it is less accurate than *pointing*, *flicking* appears less frequently. Even though the underlying wrist movements are the same, this difference in game contexts merits keeping them separate.

Tilting involves moving entire controllers using coordinated wrist and forearm movements; it exists in the context of handheld motion controllers, smartphones/tablets, and handheld consoles. The way that each device is held affords different degrees of movement. For handheld motion controllers when held in a single hand, tilting laterally involves the player twisting their wrist and forearm to angle their controller in the same motion as turning a doorknob (wrist supination and pronation Figure 4). Tilting vertically in this context is the same movement as vertical pointing movements (radial and ulnar deviation). For smartphones/tablets held in a single hand in portrait mode, tilting is the same as handheld motion controllers.

Figure 4: Lateral Wrist Tilting Movements Single Handed. This figure illustrates wrist supination and pronation while holding a handheld motion controller.

When holding devices between the hands (as in landscape orientation), tilting vertically uses the same movements as vertical pointing (radial and ulnar deviation). When tilting laterally, the wrist's main function is stability. The tilting motion is a coordinated movement of the forearms (forearm flexion and extension Figure 5). For example, when holding the Nintendo Wii U gamepad, tilting the device laterally to the left requires the player's right forearm to move up (flexion), while their left forearm simultaneously moves downward (extension). The player's wrists remain stable in order to not drop the controller. An example is steering the flying beetle item in *The Legend of Zelda: Skyward Sword* (Nintendo EAD, 2011) by tilting the handheld motion controller. Tilting is a continuous action, like pointing, but the added twisting movement is enough difference to keep them separate.

Figure 5: Lateral Wrist Tilting Movements Two Handed. This figure illustrates forearm flexion and extension while holding a handheld console (Wii U).

Drawing is the interaction of moving a brush proxy in a controlled path, over a canvas, using predominantly wrist and forearm movements. It exists in the context of handheld motion controllers (held in a single hand), smartphones/tablets, and handheld consoles, where the brush proxy is

either a finger or a stylus used to paint on a touchscreen (canvas). *Drawing* motions depend on the scale of the canvas, with larger canvases using more forearm movements, and smaller ones using more wrist movements. This scale dependency makes *drawing* distinctly different from the previously discussed actions.

Swinging is the repeated lateral movement of the wrist in the context of handheld motion controllers held in a single hand. Examples include using tools like the fishing rod and net in *Animal Crossing: City Folk* (Nintendo EAD Group No. 2, 2008), cracking an egg in *Cooking Mama: Cook Off* (Cooking Mama Ltd., 2007), and sword actions in *The Legend of Zelda: Skyward Sword* (Nintendo EAD, 2011). To be considered *swinging*, a minimum of two distinct lateral wrist movement must occur (back and forth), though more can be performed to repeat the in-game actions; in contract flicking is a single movement. The difference between *swinging* and *flicking* is speed; flicking is fast and less precise, while swinging can be steady and accurate.

Shaking is the quick repetitive movements of the wrist and/or forearm to move a controller. It exists in the context of handheld motion controllers (both orientations), smartphones/tablets, standard controllers, and handheld consoles. For handheld motion controllers held in one hand and smartphones/tablets in portrait mode, *shaking* exists as either a vertical wrist motion (radial and ulnar deviation) mimicking the motion of a drumstick tapping on a drum, or as a jerking forearm movement similar to the motion of shaking a cocktail shaker as Figure 6 illustrates. Examples include ground pound in *Donkey Kong Country Returns* (Retro Studios, 2010) when using a handheld motion controller and asteroid in *SpaceTeam* (Sleeping Beast Games, 2012) on smartphones/tablets. For handheld motion controllers held horizontally, smartphones/tablets in landscape mode, standard controllers, and handheld consoles (which are held between the hands), *shaking* is exclusively the result of forearm movement (forearm flexion and extension). Though shaking actions are possible for all these controllers in this orientation, they are most common for handheld motion controllers. Examples include: ground pound in *Donkey Kong Country: Tropical Freeze* (Retro Studios, 2014), performing wheelies in *Mario Kart 8* (Nintendo EAD, 2014) and performing the homing hat throw in *Super Mario Odyssey* (Nintendo EAD, 2017).

Figure 6: Forearm Shaking Movements. This figure illustrates forearm rotation while holding a handheld motion controller.

We were unable to find examples of *shaking* for landscape smartphones/tablets and handheld consoles. We conjecture that because the screen is attached, shaking the controls shakes the screen too, making the game difficult to play since the player can't receive visual feedback easily. The movements for all *shaking* contexts are sufficiently distinct from all previously discussed wrist movements.

Neck and face

Head movements, such as *tilting*, *nodding*, and *shaking* are neck movements. These actions are becoming more important for AR and VR games, which use headsets and monitor head movements as input. But these are out of our current scope.

A face's actions are making facial expressions and speaking. *Facial expressions* are registered by the front camera of handheld consoles (e.g. *Pokémon Amie Pokémon X and Y* (Game Freak, 2013)). *Speaking*, as an action, exists for smartphones/tablets and handheld consoles and is performed by making noise directed at the device's microphone. *Speaking*, as we describe it here, is not to be confused with natural language processing. The microphones are only detecting whether a noise is made and at what intensity. Examples include Puzzle 138 in *Professor Layton and the Diabolical Box* (Level-5, 2009), which requires players to blow into their microphone simulating a gust of wind, and *Chicken Scream* (Perfect Tap Games, 2017)

on smartphones, which allows the user to control how the chicken avatar moves by making sounds.

Ankle and feet

Existing controllers that use foot input (mat controllers) only allow for pressing as an action. Therefore, even though there are many potential movements for ankles and feet, we are limited to considering the two as a single unit and to condense all possible actions to just *pressing*. Examples include *Dance Dance Revolution* (Konami, 1999), *Shaun White Skateboarding* (Ubisoft Montreal, 2010), and *Mario and Sonic at the Winter Olympic Games* for the Wii Balance Board (Sega Sports R&D and Racjin, 2009).

The Generic Player Homunculus.

A generic player homunculus has motor abilities and basic cognitive abilities (attention, perception, memory). For each ability, a player has a score between 0, meaning not able to use that ability, and 100, meaning fully able to use that ability unencumbered. The generic player homunculus being an abstract representation of an able-bodied neurotypical player can use all abilities to their fullest.

Table 3 includes the refined set of motor abilities.

Table 3

Fine and Gross Motor Abilities Used to Interact with Video Games

Type of motor movement	Body part category	Specific body part	Action
Fine motor abilities	Hands	Fingers	Pressing
			Swiping
			Pinching
		Wrist	Shaking
			Flicking
			Pointing
			Swinging
			Drawing
	Head	Neck	Tilting
			Moving
		Face	Speaking
			Making facial expressions
	Feet	Ankle and foot	Pressing
			Pushing
Gross motor abilities	Arms		Swinging
			Drawing
			Rotating
			Positioning
	Legs		Moving
			Positioning
	Torso		Positioning

The generic player homunculus is not the representation of all players. Player homunculi need to be constructed for different demographics in order to more accurately represent their abilities. This concept can be used to describe groups of players as well as the very specific skill set of a single player. Most importantly, homunculi can be constructed experimentally, or approximated through the literature of various fields.

GAMEPLAY CHALLENGES

We define a *gameplay challenge* as any in-game activity with a success condition which engages the player in a way that requires some level of proficiency in at least one dimension (physical or cognitive). One view of games is that they can be described adequately by the set of challenges they use (Adams, 2010; Djaouti et al., 2008; Feil & Scattergood, 2005;

McMahon et al., 2015; Veli-Matti, 2014). This positions *challenges* as the unit tasks of gameplay, describing individual tasks the player must accomplish. This reductionist approach does not extend to all aspects of the player experience, but is sufficient to study the mechanical experience. Though previous works (e.g. Adams, 2010; Feil & Scattergood, 2005; Veli-Matti, 2014) differ on what makes a challenge, they all define them along the lines of goals and mechanics.

We look to identify atomic types of challenges – challenges that are mutually exclusive in their goals, context, and mechanical experience. Others have tried to produce such lists (e.g. Adams, 2010; Djaouti et al., 2008; Feil & Scattergood, 2005; McMahon et al., 2015). To decide if we can use one of these lists, we need criteria to judge their challenge descriptions. Ideally, a challenge description should include the in-game mechanics and the mechanism of interaction between the player and the game (i.e. the inputs and outputs). The mechanics will let us understand the goals and actions of the challenge. The mechanisms of interaction provide the mechanical context and some insight into the mechanical experience. We found six frameworks for analysing gameplay and categorizing challenges (Adams, 2010; Bjork & Holopainen, 2004; Djaouti et al., 2008; Feil & Scattergood, 2005; McMahon et al., 2015; Veli-Matti, 2014). All frameworks covered the in-game mechanics; none included the mechanisms of interaction.

We therefore needed to either refine or create a new taxonomy that fit our purposes. To direct this process, we needed to decide the components of an ideal challenge description. The purpose of the refinement is to arrive at a list of atomic challenges. Therefore, just adding mechanisms of interaction is insufficient as that only gives us *insight* into the mechanical experience. We need to understand the specific abilities underlying the mechanisms of interaction to know the mechanical experience. To this end we explored the concept of competency profiles.

As unit tasks, we can characterize challenges by their *competency profiles*, the set of human abilities (motor, cognitive, emotional, etc.) needed to succeed at the task (Fleishman et al., 1984). This is different from game mechanics, which are described in game terms (e.g., match three blocks in a line). Competency profiles deal with specific task-based abilities (i.e.,

pressing a button with your finger). By characterizing challenges through their competency profiles, we can get an idea of the intrinsic mechanical experience of each challenge. Evaluating this mechanical experience requires approximating the weights of the abilities in the competency profile – creating an *intrinsic competency profile*. The *intrinsic competency profile* informs the designer about the *expected mechanical experience* of the challenge for able-bodied, unencumbered players.

A good challenge description must delineate between similar challenges, and thus include the following:

1. the in-game mechanics associated to the challenge
2. the mechanism of interaction between the player and the game
3. the intrinsic competency profile

The first and second point lets us capture the challenge's goals and context, while the third point is what lets us to distinguish between similar challenges with different player mechanics.

Perspectives on challenges

No list was perfect, so we decided to use Adams (2010) as a starting point. We use Adams' list because of its grounding in gameplay examples and understanding of challenges being physical and cognitive. He presents 10 major challenge types, subdivided into 30 challenges (Adams, 2010, p. 19). This list attempts to capture both the in-game mechanics and the player experience. The major challenge types give an idea about the expected mechanical experience and whether it focuses on cognitive or motor abilities, while the individual challenges provide more insight into the particular mechanics for that challenge. Consider the *Timing and Rhythm* challenge. Adams (2010) defines rhythm challenges as, "tests of the player's ability to press the right button at the right time" (p. 263) directly referencing the mechanism of interaction and the mechanic. From this definition we can tell that these challenges emphasize motor abilities, justifying it falling under the *Physical Coordination* type. However, it does not provide crisp definitions for each category, leading to different experiences being lumped together.

Refinement methodology

Adams' (2010) definitions are inconsistent, with varying type of information in each. We refine the definitions to systematically describe game mechanics, control mechanisms, and content of the challenge (e.g. single vs. multi-player, time limits, etc.). Often when the definition was not specific, we could synthesize the information from the examples provided. This required playing the games involved, watching other players interact with the game, and attempting to list out the traits of the games involved to look for similarities.

Once we had consistent definition and examples, we found other gameplay instances that fit those descriptions. We tried to find as many as possible across various "genres" and systems. The purpose of these examples was not to determine whether these challenges are universal, but rather to get a better understanding of where they tend to appear and how they exist. This process relied on the subjective knowledge of the researcher (and, to a limited extent, lab peers) to come up with examples, as extant literature on challenges from this perspective is limited, there was no easy way to systematically search for this information. Our collective gaming experience spans more than 20 years, covering the third to eighth generations of home consoles, arcade games, and home computers from MS-DOS to Windows 10. We average 15-20 hours of gaming per week between a variety of game genres (MMOFPS, Hack 'n' Slash, Puzzle, Strategy, Fighting, and casual). This a limitation of the process; future work would benefit from a larger pool of researchers with different gameplaying experiences.

We sorted our examples by their *mechanisms of interaction,* as this is the most easily identified difference. We did this by examining the game mechanics and instructions for each instance and the controller used. This first separation accounted for differences in motor abilities used even if the abstract goals are the same. For example, playing the guitar in *Rock Band* (Harmonix, 2007), *Donkey Konga* (Namco, 2004), and *Just Dance* (Ubisoft Paris and Ubisoft Milan, 2009) all use *Timing and Rhythm* challenges. The mechanics require you to stay in time with the song and react to the on-screen stimuli, but this is accomplished in broadly different ways (pressing

buttons, hitting a drum, and swinging your arms). We used *close reading techniques* to construct the competency profiles, first identifying required motor abilities (see previous section for list of abilities) then comparing with the generic player homunculi in order to find the normative mechanical experience.

For each category, we added more examples that fit the specific description of the challenge. We separated instances based on game mechanic variants, capturing distinctions like pushing one or two buttons, or having time limits on the challenge. Our purpose was to capture differences in experience due to increased use of attention for coordinated movements or the use of perception. This allowed us to understand the broad cognitive abilities of the competency profile. We then ranked the competency profile abilities as: not used, used but not noticeably, noticeably used, important but not limiting, or limiting ability.

We repeated this process (added more examples, found additional distinctions, etc.) until it stabilized. We did not have to split abilities more than twice. We then examined the rest of the context in which these challenges occur: whether the game is competitive or cooperative, single or multiplayer, team-based or solo, etc. The purpose was to see whether differences in context creates differences in the motor or cognitive abilities used, leading to further refinement when that was the case.

We considered two challenge instances to be identical if they involved the same motor and cognitive skills from a player, occurred over similar periods of time, and were performance bounded by the same skill. We then re-examined our observations of the examples to assign values to each ability in the competency profile. We assigned each ability a value between 0 and 100 with a margin of error of (at least) ±10 as an indication of "percentage of use"; this helped us understand the relationship between abilities in the same category or on the borders. For example, a value of 37 for a skill S would correspond to "a player uses 37% of their (normative) skill S while completing this challenge." Of course, 37% is ridiculously over-precise: we only distinguished the five categories outlined above: not used, used but not noticeably, noticeably used, important but not limiting, or limiting ability. The use of a "finer scale" is to allow for increased precision in the future, we expect that "important but not limiting" will warrant

refinement. The extra range also allows close readers to express their feeling of finer differences in the use of each ability. While this is still subjective, we sample-tested our assignments against others' subjective classification (within our lab) and found our rough numbers to be uncontroversial. Currently our descriptions only concern an individual's mechanical experience of these challenges. Thus, while we included examples of multi-player games, we examined them when playing with or against humans or non-player characters.

More specifically, when doing a close reading of a challenge, we played the game several times, first to become familiar with the challenge, then to witness our own use of each skill in the performance. We systematically observed our performance and ranked our use of each ability as it related to the completion of the challenge. A first pass established the gross scale (the five categories), and then subsequent passes refined that into a number that expresses a subjective value judgement of relative use as compared to other like challenges.

These values, like the challenges themselves, are a starting point and we will experimentally validate them in the future.

We applied this process to Adams' *Speed and Reaction Time* challenges, which we previously noted as incorrectly lumped together. We split them and analyzed the *Speed Challenges* in detail. This illustrates that refining the definitions, via our 3-pronged approach, leads to new distinct categories, each with *simpler* descriptions. Refining Adams' complete list of challenges is still work in progress.

Speed Challenges

Speed challenges "test the player's ability to make rapid inputs on the controls" (Adams, 2010, p. 262). Thus, these challenges have a *time limit*; otherwise the idea of *rapid* wouldn't be well defined. Furthermore, these challenges should be identifiable as small chunks of gameplay, not something that takes place over the course of hours of a play session. Secondly, "inputs on the controls" indicates that this ought to be controller independent, and so examples should exist using all controller types.

Finally, Adams implies these are motor-focused challenges by placing them under *Physical Coordination*. This definition does not mention stimulus that would trigger this action. This is likely due to the distinction between *Speed* challenges and *Reaction Time* challenges, where the latter relies on a specific stimulus for a reaction. So, gameplay instances that require players to "react" and not just "act" do not belong to *Speed Challenges*. We see *short sessions, time limits, and exclusively motor-focused* as the defining features of this challenge type.

Adams lists *Tetris* (Pajitnov & AcademySoft, 1986), *Track & Field* (Konami, 1983), and *Quake* (id Software, 1996) as examples, without giving specific instances inside these games to pinpoint what he means. He does list platformers, shooters, and fast puzzle games as genres where these are most readily found. Deeper analysis reveals more instances of reaction time over speed challenges. We identified several examples of gameplay instances that had *short sessions, time limits, and are motor-focused*. We started our survey with party games and games that relied on mini-games, as they are explicitly designed as short session challenges with time limits. Nintendo games are particularly popular in this genre and exist across multiple input mechanisms; this gave us 10 examples:

- Manic Mallets, *Mario Party 5* (Hudson Soft, 2002)
- Cycling, *Mario and Sonic at the Olympic Games* (Sega Sports R&D, 2008)
- Mecha-Marathon, *Mario Party 2*(Hudson Soft, 2000)
- Pedal Power, *Mario Party* (Hudson Soft, 1999)
- Tenderize the Meat, *Cooking Mama* (Cooking Mama Ltd., 2006)
- Impressionism, *Wario Ware: Touched!* (Intelligent Systems & Nintendo SPD, 2005)
- Wash Rice, *Cooking Mama* (Cooking Mama Ltd., 2006)
- Hammer Throw, *Mario and Sonic at the Rio 2016 Olympic Games* (Sega Sports R&D & Racjin, 2011; Sega Sports R&D & Racjin, 2012)
- Candy Shakedown, *Super Mario Party* (NDcube, 2018)

- Trike Harder, *Super Mario Party* (NDcube, 2018)

These gameplay instances are rather different in their mechanisms of interaction, and thus the motor ability that each emphasizes. Analyzing the description of each challenge gave rise to the following new sub-categories of *Speed* challenges: *button mashing, rapid analog stick rotation, rapid tapping, scribbling, rapid controller rotation, and rapid controller shaking*. For space considerations we only present the decomposition of button mashing. Readers interested in viewing the results of the other speed challenges can contact the first author directly.

Button Mashing

Button Mashing is where a player must rapidly press button(s) or key(s) in a given time limit. While button mashing retains short play sessions, time limits, and motor focus, it becomes hardware-dependent in that these challenges require real, physical controls to depress (ergo "buttons" to "mash"). This is different than pressing virtual buttons, like those found on a touch screen, as it loses the mechanical feedback of a button. From our list, button mashing appears in:

- Manic Mallets, *Mario Party 5*
- Mecha-Marathon, *Mario Party 2*
- *Track & Field*

We can then easily find more (Nintendo) instances:

- Psychic Safari, *Mario Party 2* (Hudson Soft, 2000)
- Speed Skating, *Mario and Sonic at the Winter Olympic Games* (Sega Sports R&D & Racjin, 2009)
- Ridiculous Relay, *Mario Party 3* (Hudson Soft, 2001)
- Take a Breather, *Mario Party 4* (Hudson Soft, 2002)

- Pump, Pump, and Away, *Mario Party 3* (Hudson Soft, 2001)
- Chin Up Champ, *Wii Party* (Nintendo SPD Group No. 4 & ND Cube, 2010)
- Balloon Burst, *Mario Party* (Hudson Soft, 1999) and *Mario Party 2* (Hudson Soft, 2000)

The abundance of examples argues that this is a common category of challenge in the party and mini-game genres. Identifying examples outside Nintendo and party games is made more difficult as instances tend to be embedded in larger gameplay segments. Here are four more representative examples:

- Torture Attacks, *Bayonetta* (Platinum Games, 2010) and *Bayonetta 2* (Platinum Games, 2014)
- Dragon's Breath, *South Park: The Stick of Truth* (Obsidian Entertainment & South Park Digital Studios, 2014)
- Boss Knockouts, *Donkey Kong Country: Tropical Freeze* (Retro Studios, 2014)
- Colossus of Rhodes Fight, *God of War 2* (Sony Computer Entertainment Santa Monica Studio, 2007)

The time limit is now implicit, often being tied to the length of an animation or just not explicitly shown to the player. The previous examples all had explicit timers or gauges. Nevertheless, we didn't find that explicit versus implicit time limits affected our mechanical experience. Generally, we were too focused on pressing quickly to watch the timer when it was explicit. As well, since the goal in every instance is to press the buttons as quickly as possible, there was no change in our play style or strategy. This is likely because of the simplicity of this particular challenge; we believe explicit time limits would affect cognitive-focused challenges more.

Having 16 examples for button mashing shows it's an easily identifiable and common challenge. But do these examples have the same game

mechanics? Consider three of our original examples: Manic Mallets, Speed Skating, and Mecha-Marathon. In Manic Mallets, the player hits a single button as many times as possible in the time limit; Speed Skating requires the player alternate between two buttons; Mecha-Marathon requires the player to press two buttons simultaneously as many times as possible. Manic mallets, with its single button, is a straightforward case of button mashing, requiring no additional abilities outside of pressing the button. Mecha-Marathon requires some coordination of button pressing, principally focussing on the pressing but requiring some attention. Speed Skating similarly requires finger pressing and attention, adding a small perception and memory component to keep the alternating pattern correct. All the other examples repeat one of these three patterns. These differences identified in used abilities yielded distinctions in button mashing based on type of input: single, multiple, and alternating.

Single Input

Single Input Button Mashing tasks the player with repeatedly pressing a specific single button or key on the controller as fast as possible within a given time limit. Examples include: Manic Mallets (*Mario Party 5*), Dragon's Breath (*South Park: The Stick of Truth*), torture attacks (*Bayonetta and Bayonetta 2*), and Boss Knockouts (*Donkey Kong Country: Tropical Freeze*). All have the same goals, mechanics, and mechanisms of interaction. We can now examine their competency profiles based on close readings of these instances.

In Manic Mallets two players repeatedly hit a switch with a hammer to avoid being crushed by a bigger hammer. The time limit is explicit at ten seconds, and the team with the highest score wins. The context is local team-based cooperative-competitive multiplayer on a standard controller. We played this game in multiple scenarios with both normal difficulty NPCs and human players to determine the differences between modes of play. Our first few playthroughs were with an NPC partner versus NPC opponents. The impression from these were that the partners hits weren't reliable for winning, and so we focused entirely on our own button presses. Here *rapid finger pressing* using our forefinger was the most important movement. We never watched the opposing team and were solely

concerned with ourselves. We relied minimally on attention to make sure we were pressing the right button at a good pace. Perception's effect also seemed minimal after the initial press on the right button. Playing games with a human partner against normal difficulty NPCs, we (implicitly) realized that we could rely on our partner, but that our mechanical interactions were the same: finger pressing and minimal attention and perception. The main difference was our impression of urgency; knowing we had a partner whose contribution was meaningful put less pressure on us to perform optimally. This change in our feeling of pressure did not affect the competency profile as it didn't change our approach to the gameplay. When we played with a human partner against a human team, we limited ourselves to holding the controller as intended but did not limit our teammate or opponents in the same way. The mechanical interactions were again the same, but the performance pressure was significantly higher; we pushed the buttons much harder, leading to fatigue over repeated plays. Removing the limitation of ergonomic holds may have resulted in a different ability emerging in the competency profile to adjust to this pressure. Overall, we identified *finger pressing, attention, and perception* as the three abilities in this competency profile.

Dragon's Breath (Figure 7) is a mage-class attack where the player repeatedly waves a lit firecracker in their opponent's face to deal damage. The time limit is implicitly tied to the length of the waving animation, with every button press adding to the base damage of the attack. As this exists as a single attack in a larger combat system, failure to perform doesn't guarantee loss, but does hurt the player's ability to play optimally. The context is local character-based competitive single player on a keyboard and mouse. Unlike Manic Mallets, there was only one scenario to explore, which seemed the same as Manic Mallets when we were playing exclusively with NPCs. Finger pressing is the most important ability, with minimal attention and perception after the start. Since there was no immediate threat of loss, we didn't feel intense pressure to continuously perform optimally or extend ourselves beyond a comfortable level. Therefore, this example and Manic Mallets have the same competency profile.

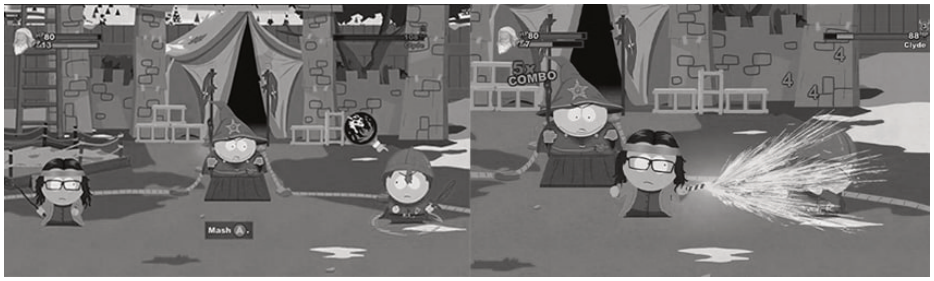


Figure 7: Dragon's Breath Gameplay. This figure illustrates an example of single input button mashing with implicit time limit in the form of South Park: The Stick of Truth's Dragon's Breath attack.

Torture attacks are a triggered combat action which removes the player from regular combat to perform a quick button mashing segment to increase their score and deliver a cinematic finishing blow. Like Dragon's Breath, the time limit is implicit and tied to the length of the animation. The context is local solo competitive single player on a standard controller with only one scenario. This segment of combat seemed mechanically identical to the previous ones: finger pressing, minimal attention, and perception. Though there was no immediate fear of failure from not getting the highest damage, the knowledge of rewards for high scores after the mission created some pressure to perform well, but did not change the competency profile.

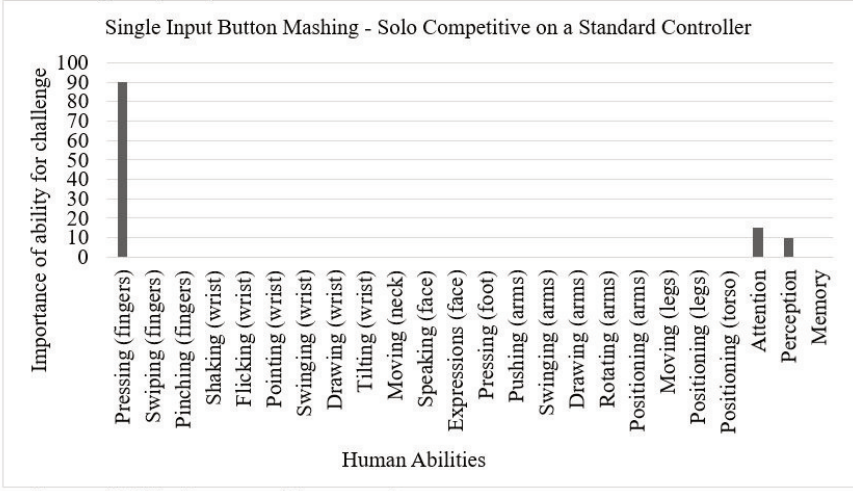
Boss Knockouts are cinematic finishers to a boss fight where the player mashes a button to increase their high score. The time limit is implicit. The context is a local solo competitive single player on a horizontal handheld motion controller. Like Dragon's Breath, there is no risk of failure, and so little pressure to perform optimally. The competency profile is thus the same.

These instances having the same competency profiles mean that we don't need to decompose this challenge further. Regarding the abilities used: In all examples, finger pressing speed seemed to be the main bottleneck, especially as pressure increased. Continuous plays of Manic Mallets made this clear, where the physical fatigue and slower pressing affected the

outcome. Even in lower pressure scenarios, like Dragon's Breath, finger fatigue was the difference between defeating an enemy in one attack or needing more. We approximated the level of use of finger pressing to be 90, making it the limiting ability. We used a value of 90 to communicate that we're confident that testing will reveal as the limiting ability, but conscious of potential error. We found that attention and perception are both used, but not noticeably enough to imperil success. From play, the importance of these abilities was directly related to perceived pressure; attention increased when playing against human opponents. Nevertheless, we could still be competitive while holding a conversation with our opponents and/or teammates. We assigned attention a 15: used, but not important. With the margin of error of our estimates, we allowed that in sufficiently stressful circumstances attention may cross over into noticeably used territory. Perception seemed to have minimal effect on our performance. Beyond awareness that we were pressing the right button, we could play these instances blindfolded if given a cue to start. Thus, we assigned perception a 10, leaving it squarely in the used, but not important category, even with the margin of error. We summarize the intrinsic competency profile in Table 4.

Table 4

Challenge Description for Single Input Button Mashing Challenges

Name	Single Input Button Mashing
Challenge Information	
Definition	Repeatedly pressing a specific single button or key on the controller as fast as possible within a given time limit.
Mechanics	
Button pressing, short time limits	
Variable components	• Time limit
Context	
Mechanism of Interaction	Pressing buttons
Controller Type	Standard Controller
Number of Players	Single player
Type of Play	Competitive (solo)
Examples	
• Dragon's Breath, South Park: The Stick of Truth • Torture Attacks, Bayonetta and Bayonetta 2 • Boss Knockouts, Donkey Kong Country: Tropical Freeze	
Variants	
• Controller Type: Handheld console, handheld motion controller (horizontal), keyboard • Number of Players: Multiplayer • Type of Play: Cooperative-Competitive (team based), Cooperative	
Intrinsic Competency Profile	
	
Source of Difficulty	Finger pressing

Multiple Input

Multiple Input Button Mashing (MIBM) requires the player to push multiple buttons simultaneously, repeatedly, and rapidly. Examples include Mecha-

Marathon (*Mario Party 2*), and Chin-Up Champ (*Wii Party*). All examples we found have the same goals, mechanics, and mechanisms of interaction and thus does not need further decomposition. We analyzed these examples for their competency profile.

In Mecha-Marathon (Figure 8), each player competes against the others to wind up a doll by simultaneously mashing the A and B button (on a standard controller) within a 10-second time window, after which the dolls begin to fly forward. The doll that travels furthest wins. We played with normal level NPCs and human players to test whether the type of competitor affected the competency profile. Against NPCs we found ourselves pressing the two buttons with our forefinger and middle finger while bracing the controller body against our thigh. Performance was adequate, but the position was uncomfortable and repeated play was fatiguing. But this play style revealed that *rapid finger pressing* was the most important movement. We also actively noticed our wrist needing to be stable to allow for quick presses; this is the *wrist pointing* motion. We noticed that our perception wasn't actively used outside of understanding which buttons to push. Our attention seemed divided in this case, as we coordinated the simultaneous button pressing. In a second attempt, we found a more comfortable position where we held the controller in one hand, rested our thumb across the A and B buttons, with the pressing action being done as a movement of the base knuckle of the thumb (near the palm). However, it didn't improve performance against the NPCs and it required a bit of attention to make sure our thumb didn't slip out of place instead of to coordinate movement, but otherwise did not change other aspects of the profile. Against human players, in both holding contexts, we noticed that we exerted ourselves more as we actively considered the competition; we noticed increased movement of our wrist and forearm. The motion speed came from shaking our forearm. We replayed the NPC context to see whether this motion was used there without us noticing, and found that we were subtly moving our forearms, leading us to believe this action is important as difficulty increases.

Figure 8: Mecha-Marathon Gameplay. This figure illustrates an example of multiple input button mashing in the form of Mario Party 2's Mecha-Marathon.

Chin-Up Champ has players compete at performing the most chin-ups in 10 seconds by simultaneously mashing the A and B buttons on the Wii Remote held vertically. The context is local solo competitive multiplayer on a vertical handheld motion controller. We played against normal NPCs and human players. To play the game we held the remote in our right hand with our thumb on the A button and forefinger on the B button. The gameplay for both contexts was identical to Mecha-Marathon; emphasis on finger pressing, noticeable attention use, wrist stability through pointing, and minimal perception. We did not experience forearm shaking. We think this was predominantly because of the shape of the controller; the placement of the A and B buttons on the Wii Remote was more ergonomic resulting in a more natural hold and movement in comparison to the N64 controller as Figure 9 highlights.

In general, standard controllers assume that the player's thumb is their main interaction with the face buttons. This limits comfortable ways to hold the controller, leading to using other abilities to compensate for an uncomfortable grip. This seems to indicate that the specific motor ability that limits success not only changes with difficulty, but also with the controller. Thus, controller design, and choice of which buttons to press, causes variation in the competency profile.

In our survey we couldn't find many examples MIBM. While the mechanic

of pressing two buttons simultaneously is used in other challenges, like quick time events, it doesn't frequently occur in a Speed Challenge setting. We conjecture that MIBM is less popular because of the difficulty in coordinating multiple simultaneous button presses. It can also explain why three button input is not used, as it would be too taxing on the player's cognitive and psycho-motor skills. The effect of controller variability on difficulty must also play into this, as designers may intuitively feel the discomfort of using this challenge in most controller contexts that expect thumbs pressing the face buttons. Another potential reason for the unpopularity of MIBM is the similarity in skills used in the single input button mashing. Designers may not consider them to be different enough and thus choose to use the cognitively simpler single input button mashing instead.

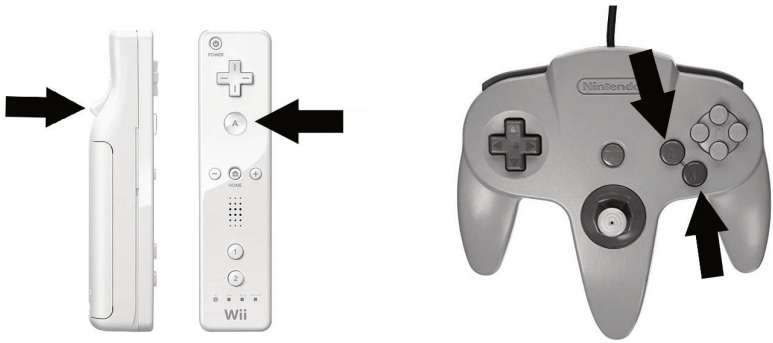


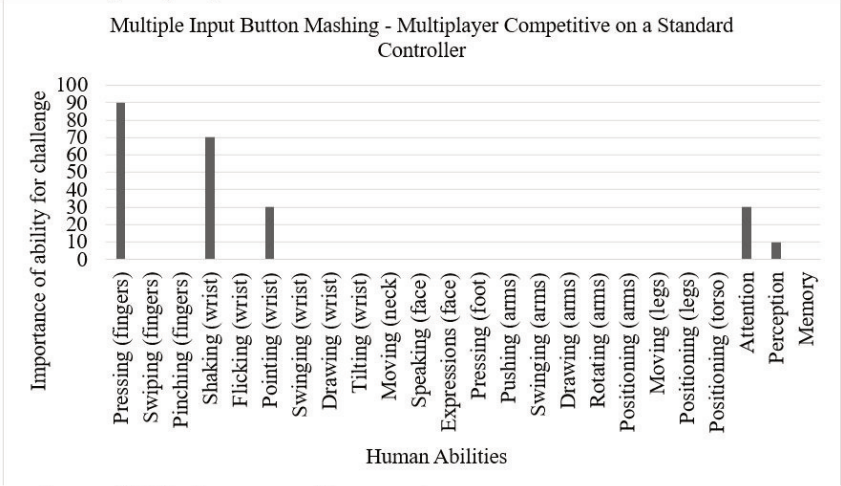
Figure 9: Comparison of A and B button placements between Wii Remote and N64 controller. This figure illustrates the different placement of buttons on the Wii Remote and N64 Controller.

Table 5 shows the competency profile, although the paucity of examples available means there is more room for error. Unlike SIBM, the MIBM

competency profile does vary depending on the example. In both examples—Mech-Marathon and Chin Up Champ—finger pressing speed seemed to be important; whether it was using different fingers to press the two buttons or one finger to press both, this action was instrumental in the action. This was most obvious in comparing the different holds of Mecha-Marathon against NPCS and how there was no difference between our performance in these contexts. While high pressure situations introduced a new ability, finger pressing was the most essential ability. We approximated the level of use of finger pressing to be 90, making it the limiting ability. Wrist pointing is a supporting ability, as it was needed to stabilize the controller; it was never taxing, so we estimate it as noticeably used (30). Attention is like wrist pointing, noticeably used (30) in all scenarios, although for different reasons. Perception, on the other hand, had minimal effect on our performance, thus we assigned it a 10 (used, not important, and less so that the others). Since wrist/forearm shaking only appeared in a single variant (high pressure standard controller contexts), it was not a limiting ability of the abstract challenge type. However, because significantly affected our performance against human players in Mecha-Marathon, we gave it a 70, as important but not limiting. Given our built-in margin of error, this documented the importance of this ability, while leaving room for it to cross into the territory of limiting ability as difficulty rises.

Table 5

Challenge Description for Multiple Input Button Mashing

Name	Multiple Input Button Mashing
Challenge Information	
Definition	Pushing multiple buttons simultaneously, repeatedly, and rapidly.
Mechanics	
Button pressing, short time limits	
Variable components	• Number of buttons pressed • Which buttons are being pressed • Time limit
Context	
Mechanism of Interaction	Pressing buttons
Controller Type	Standard Controller
Number of Players	Multiplayer
Type of Play	Competitive (solo)
Examples	
• Mecha-Marathon, Mario Party 2	
Variants	
• Controller Type: Handheld console, handheld motion controller (vertical), handheld motion controller (horizontal), keyboard • Number of Players: Single player • Type of Play: Cooperative-Competitive (team based), Cooperative	
Intrinsic Competency Profile	
	
Source of Difficulty	Finger pressing

Alternating Input

Alternating input button mashing requires players to repeatedly and rapidly

press two specific buttons in sequence. Examples include Psychic Safari (*Mario Party 2*), Take A Breather (*Mario Party 4*), Pump Pump and Away (*Mario Party 3*), Balloon Burst (*Mario Party and Mario Party 2*), Ridiculous Relay (*Mario Party 3*), Speed Skating (*Mario and Sonic DS*), and the Colossus of Rhodes fight (*God of War 2*). Adams included the Track and Field example here, but for brevity we will skip it. We analyzed the competency profiles of this group which has converging mechanics, goals, and mechanisms of interaction.

Psychic Safari (Figure 10) tasks two players to power up an ancient relic to destroy their opponent's relic. There is an explicit five-second time limit and the player who can make the most inputs wins. The context of this game is local solo competitive multiplayer on a standard controller. We played this game against a normal level NPC and a human opponent. We noticed a similar holding issue to Mecha-Marathon, as they use the same controller. We resorted to holding the controller with one hand while pressing the buttons with our forefinger and middle finger. In both contexts (NPC and human), we relied predominantly on finger pressing to work the buttons, with wrist pointing acting as a supporting ability. Our attention was used to keep the alternating pattern going and perception was used to know which buttons to press. Memory was trivially used, as the sequence needed was short enough to fit in short term memory.

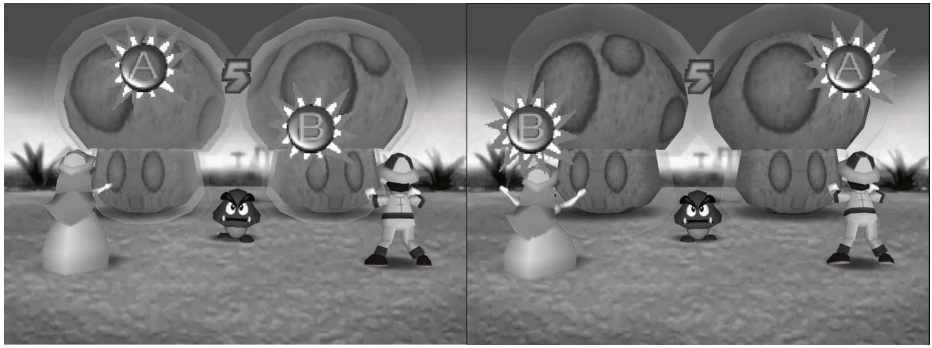


Figure 10: Psychic Safari Gameplay. This figure illustrates an example of alternating input button mashing in the form of Mario Party 2's Psychic Safari.

Take a Breather gets players to inhale by alternately mashing the L and R buttons to see who can hold their breath underwater longest. These is an explicit time limit of five seconds, after which the players submerge and the person who made the most inputs wins. The context is local solo competitive multiplayer on a standard controller. We played this against normal NPCs and human players. In both contexts we found the same abilities as Psychic Safari. The main difference between Psychic Safari, and this, was the ergonomics of play; by having the player press the shoulder buttons (L and R) we were able to hold the controller in a natural way. We still needed wrist pointing to provide stability when holding the controller and enacting the pressing, but now pressing was coordinated across both hands. We do not believe this affected the amount of attentional resources needed, as we were not coordinating our movements to be simultaneous, but just so that they happened in a particular sequence. This more ergonomic interaction will likely affect higher-level forms of experience, and experience over time, as we felt less fatigue from multiple playthroughs when compared to other examples. Perception and memory were still minimally used.

Pump, Pump, and Away tasks players to work together to fill a rocket with air. There is an explicit 10-second time limit to pump air to the rocket before take-off. The players who have made the most inputs (and pumped the most air) win. The context is local team-based cooperative-competitive multiplayer on a standard controller. Unlike previous examples, this game gave us a choice of inputs: either pressing A and B in sequence, or A and Z to the same effect. Having tried Psychic Safari with A and B on the same controller set up, we decided to examine the A and Z experience to see if there was an ergonomic difference. We tried this in three variations: with an NPC teammate against NPCs, with an NPC teammate against humans, and with a human teammate against humans. For the all-NPCs and NPC against human variants, its abilities seemed identical to Psychic Safari. The interesting case was when it was a human team versus a human team. In this case, it performed similarly to Take a Breather. We did find that the A and Z setup felt more natural, as it allowed us to hold the controller in a reasonable way while leaving our fingers resting on both buttons.

Balloon Burst (Figure 11) tasks players to fill a balloon version of Bowser

with air. There is an explicit 30-second time limit, however, the challenge can end earlier if players can burst their balloon (i.e., make a sufficient number of inputs). Balloon Burst exists in different contexts depending on the version. The *Mario Party* context is local solo competitive multiplayer on a standard controller. For *Mario Party 2,* it's local team-based cooperative-competitive multiplayer on a standard controller. The mechanisms of interactions (A and B, or A and Z like Pump, Pump, and Away) and goals are identical across these contexts; therefore, the only difference is the individual versus team nature of the two. We played both contexts to compare whether this change affected the competency profile. For *Mario Party 2,* we compared three variations, as we did in Pump, Pump, and Away. We found that it played almost identically to Pump, Pump, and Away; the major difference was that the time limit was not as important. Where previously we would be mashing buttons until the time limit ended, and then waiting for the results, here there was pressure to mash quicker as more efficient inputs meant a shorter game. We similarly played the *Mario Party* context in two variations: against NPCs and against humans. The results were the same. This variable time limit led to more strain on our motor abilities as we tried to push ourselves to beat the other human opponents.

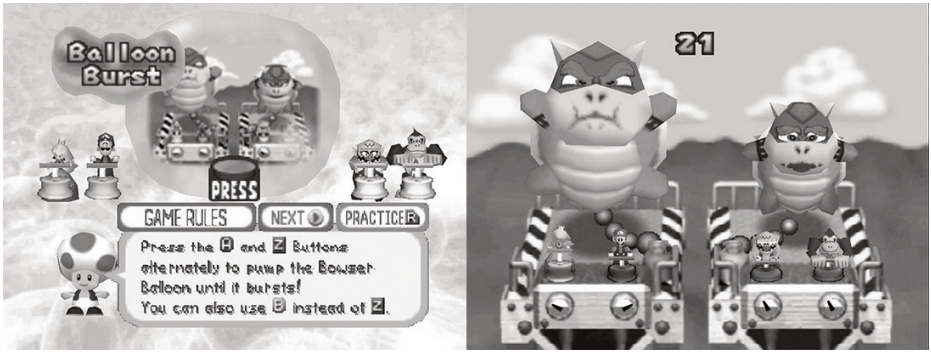


Figure 11: Balloon Burst Gameplay. This figure illustrates a local team-based cooperative-competitive multiplayer alternating input button mashing in the form of Mario Party 2's Balloon Burst.

Ridiculous Relay is a race between a solo player and a three-player group; it has two types of player experiences. Here we focus on the mechanics of the three-player group, particularly the shell section (the first part of the relay). The player must rapidly alternate between the A and B button, which control the right and left oar. The time limit is implicit as the player needs to move fast enough to cover the distance of their segment of the race. When playing, we realized that the three-player team experience was really more like three distinct 1-v-1 experiences put together; as once we were done with our segment of the relay we did not concern ourselves with the performance of others because we could not influence the result. We found that the abilities we used in the shell section seemed the same as previous examples: finger pressing, wrist pointing, attention, perception, and memory.

Speed Skating is a race between the player and three opponents around an Olympic rink. The player skates by alternately pressing the shoulder buttons (L and R). The time limit is implicit and determined by the speed of the player in the lead. The context is local solo competitive multiplayer on a handheld console. Though the controller was different we found the abilities used to be identical to Take a Breather.

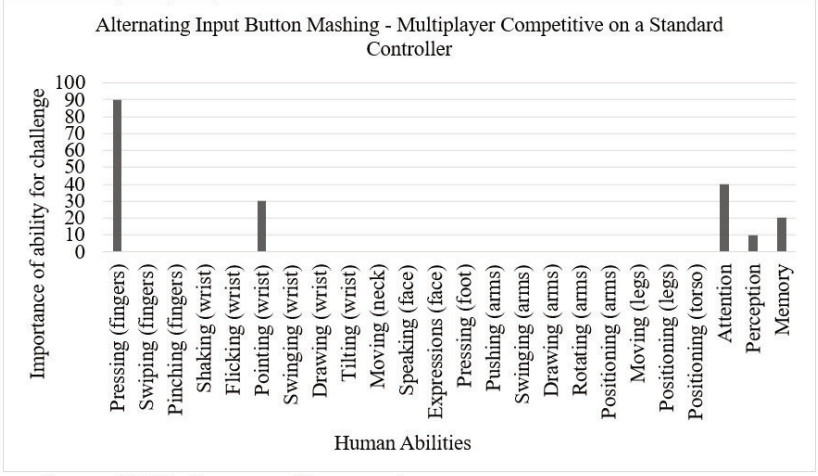
The Colossus of Rhodes fight is the first boss fight in *God of War 2* and is comprised of many smaller challenges (mostly related to combat). During the end of the second phase of the fight, the giant statue grabs the player and, to escape, the player must alternately mash the L1 and R1 buttons. There is an implicit time limit as the player will lose health and potentially die if they cannot escape from the statue. The context is local solo competitive single player on a standard controller. We found the abilities used to be identical to Take a Breather and Speed Skating.

Table 6 shows the competency profile of alternate input button mashing. Although the contexts of the examples differed, we found the abilities used and their amounts, were consistent. Finger pressing continued to be the most important ability (90), thus the limiting ability. Wrist pointing was noticeably used to support finger pressing (30). Attention was used to maintain the sequence, which we felt was slightly more important than wrist pointing (as an incorrect button press could cost us the challenge) so we listed it at 40. Perception was minimally used (10). Memory used varied

with the length of the sequence, and so could vary from minimally used to noticeably used, thus we rated it 20.

Table 6

Challenge Description for Alternating Input Button Mashing

Name	Alternating Input Button Mashing
Challenge Information	
Definition	Repeatedly and rapidly press two specific buttons in sequence.
Mechanics	
Button pressing, short time limits, pattern recognition	
Variable components	• Length of sequence/number of buttons pressed • Which buttons are being pressed • Time limit
Context	
Mechanism of Interaction	Pressing buttons
Controller Type	Standard Controller
Number of Players	Multiplayer
Type of Play	Competitive (solo)
Examples	
• Take a Breather, Mario Party 4 • Balloon Burst, Mario Party • Psychic Safari, Mario Party 2	
Variants	
• Controller Type: Handheld console, handheld motion controller (vertical), handheld motion controller (horizontal), keyboard • Number of Players: Single player • Type of Play: Cooperative-Competitive (team based), Cooperative	
Intrinsic Competency Profile	
	
Source of Difficulty	Finger pressing

CHALLENGE JUTSU: A KNOWLEDGE CAPTURE ARTIFACT

One of our goals is to develop a vocabulary to discuss a player's mechanical experience of a challenge. Challenge descriptions capture the competency profile required for completion, while the player homunculus captures player abilities. We present *challenge jutsu* to link them together.

As a knowledge capture mechanism, challenge jutsu are inspired by the *design patterns* found in HCI (Dearden & Finlay, 2006), and software engineering (Gamma, Helm, Johnson, & Vlissides, 1994). Both are knowledge capture tools with different focuses: design patterns are solution-focused while jutsu are about framing the problem and its root causes. We see design patterns as emerging from challenge jutsu once context of occurrence is fixed.

Challenge jutsu methodology

We document challenge jutsu in three sections: the challenge description, the player description, and the derived mechanical experience.

The challenge description is composed of: a natural language definition of the challenge, the in-game mechanics, the context, examples from mainstream games, context variants, and intrinsic competency profile. These are all needed to narrow down the type of gameplay instance under discussion.

The player description is the player homunculus for the demographic of targeted players. It is represented as a bar graph, with each bar representing proficiency in an associated ability compared to the generic player homunculus. Here we will only discuss generic players, i.e., those the abilities of an able-bodied neurotypical adult, as previously described.

The derived mechanical experience relates the challenge and player descriptions, visualized as a bar graph overlapping the player's abilities with the intrinsic competency profile of the challenge. From this graph, areas of difficulty (where the required ability is greater than the player's ability) are visible and recorded in the jutsu. We identify barriers to challenge completion in order to offer a shortlist of tweaks that could be

made to the variable components of the challenge to address the gap between the challenge requirements and the player's abilities.

Challenge jutsu: Single input button mashing

We applied the above methodology to Single Input Button Mashing challenges to detail its challenge jutsu. The challenge description is Table 4, and the player description is the Generic Player Homunculus.

We compared the competency profile with the player description to create the "actual" mechanical experience. When the player's ability is significantly lower, we placed an X above the column to indicate that it is highly unlikely the player will be able to successfully interact complete the given challenge. We call these *unintentional sources of difficulty*. We then attempted to provide ways to adjust the challenge to accommodate for the player's abilities.

When the player's abilities are marginally lower or higher than the competency profile, we used an exclamation point (!). Exclamation point (!) abilities may not affect the player's chances of success. Players may compensate for these abilities by using supporting abilities, or alternatively can train these abilities for these contexts. We called these identified areas *potential sources of difficulty* as their effect on play varies from player to player.

For player abilities that greatly exceed the competency profile we place a check mark to indicate that they can easily complete that component of the challenge. If all player abilities are well above the required competency profile, this challenge is probably too easy and may bore the player. But this is something for future work.

After all of this we composed it into a final challenge jutsu of a single input button mashing on a standard controller for generic player homunculus, represented in Tables 7 and 8.

Variants in challenge jutsu

Consider a single input button mashing challenge played on a standard controller versus an arcade machine. Both scenarios have physical buttons and are identical in the game context, except for the mechanism of interaction. An arcade machine has larger buttons, which affords pressing with the whole hand and arm rather than just fingers. Rather than creating new jutsu when the only change is the controller, we instead use *jutsu variants*. *Jutsu variants* are when the same challenge exists across different motor abilities, for example, substituting finger pressing with foot pressing or arm pressing. Variants do not change the shape of the competency profile (how much each ability is used), it just replaces the dominant motor ability. Consider the case of the 100m Dash in *Mario and Sonic at the Rio 2016 Olympic Games: Arcade Edition* (Sega and Racjin, 2016) which is an alternating input button mashing challenge presented as a gross motor challenge, replacing finger pressing and wrist pointing with foot pressing and leg moving (Tables 9 and 10).

Table 7

Challenge Jutsu for Single Input Button Mashing – Challenge Description

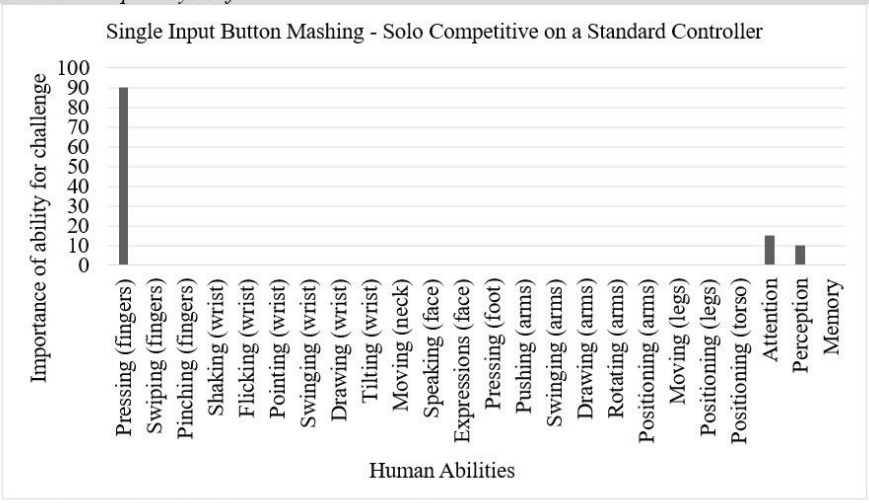
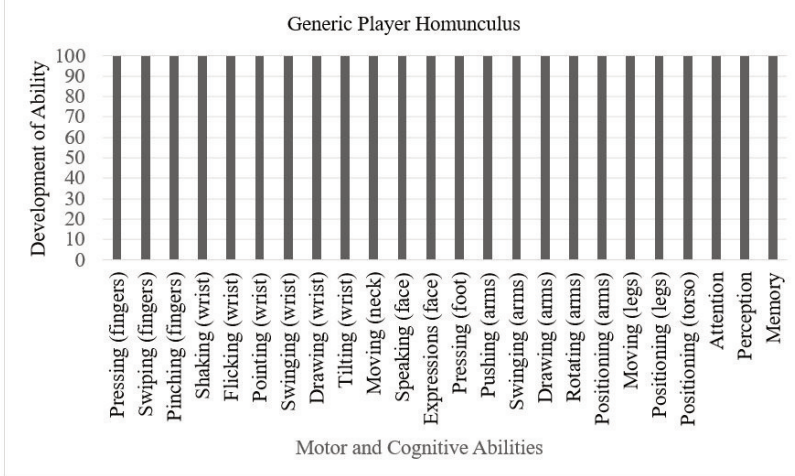
Name	Single Input Button Mashing
Challenge Information	
Definition	Repeatedly pressing a specific single button or key on the controller as fast as possible within a given time limit.
Mechanics	
Button pressing, short time limits	
Variable components	• Time limit
Context	
Mechanism of Interaction	Pressing buttons
Controller Type	Standard Controller
Number of Players	Single player
Type of Play	Competitive (solo)
Examples	
• Dragon's Breath, South Park: The Stick of Truth • Torture Attacks, Bayonetta and Bayonetta 2 • Boss Knockouts, Donkey Kong Country: Tropical Freeze	
Variants	
• Controller Type: Handheld console, handheld motion controller (horizontal), keyboard • Number of Players: Multiplayer • Type of Play: Cooperative-Competitive (team based), Cooperative	
Intrinsic Competency Profile	
	
Source of Difficulty	Finger pressing

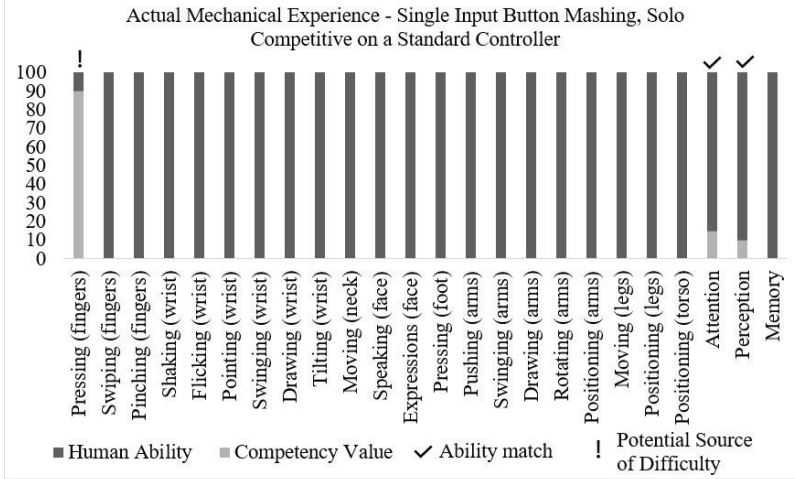
Table 8

Challenge Jutsu for Single Input Button Mashing – Player Model and Mechanical Experience

Name	Single Input Button Mashing
Player Profile	



Mechanical Experience



Areas of difficulty	• N/A
Suggested Tweaks	• N/A

Table 9

Challenge Jutsu for Alternating Input Button Mashing – Challenge Description

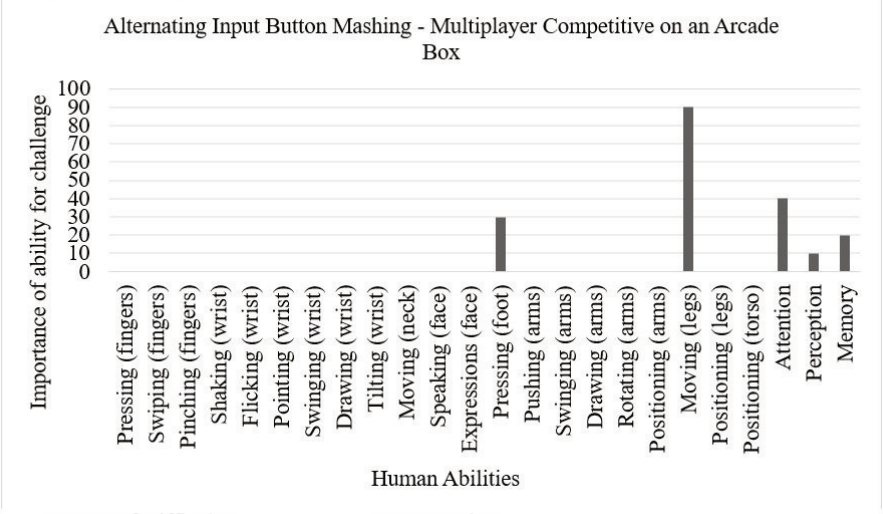
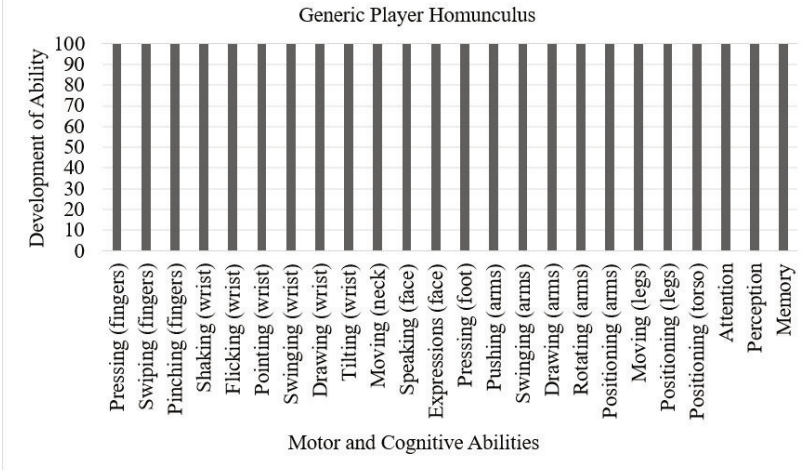
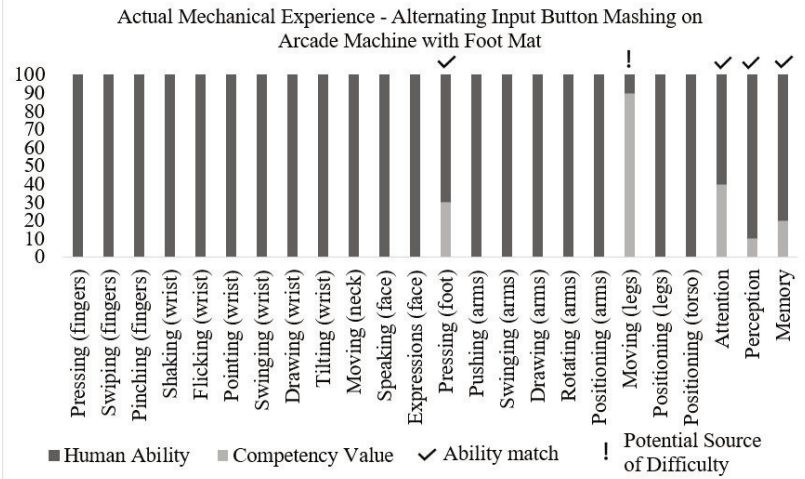
Name	Alternating Input Button Mashing
Challenge Information	
Definition	Repeatedly pressing a specific single button or key on the controller as fast as possible within a given time limit.
Mechanics	
Button pressing, short time limits	
Variable components	• Time limit
Context	
Mechanism of Interaction	Pressing buttons
Controller Type	Arcade Box
Number of Players	Single player
Type of Play	Competitive (solo)
Examples	
•	
Variants	
• Controller Type: Handheld console, handheld motion controller (horizontal), keyboard • Number of Players: Multiplayer • Type of Play: Cooperative-Competitive (team based), Cooperative	
Intrinsic Competency Profile	
	
Source of Difficulty	Arm pressing

Table 10

Challenge Jutsu for Alternating Input Button Mashing – Player Model and Mechanical Experience

Name	Alternating Input Button Mashing
Player Profile	
	
Mechanical Experience	
	
Areas of difficulty	• N/A
Suggested Tweaks	• N/A

Collection and organization of challenge jutsu

An organized system of jutsu should be helpful to understand individual

challenges, but their sheer number is a bit overwhelming. Furthermore, as collecting these is ongoing, and will hopefully become a collaborative community effort, we need a proper system to organize this information. We propose an online, public database. This way, via different views, we can accommodate both user groups: researchers looking to analyze existing games, and designers looking to create new games. A structured wiki may provide the easiest access to both user groups.

Organizing the jutsu in a manner useful for different user groups is the biggest challenge. Our two primary user groups (researchers, and designers) have different use cases, and thus need different views. We dub these the *analysis view* and the *design view*. We expect to add more views as needs arise in the future.

A primary analysis view might sort the jutsu by their source of difficulty as Figure 12 shows. When other dimensions of game analysis that fit the jutsu pattern become clear, other views can be added. The analysis view is useful for understanding interaction barriers (and thus accessibility problems). For example, investigating whether a game is playable by children with cerebral palsy, a researcher would know the specific abilities of their participants, but may not know enough about gaming to identify what games would be playable without playing it themselves. The analysis view sorts the challenges by abilities, highlighting of what challenges are achievable by their chosen players.

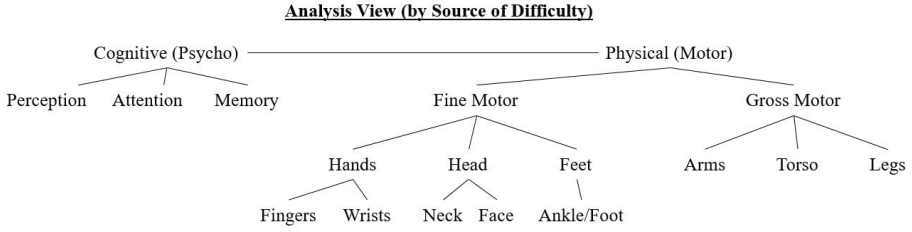


Figure 12: Analysis-View organization of Challenge Jutsu Database. This figure illustrates an organization of identified challenge jutsu based on their source of difficulty.

A design view might sort the jutsu by their challenge types as Figure 13 shows. When crafting new games, designers tend to discuss in terms of game concepts like (types of) challenges rather than abilities used. This

view meshes designer's mental model of game creating, but additionally reveals ability information.

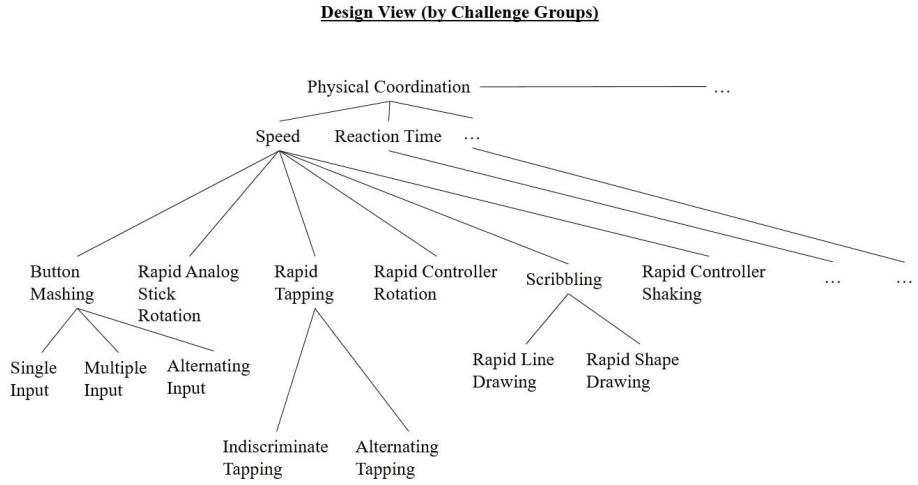


Figure 13: Design-View organization of Challenge Jutsu Database. This figure illustrates an organization of identified challenge jutsu based on the challenge types.

DISCUSSION AND CONCLUSION

We created the *Jutsu Framework (JF)* to analyze and discussed the mechanical player experience.

Specifically, we:

- Described a generic player model based on cognitive and motor abilities;
- Provided a methodology to define gameplay challenges via their competency profiles;
- Outlined a standardized structure for presenting *challenge jutsu;*
- Presented a methodology for how to create *challenge jutsu*; and
- Presented multiple methods of organization for challenge jutsu.

Our presentation of challenge jutsu does not aim to be comprehensive.

Rather, our main contribution is the rationale and methodology behind their construction and organization, coupled with sufficiently detailed examples to evaluate its effectiveness.

Potential applications

The first use for JF is in helping to identify and quantify the sources of mechanical difficulty. This enables creative ways to let designers compensate for player differences between their abilities and the challenge competency profiles. This could also support existing research into accessible controller design or adaptive gaming. This tool can also help support a more targeted form of user testing. Designers know their intended market; challenge competency profiles and specific demographic abilities can drive the selection of test cases, hopefully leading to reduced testing time around playability.

Challenge jutsu also can foster systematic exploration of why challenges work in specific contexts and not others. For example, by understanding the cognitive and motor abilities used in challenges, it may become obvious that certain abilities do not translate well to contexts like VR. Or, alternatively, why certain challenges work for some of the target demographic and not others. This framework can support game balancing and adaptive gaming research into dynamic difficulty adjustment. It could give dynamic difficulty adjustment frameworks a way to consider that the problem is with the game design, not the individual player's abilities.

Relatedly, JF provides a pathway for exploring novel challenges through jutsu variants. As gaming continues to grow as an industry, novelty becomes more difficult to achieve and more important as a selling feature. The structured presentation of the jutsu makes underrepresented and unused abilities salient. This gives designers a guide to explore that space and create new challenges.

Ambitiously, we hope that a further application will be a more concrete rating system for games based on their playability and not their aesthetic context. If game ratings can be upfront about their accessibility requirements, this would make gaming a more inviting and available hobby

to people with disabilities. It would allow for gamers to connect with games that are mechanically appropriate for them and incentivize designers to think about creating more mechanically inclusive games.

Future work

We plan to work on further refinements, and then experimental validation. Expanding the work to encompass Adams' (2010) full list, as refined through our methodology, will create many more challenge jutsu. We also need to define more player homunculi for various demographics. The player homunculi also need refinement to expand the cognitive aspect. Validation will require running a series of experiments to first confirm our challenge competency profiles from our close readings. We could then test the relationship between competency profiles and various player homunculi to get a better understanding of the playability of different challenges in different contexts.

While our focus here is on jutsu based on mechanical experience, the concept can extend to all aspects. Each is based on different player characteristics; for example, the socio-cultural experience requires an analysis of the players' knowledge of society and culture. Challenge descriptions would require adjustments to incorporate related elements, but we do not foresee the fundamental structure changing.

Understanding the mechanical experience of game challenges is a necessary first step in dealing with accessibility issues. This work is ready to expand and we plan to put all our data online shortly for just that purpose. We see our foundational work as a starting point to systematically address issues in design accessibility to improve the player experience for many under-served gamer demographics.

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About iThrive Games Foundation

iThrive Games Foundation prepares teens to thrive by meeting them where they are, and by working in partnership towards a world where all have the voice, choice, and agency to reach their full potential. We use games and game design to equip teens with the skills they need to be healthy and resilient, the tools that support and protect their mental health and well-being, and the systems thinking they need to recognize inequity along with meaningful opportunities to imagine and design a better world. We envision a world where teens are seen and valued by society, where adults have the tools they need to support teens' development, where all live healthy and purposeful lives, and where there is equal opportunity open to all, especially to those who have traditionally been marginalized.

iThrive Games Foundation is a 501(c)(3) organization. Visit www.ithrivegames.org to learn more.

Editorial Team

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