Roguelikes and Addiction:

Dying for a Good Time

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Abstract

This paper explores the science behind gamers repeatedly subjecting themselves to the Roguelike genre. This genre is characterized by runs that restart upon death, effectively erasing all progress players make and starting them from zero. However, their highly randomized nature and habitual repetition makes this seemingly frustrating element extremely addicting. This paper explores the psychology behind the genre, how developers convince players to keep coming back, as well as its similarities to traditional casino gambling. How is casino science used to keep players in their seats? Other factors such as the design behind individual Roguelikes and their randomization systems are also considered, as well as the adjacent Rogue*lite* genre, which changes the formula in key ways. Variations on the formula will be further considered. How do different methods of procedural generation change the games' relationship with the player? Games discussed include *Balatro*, *Hades*, *Inscryption*, *The Binding of Isaac*, *Vampire Survivors, Enter the Gungeon*, and, of course, *Rogue*, the game which inspired the genre. This research will give readers a greater understanding of why they enjoy such a seemingly oppressive genre, and give developers an advantage in developing a Roguelike for themselves.

Introduction

Video games have come a long way since the time of coin-operated Pac-Man and Galaga, where developers' main goal was to kill players as fast as possible, simultaneously keeping them engaged enough to insert another quarter and try again. Compared to other art mediums, games have likely seen the most progress. Compare the Lumiére brothers' original films to blockbusters of today. There's an incomprehensible difference in fidelity, sound, motion, narrative design. An outstanding improvement that proves humanity's incredible ability to create and innovate. But make the same comparison between 1958's *Tennis for Two* and 2018's *Red Dead Redemption 2*, and the difference is significantly greater, perhaps exponentially so. Not only have visuals or "fun factor" improved, but also the convenience of putting a game down and coming back to it. Games can perfectly retain your character's location, appearance, inventory, story progress, and past decisions. *Final Fantasy XIV* hosts hundreds of thousands of players online every day, and each player's data is at the ready as soon as they choose to log on. Games have left behind the days when death meant game over. More often death is nothing but a short delay in reaching the next bit of content, often an inconvenience and annoyance. Certain games such as *Animal Crossing* and *Journey* do away with death entirely to allow for a seamless experience. However, there is a genre that does away with this trend of reducing game overs. Instead, death is the point of playing.

The roguelike (and roguelite) genre keeps the spirit of coin-operated games alive by forcing the player to start from the *very* beginning every time they die. Someone unfamiliar with the genre might consider such a concept cruel. They are correct. However, every year there

seems to be a breakout hit for the roguelike genre that forces players to die, die, and die again, but they can't seem to get enough. What is it about roguelikes that make players start from scratch, over and over for millions of collective hours? They are designed down to every line of code to simulate the feeling of gambling. Like pulling the arm of a slot machine again and again no matter how many times you lose, the feel, look, and sound of these games are fine-tuned to keep you seated for run after run. In the way that they target the part of the human mind that gets attached to inconsistent reward, roguelikes are created from the same DNA as slot machines, but each wield their power for very different purposes. While casinos aim to squeeze out as much as they can from gamblers, roguelikes are playfully activating the same part of the brain for a less malicious purpose, for the joy of playing.

What Does it Mean to be Like *Rogue*?

To be clear, a roguelike is not any game that starts from zero after every death. *Pac-Man*, for example, is not a roguelike, despite not retaining any progress from previous attempts. In 2008 we saw the first ever International Roguelike Conference in Berlin, where an official definition was collaboratively produced by developers in attendance. This has come to be known as the "Berlin Interpretation" (Hatfield), and while it is not an immutable definition, it has been the standard to today. The Berlin Interpretation claims that any roguelike-to-be must:

- Be turn-based.
- Have randomly-generated environments.
- Include permanent failure and death.
- Have a single, unified command set (no separate menus).
- Not follow a linear path.

- Force you to discover the nature of any items you find.

The Berlin Interpretation has been the standard since 2008, but the genre has evolved since then, that evolution being known as a subgenre called the rogue*lite*, denoting games that follow some but not all of the Berlin guidelines. Most often, this refers to games that do not erase *all* progress on death, but other variations include real-time combat instead of turn-based, and certain items having basic descriptions. The lack of a true save wipe upon every death allows for adaptation of the original formula, including incremental upgrades or unlocks to make an individual "run" (one attempted playthrough of the game, resulting in either death or victory) marginally easier, as well as shortcuts, as seen in *Enter the Gungeon*, so you can skip a lower level of which you have proven mastery over. True roguelikes that follow the Berlin Interpretation are extremely few and far between, and roguelites have more than surpassed them in popularity. As a result, for the purposes of this essay, roguelites will be included, and often prioritized, in discussion of the genre. Many of the biggest innovations have come from roguelites, and to discredit their contributions would be a disservice to the discussion.

The genre is named after the game *Rogue*, released in 1980. It is in many ways extremely simple, especially visually, but in other ways quite complicated, even compared to its spiritual ancestors. It was created by Michael Toy and Glenn Wichman while they were university students because they wanted to develop a game that they themselves enjoyed (Wichman). Their idea was to have the computer generate the dungeon instead of the developers, allowing for a unique layout every time— different enemies, items, room layouts all made for unique experiences and forced the player to adapt to different scenarios. According to Wichman, "I think Rogue's biggest contribution, and one that still stands out to this day, is that the computer itself generated the adventure in Rogue. Every time you played, you got a new adventure. That's really

what made it so popular for all those years in the early eighties." Put that way, you can also see why it inspired so many other developers to create games inspired by *Rogue*.

Rogue, even today, has a lot to teach those who are willing to learn. The game starts by dropping you on floor 1 of a dungeon. The dungeon is made up of six to ten rectangular rooms connected by one-space passages. Survive until you find the stairs down to floor 2, and repeat until you can make it to the bottom of the dungeon and obtain the ultimate treasure. Graphically, it is made up entirely with ASCII (American Standard Code for Information Exchange) characters, the standard symbols seen on early computers. That meant that for the developers, everything, from the rooms, enemies, items, player character, all had to be made up of symbols. For that reason, there is a great deal of learning to be done. For example, there are 26 enemies, each represented by a capital letter from A-Z. If you see an *O* approaching your character, it represents an ogre. An *E* is an emu, and a Z is a zombie. Keeping these classifications banked in your memory is essential, as certain monsters have capabilities to keep track of. *I* for ice monster means watching out for its ice beam which can temporarily freeze you in place. Other symbols, such as a "*", represent other items (gold, in this case). There is also a learning curve when it comes to the controls. In the current Steam release, there are 48 individual keys that can be pressed for a different effect. All of them vaguely imply the action that they correlate to. A lowercase *q* will quaff a potion, an uppercase *T* will take off your armor, a lowercase *e* will eat food.

Action verbs are excellent ways to classify what type of game you will be playing. This idea is generally understood to be coined by Chris Crawford, who had this to say on the subject during an interview with David Wolinski for Don't Die; "The verbs define the product. Not just games. Any piece of software. And so in games, the standard verbs are: turn to the right, turn to

the left, move forward, move backwards, duck, jump, run, fire, pick something up, drop something, change guns. Those are the core verbs of most games. There are all sorts of secondary verbs depending on the type of game, but when you look at the verb list for these games, what you will find is that most of the verbs focus on very simple, cognitive skills like spatial navigation, shooting things, hand-eye coordination, resource management, puzzle-solving, etc." (Wolinski) *Rogue* has more verbs than most games, almost one for each key you can press. Take, equip, eat, attack, drink, read, fire, wield, rest, drop, wear, zap, find, identify. This is not complexity for complexity's sake. It allows for player expression and choice. Will you risk fighting a powerful enemy at melee range or risk being cornered? Quaff a powerful potion or save it for when you really need it? Use your most powerful weapon now and risk it breaking or save it for a deeper level? This is not the twitch reaction of an arcade game, but the careful planning of an adventurer, or perhaps of a rogue. The randomization of every run is also hugely influential in how you play. Find a powerful weapon early and you can fight every monster you see, quickly leveling up to keep pace with the increasingly powerful enemies on lower floors. Fail to find food and you'll have to rush to the next floor to hope you can find some there before you become Feeble. Find powerful magic items and you can stay out of harm's way and take out monsters from afar. There will be runs that are impossible to win, where enough resources simply will not spawn, but you won't know until you're in the thick of it. For this reason, a new playthrough of *Rogue* is almost like playing an entirely different game. However, it cannot be said that *Rogue* is addictive in the same way something like gambling might be. It is too slow-paced and measured. Each run feels like a choose-your-own adventure story instead of pulling the slot machine arm.

Rogue inspired several games to come out in the years following its release, but by the 2000s the formula had mostly fallen to the wayside in terms of popularity. That would change in 2013, with the release of *The Binding of Isaac*, a roguelike inspired by the Biblical story of the same name. To avoid being sacrificed by his own mother, a young boy must descend deeper and deeper under the house, theoretically closer to hell, and overcome the demonic entities that reside there. *The Binding of Isaac* moves away from *Rogue* by including real-time combat instead of *Rogue*'s turn-based. It uses a twin-stick controller scheme, in which the left joystick is used to move and the right joystick is used to aim projectiles. Isaac can fire his tears as his primary attack to seemingly purify the creatures attacking him. There is also significantly increased opportunity for buildcraft. Buildcraft is the process of creating a set of items or skills that combine in particular ways, like complimenting a close range-shotgun with a long-range sniper rifle in a shooter. *Rogue* had a few examples of this, like combining a strength potion with a powerful melee weapon. *Isaac* is all about buildcraft, however. You can constantly find power-ups that can stack on top of each other in interesting ways. These can take the form of passive upgrades, like an increase in Isaac's projectile damage, alter the core mechanics of the game, such as letting Isaac slowly charge more powerful tear attacks, and activatable abilities, such as making Isaac invincible from damage for 10 seconds. Each of them seems to disfigure Isaac in increasingly alarming ways, such as infesting his head with spider eggs or growing painful twisted horns. In accordance with the Berlin Interpretation, none of these items have text explaining their use, you must instead test them yourself and experiment to see what works best.

Visually, *The Binding of Isaac* is a very unappealing game. It features blood, gore, feces, and everything in between, and enemies are horrendously monstrous and deformed. While the game is not quite as challenging as *Rogue*, it is extremely oppressive. It feels as if the game is

praying for your downfall at every step. For that reason, it may be surprising that some fans of *Isaac* are willing to put literally thousands of hours into the game, just to have their progress erased each time they succeed or die. They start from zero again and again and never seem to get bored of the repetition, or even sick of the putrid atmosphere. Perhaps it is not this Sisyphean nightmare that *Isaac* excels at, but the fact that it gives you the opportunity to break it and control it. The buildcrafting opportunities mean a good player can use the meager resources of the world and create a version of Isaac that takes the demonic nightmares and disintegrates them. The proper combinations of mutations and transfigurations will leave Isaac looking more disturbing than the previously formidable demons he battles against, but he will dispatch them with ease. Once the run ends, you are right back to square one, wondering if you'll ever have a run that perfect again. No reloads or respawns, one shot to make your drawn lot work, and then you will never see that perfect combo ever again. For that reason, a single perfect build can make two dozen failed attempts feel completely worth your time. *The Binding of Isaac* has received three major expansions, each of them adding hundreds of new items for players to experiment with and dozens of bosses to defeat. Players will return to the same core game they have overcome already perhaps a hundred times, just to feel the euphoria of finding that winning run again.

At this point, it is natural to feel the gambling influence begin to creep in. Without doing research on the issue, it might be hard to see how gambling can be addictive in the same way as cocaine or another drug, but this is supported scientifically. A UCLA Health article explains this in detail; "Like addictive drugs such as cocaine, heroin, nicotine and alcohol, gambling activates the brain's reward system, which is powered by dopamine. Dopamine is a neurotransmitter inside the brain that reinforces sensations of pleasure and connects those sensations to certain

behaviors or actions. Doctor Timothy Fong [a Clinical Professor of Psychiatry at UCLA], however, highlighted a significant contrast between gambling and addictive substances. 'Gambling, unlike any other addiction, is associated with cognitive distortions,' he said. 'People say, "If I keep gambling then eventually I'll win." You don't say that about alcohol, tobacco or cocaine,'" (Champion). Put in these terms, you can see how the justification for real gambling can be slightly adjusted to fit with the "one more run" mentality of *Isaac* players waiting for their perfect attempt. A US National Library of Medicine Study called "The Neural Basis of Video Gaming" explains how video games already produce significant amounts of dopamine, which makes them addictive in their own right (Kühn). There is a clear correlation between the chemical reaction to gambling and to gaming, so formatting games in ways reminiscent of gambling is an obvious recipe for addictive and compulsive behaviors.

The "Numbers Go Up" Design Philosophy

Far more reminiscent of real gambling is *Balatro*, a poker-inspired roguelike. The goal, like any other roguelike, is to survive for as long as possible or risk starting over again. You begin with a regular 64-card deck, with each played hand (straight, flush, etc) being worth a certain number of points. Garner enough points within a certain number of played hands and you beat the Blind and move on to the next, this time with a higher score requirement. As the game goes on, you can manipulate the cards in your deck and collect special Joker cards that grant you additional effects. For example, you may gradually transform each of your cards into kings and play the previously impossible Five of a Kind, and combine that with the Baron Joker, which multiplies your score by 1.5 every time you play a king. Or you can build a run around playing single cards, creating a deck where each card you *don't* play multiplies your score. *Balatro* is a

game about gambling, but beyond that it is a game about numbers rapidly and exponentially increasing. There are no opponents, just the increasing Blind score to contend with, which you must surpass to continue playing. You will race to scale your deck to match the Blind with your rapidly evolving deck. At the start, a decent hand can score you somewhere between 150 to 600 points, but survive long enough and you'll be fighting to collect 3.8e92 points in just four hands.

This may sound a bit boring, like real Poker but lonelier. But *Balatro* is able to overcome that through masterful visual and auditory design. The main theme that plays continuously throughout is addictive and trance-like, almost as if it is attempting to hypnotize the player. The same goes for the sound of each card played, sounding off with a satisfying click and a small visual animation. As a bonus effect from a Joker activates, you hear a short chime. Individually, these effects are cute. When combined, they are absolutely mesmerizing. On a good run, you might be creating dozens of these noises for each hand played, and as each effect activates, they play in more rapid succession. The slow build of sound and motion, rapidly increasing in speed and intensity as they do, is what makes "numbers go up" so wonderfully satisfying for the player. This is all in addition to what is likely *Balatro*'s crowning achievement: The round score. On the left of the screen is a box containing a number equating to your cumulative hands' values this round. You have four hands to make this round score surpass the Blind score and move on to the next, higher Blind. However, if you can play a good enough hand that surpasses the Blind, the score, increasing with every card played, will start to burn on screen, a small fire peeking out from behind the numbers. As this score gets higher and higher, so too does the flame, symbolizing your combo's increasing complexity and power. The hypnotic music begins to fade out, replaced by the sound of burning as you *obliterate* the Blind score's value.

Balatro creator localthunk understands this best, as he stated in his interview with the Washington Post. “It is something I really do love about ‘Balatro.’ I crafted an art style and vibe to surround the game, but beyond that, it is almost a purely mechanic experience. There is no narrative, no lessons are learned, and it resembles solitaire as a game far more than it does [other popular video games],” (Park). Why do people play *Balatro*? Perhaps it is that feeling of mastery. Outside of the cost to purchase the game, *Balatro* involves no real money, but it doesn’t seem to matter. Chasing the feeling that you have manipulated or even broken the game to the extent that you are scoring tens of millions of points higher than the limit after struggling for dozens of hands is addictive. And yet, *Balatro* does not end. No matter how perfect your deck is, the Blind score will continue scaling faster and faster until your Quadrillions of points are no longer enough to keep up. You are *guaranteed* to fail. But perhaps next time you can make it one round further. And so, *Balatro* begins again.

Balatro may be an example of roguelikes getting closer to gambling, but that is not necessarily the direction of the genre as a whole. Consider *Hades*, which combines the buildcraft of *Isaac* with a story that canonically accounts for death and rebirth, and makes the obsessive nature of roguelikes part of the narrative. You are Zagreus, son of Hades, on a mission to escape the underworld to find your mother, Persephone. This goes against the will of your father, who unleashes the dead to halt your escape. As you travel through randomized rooms and fight through hordes of enemies and powerful bosses, you will create relationships with other characters. The gods of Olympus grant you their power to aid in your escape, and you will meet heroes of legend. Achilles, Thesius, Sysyphus will all make your acquaintance on the journey. Upon dying, you return to the bottom of the underworld, Hades’ domain, and although your progress is erased, Zagreus’ memory is not. Unlike Isaac from *The Binding of Isaac*, who

escapes from his mother for the first time every time you press New Game, each of Zagreus' failures to overcome his father is etched into his brain, the same as they may be in the player's. Zagreus' life has become a roguelike, and the implications on the story are fascinating. Zag is not alone in remembering each of his attempts, the rest of the colorful cast of the underworld does as well. They will comment on his repeated attempts at escape, reminding him that Hades will eventually drag him back to the underworld should he escape. When he finally does get out, he gets a meager few minutes with his mother before, as promised, he is magically returned to the underworld.

While this first escape may seem like the end of the game, that is far from the truth, as Zagreus swears to continue escaping to see Persephone again, as many times as it takes, despite the futility. *Hades* is already a challenging game, so many may feel that they accomplished enough by escaping for the first time. But for those who want another few minutes of new story upon that second escape, you have become one with the character of Zagreus, willing to do anything it takes, even if it's pointless, to exist on the surface for a few more minutes. On top of that, *Hades* has the Heat system, a method of making the gamer even harder than it already is. Punishing difficulty is already a staple of the genre, so who in their right mind would want to make it any harder?

Knowledge as Progression

Many people play video games to relax after a long day of work or school, where challenges are abundant and there are no retries. It is unsurprising that people choose to play games where victory is guaranteed, or at least comes relatively easily. However, the popularity of challenging games is undeniable. There's a long history of challenging games garnering a broad

audience. Fighting games, for example, are well-known for having a steep barrier of entry because of the lack of progression. In fact, they are similar to roguelikes in this sense. *Street Fighter* matches start with two players on even footing. They fight a best of three match, a winner is declared, and the match comes to an end;. As a result, if you have an incredible match and outplay your opponent, your character does not get any stronger. That winning match won't have any effect on your *next* match, where you will once again have to tip the scales in your favor. The appeal of fighting games is overcoming your opponent with only your innate skill at the game. Players spend hours practicing in a training mode to perfect their skills, much in the same way a boxer will train before a real fight. This is dramatically different from most games. In most *Final Fantasy* titles, your character levels up as you defeat your enemies. You will become more skillful in some aspects, mostly through game knowledge and strategy, but if a boss is too powerful, you can keep fighting weaker enemies until your damage stat is high enough that you can win. That is not the case in *Street Fighter*, no matter how long you spend practicing, you won't outperform a stronger player until you get better.

This is the difference between extrinsic and intrinsic motivation in games. Extrinsic motivation involves giving the player a reward for performing a task, like gaining a powerful item after beating a boss that will make the next area easier. On the other hand, intrinsic motivation would include learning how to perform a complicated action like a Shoryuken in *Street Fighter*, which can take time and effort on the player's part. Nothing in the game has changed except the player's abilities. Neither of these are better than the other, and both have their place in games. Intrinsic abilities also include knowledge, however. In *Street Fighter*, that means keeping a mental bank of your opponent's capabilities and the optimal response to each of them. However, in roguelikes, intrinsic motivation takes on a different meaning. It represents

your ability to adapt. In an individual run, you will receive extrinsic rewards in the form of stronger abilities and combos, which will disappear upon death. However, you will also be challenged in your decision making skills countless times in each run. *Hades* asks the player to choose between rewards, forcing them to decide which will be the most beneficial. *Balatro* asks the player to manipulate their cards on the fly to create an optimal deck as fast as possible.

Inscryption presents another fascinating wrinkle; a roguelike within a game by combining extrinsic and intrinsic progression. You awaken in a dark room where you must play a roguelike card game against a shadowy figure at the other side of the table. It is revealed that you may get up from the game board and walk around the room, although you are locked inside. The figure informs you that you are his captive, and if you lose, you will die. The roguelike itself is very interesting incorporating deckbuilding similar to *Balatro*, where gameplay revolves around sacrificing your weaker cards to summon stronger ones. Each of your cards portrays a different animal, some of whom will beg you not to sacrifice them. Although it is presented as a board/card game in universe, it functions broadly as a roguelike. Lose, which you are all but certain to do at first, and the dark figure will grab and kill you. In each run you are controlling a new prisoner who is fated to die to the figure's unfair game. However, you can turn the tide in your favor. By standing up and exploring the room, you can solve escape-room-like puzzles to rig the game back to your favor, like finding new cards or other physical advantages by intuiting the passcode to a lockbox. The figure won't stop you, it is as if he takes pleasure in seeing you desperately trying to save yourself. *Inscryption* is a far larger and more complex game than it initially appears, and beating your captor at his game will reveal that the story in the cabin is just beginning. What makes it an interesting entry as a roguelike is how it controls what is and is not diegetic to the game world. Usually the player commands the protagonist to perform actions, but

here we have another level of separation from the game. We can see the protagonist's hands as he holds his cards and draws from his deck. When we "die" in the card game, the protagonist is dragged away from the board and "killed" a second time. The puzzles remain solved for the next victim, meaning they might have garnered some advantages from the environment, but the game itself stays the same. This is extrinsic intrinsic motivation. The character we control is progressing intrinsically, but the game itself remains unchanged. Roguelikes are games about failure, so it is fascinating to see a game make the horror of repeated death a canonical part of the story. Here, people play the figure's game to survive. The player does so for fun.

This is Your Brain on Slots

It is impossible to ignore the connection between gambling and gaming. A 2018 study found that 78% of gamers are gamblers, and 70% of gamblers are gamers. Problem gamblers and problem game players showed a weaker but still significant overlap at 10.5 and 24.1% (Sanders). Those with addictive personalities seem likely to develop problematic habits with both hobbies, as both are remarkable sources of dopamine and other chemical messengers. Although the evidence is not conclusive, there are also some studies that indicate that online gambling may be even more addictive than in-person gambling (Gainsbury). Online gambling is rising in prevalence, and the format makes it more likely that underage gambling might be taking place. As a result, online gambling is a likely pathway to addiction.

The question at hand then becomes: when this structure is adapted into a game, is it still inherently dangerous? When monetization of this randomness is introduced, the answer appears to be yes. Gacha games (like *Genshin Impact* and *Zenless Zone Zero*) are another popular genre that's central mechanic is "pulling" from packs to draw characters or items, which often costs

real life currency. This fits the definition of gambling pretty perfectly, although it is not legally considered to be so in most countries. These “pulls” can drop an ultra rare character, or a common one that you may already own. The more money you feed the game, the higher your likelihood of pulling an extremely rare character. Like a high roller in a casino, there are “whales” in Gacha games who will often spend tens of thousands of their earnings on an otherwise free game (Jiang). Gacha games are considered explicitly predatory by many because of the monetary investment that can quickly spiral out of control, exacerbated by the fact that these games are usually free so players can get a taste before taking the plunge with their wallet. Additionally, because they are not legally considered gambling, the age restriction is far lower, meaning young teens can often get roped into such an addiction. Other regulations on gambling are also unrestricted here, such as banning the act of changing the odds of victory after a certain number of losses. *Genshin Impact* implements the Pity system to make sure that if you play enough, you will eventually win a large prize, incentivizing more purchases. The free game is often flashy and enjoyable, and new players usually get rare pulls for free, but quickly fall behind their paying peers. Without paying for power, their progress is slowed, and as a result paying often seems like a shortcut to fun late-game content. At this point, most players either quit or cave and pay for pulls to keep up. On top of that, there are often daily rewards to keep players coming back as often as possible.

This is the business model of Gacha games. It does have some connection to roguelike, in which the goals of both are to entertain the player over long periods of time, instead of a single playthrough like a more narrative-focused story might encourage. However, instead of free entry followed by unlimited microtransactions, most roguelike developers make the explicit choice to charge somewhere between $5 and $30 USD (relatively cheap compared to the $69.99 AAA

industry standard), and no additional fees. Therefore, perhaps the only risk is the player's time. Do we condemn a gambler for the time they spend in the casino? Likely not. They are condemned because they are risking their future, and potentially their family's future, on an uncertain and likely unfair game. The same may be true for a Gacha game, but is it different for a roguelike? Is gambling without the monetary risk still dangerous?

To answer that question, it is worth considering what makes gamblers continue playing, making the gambling industry 65.5 billion in 2023, an all-time high (Greenburg). Slot machines are built with the sole purpose of encouraging gamblers to attempt as many times as possible while still making sure they lose the vast majority of time. While smaller payouts are more common, the top prize for slots are usually somewhere between one-in-5000 and one-in-34-million (Neiger). This is obviously to ensure that casinos remain highly profitable while still being able to pay that multi-million dollar payout once in a while to encourage continued play. As a result, they need to do everything they can to make taking that chance as appealing as possible. Slot machines would be equally functional if they were blank screens that said "win" or "loss" whenever you inserted money, but that would quickly bore users. New slot machines utilize speed of betting as a major incentive for the player. Brad Plumer from Vox describes this phenomenon well: "Instead of a single line, a player can bet on up to 200 lines at a time on the video screen — up, down, sideways, diagonal — each with a chance of winning. So a person might bet a dollar and win on 35 of the lines, getting 35 cents back. That *feels* like a partial win — and captivates your attention," (Plumer). This visual feedback is perhaps more important than the actual act of winning. It manifests as a gradual drip of dopamine, resulting from the excitement of monetary risk, the environment of the casino, the visuals and flashing lights of the slot machine. Many slots are also designed with extremely comfortable seats to

make it easy to sit for long periods of time. In a society of declining attention spans, this is the perfect storm to get the gambler into a flow, sinking hours and hundreds of bets a minute into a single machine.

The landmark Skinner box experiment hypothesized that if animals are rewarded with food upon pressing a lever, they would become increasingly more likely to press it again, quickly learning that certain actions resulted in what we now call positive reinforcement. Professor Saul McLeod of the University of Manchester summarizes this experiment well. He explains that if the food was supplied at a consistent rate of five presses, animals would press the switch fairly often to get the reward. This is known as fixed-ratio reinforcement. However, separate groups were tested with what is called a variable-ratio schedule, where food would be supplied at a random rate of anywhere from one to several dozen presses. These animals would press the button hundreds of times, obsessing over getting the reward, even after they had eaten far more than they would normally want to (McLeod). The inconsistent reward schedule also had animals "extinguish" this behavior far later than fixed-ratio reinforcement, and as a result never seemed to get tired of pressing the lever. This is the exact reward structure of slots and other forms of gambling, constant inputs and inconsistent and random rewards. The Skinner box experiment implies that gamblers would more quickly become bored of a button that always gave them a dollar than a slot machine. We see something similar when it comes to social media, where algorithms are designed to give you posts calculated to be most enjoyable every once in a while to keep you scrolling for longer periods of time. Professor McLeod goes on to explain, "Skinner argues that the principles of operant conditioning can be used to produce extremely complex behavior if rewards and punishments are delivered in such a way as to encourage move an organism closer and closer to the desired behavior each time. In shaping, the form of an existing

response is gradually changed across successive trials towards a desired target behavior by rewarding exact segments of behavior." To do this, the conditions (or contingencies) required to receive the reward should shift each time the organism moves a step closer to the desired behavior. According to Skinner, most animal and human behavior (including language) can be explained as a product of this type of successive approximation," (McLeod).

Games often follow these same types of reward schedules. For example, battle passes in games like *Fortnite* allow players to buy access to a fixed-ratio reward track— in a way, paying for low doses of dopamine. After completing a certain number of quests or gaining enough experience, you are rewarded with a new skin or item. The aforementioned Gacha games use the variable-ratio reward structure, where you keep buying pulls until you find the rare drop that you were hoping for, resulting in occasional yet large bursts of dopamine, which is the far more addictive structure. Roguelikes, on the other hand, fall under this variable-ratio category. Waiting for the appropriate elements of the game, whether that be resources, buildcraft components, room layouts, or any of the other dozen randomized components of a given run. *However*, unlike slot machines and card games, these titles give the player perhaps hundreds or thousands more opportunities to adjust their odds and adapt to the given situation. Blackjack or Solitaire strategies certainly exist, but leave quite a bit up to chance. A *Balatro* run will have an experienced player making dozens of decisions and calculations every minute. They are not at the mercy of the odds, they are competing against and overcoming them. *Hades* incorporates real-time combat, meaning players are making dozens of decisions a *second* to defeat tough enemies on top of making build decisions.

Vampire Survivors takes this one step further, the roguelike most reminiscent of gambling, and it is entirely by design. The game's developer, Luca Galante, was formerly a

programmer in the casino industry. In an interview with The Verge, he explained how he used what he learned about the importance of sound design and visual feedback (Peters). *Vampire Survivors* also perfects the "flow state" of slot machine play by making the game exceptionally simple and constantly visually entertaining. The game sees you fighting hoards of endlessly-spawning monsters, but the only controls are WASD to move. That is because, after selecting a new weapon after each level up, all of the weapons are used automatically. You simply need to move in whatever direction is optimal for not being hit by the encroaching beasts, who drop colorful gems upon their defeat that will quickly flood the screen. Upon defeating certain larger monsters, you can pick up a treasure chest, at which point a slot machine will literally play out on your screen, spinning to give you a random reward. When the slot stops on the result, colorful gems and lights flood the screen. Some rare chests will fire off five slots at once, reminiscent of the newer slots where you can gamble on many games at once. If you can survive long enough, your combo of weapons and other abilities will completely fill the screen to the point that even experienced players will be unable to parse any useful information. It can be genuinely disorienting to look at due to the amount of particles and effects covering the screen.

Vampire Survivors is in many ways the easiest and simplest of the games discussed in this paper, although some knowledge is necessary to survive long enough. However, it has nailed the formula of simple inputs from the player resulting in chemically perfected feedback from the game.

Conclusion

There are clear parallels between roguelikes and gambling, and in some cases the genre has directly taken casino science to optimize systems. The main difference is that roguelikes are

not monetarily predatory. That begs the question, why has the genre gained so much popularity? At least for gambling, the obvious answer might be potential monetary gain, but the Skinner box experiment's findings appear to prove otherwise. Perhaps then gambling and roguelikes have the same appeal; feedback to the player's actions. Simple input/output. This appears to be a fundamentally human experience, but our brains are wired to become obsessed with inconsistent output, as per the Skinner box. Real life often runs on fixed-ratio reward scheduling. When you work for a certain amount of time you receive a paycheck. If you finish your chores, then you have the opportunity to relax for a few hours. But when you use a slot machine the outcome is uncertain and you cannot affect it. In a casino, you might win ten million dollars by pressing a button, or you might not. Rather than playing to win, players are motivated by the thrill of that possibility of winning. Roguelikes might not offer the player a chance to win money, but there is that activating chance of overwhelming success, of a run where you are in control of every mechanic of the game. If it happened *every* time you played, there would be no chemical reward. We would get sick of it just as Skinner's animals got tired of their consistent rewards.

This is not to say the two categories are equivalent. The key difference between them is randomness. Casinos try to make the player feel like they are in control of a random game through unclear systems and false choices. Roguelikes initially seem random, but the more you play, the more clear it is that you are in control of the odds. The player uses their adaptation skills to contend with the game's randomization. If you can adapt well enough, the random elements can be overcome nearly every time. In all of the roguelikes discussed today, top players have a great chance of winning every time. On the other hand, the best casino gamblers will still lose a lot of the time.

The parallels between the two are not insignificant. Both are created to entertain the audience. But the same could be said about film, television, music, and other genres of games. It would be irresponsible to consider them equal in risk for the consumer. Roguelikes, and games in general, are new enough that it is difficult to gauge their long-term effects on our psychology compared to other higher-risk hobbies such as gambling. At this time, experiencing the dopamine rush of a successful roguelike run cannot be proven to have any more negative effects than other forms of gaming. There does appear to be a high probability that human brains are wired in such a way that roguelikes are positioned to be particularly amicable to such a reward structure, which is perhaps a large reason that the genre is taking off so quickly. These games are relatively simple to develop from a technical standpoint compared to big-budget AAA games, but they are immensely challenging to design and fine-tune to the point that they become enjoyable and not too punishing or too easy. The successful titles of the genre have made Skinner's box into a medium of entertainment by making death and rebirth feel exciting and rewarding, and that in itself is an achievement.

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