

The Neuroscience of Desire: Dopamine, Intermittent Reinforcement, and Player Retention in Genshin Impact

Thiago Santos

Universidade Federal de Alagoas/ Design -- Student
Rua Augusto Quintela. N.10 - Residencial Maria Luiza
Maceió - AL - Brazil
+55 82 987390699
thiago.silva@fau.ufal.br

Daniel Leite Costa

UniFacisa // Digital Games -- Teacher and Course Coordinator
Rua Maria Gomes de Souza. n.16 - Conjunto Dinamérica
Campina Grande - PB - Brazil
+55 83 981557051

Livia Scienza

Universidade Federal de São Carlos // PhD Candidate - Psychology
Rod. Washington Luís, s/n - Monjolinho, São Carlos - SP, 13565-905
+55 16 3351-8111

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INTRODUCTION

The phenomenal success of gacha games like Genshin Impact (HoYoverse 2020) presents a core puzzle for developers and researchers. How do these games maintain such a massive, engaged player base, driving retention that outpaces many traditional titles? (JCOMA 2025). The conventional answer, and often simplistic, one is that the game is simply "fun." However, this explanation fails to address the persistent, near-compulsive behavior that gacha systems can induce (Skeptic.org.uk 2024). The public discourse frequently compares these mechanics to gambling (Wu & Singh 2023), but this comparison, while accurate, often lacks a neuroscientific explanation of why the loop is so effective. We assume retention is driven by the "joy of winning," but this assumption confuses the experience of pleasure with the mechanism of motivation.

This paper argues that the retention model of Genshin Impact is not primarily built on the pleasure of possessing a reward, but on the deliberate engineering of the desire to seek that reward. This is not a semantic distinction; it is a fundamental neurobiological dissociation. Drawing from the Incentive-Sensitization Theory (Berridge, Robinson, & Aldridge 2009; Berridge & Robinson 2016), we posit that gacha systems are optimized to exploit the dopaminergic "Wanting" system, rather than the "Liking" system. "Liking" is the hedonic pleasure, which is neurologically

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fragile (Berridge 2009). "Wanting" is the incentive salience, the motivational drive, which is powered by dopamine and is neurologically robust (Berridge & Robinson 2016; Robinson & Berridge 1998; Berridge 2007). The thesis of this paper is that Genshin Impact functions as a motivational architecture designed to neurologically "sensitize" the player's "Wanting" system (Linnet 2014; Robinson & Berridge 2025), creating a persistent seeking-behavior loop that becomes dissociated from the actual pleasure obtained.

To prove this thesis, we synthesize two foundational lines of research:

Neuroscience of Reward: We analyze the seminal neuroscientific literature of Berridge and Robinson (2016) to establish the neurochemical dissociation between "Wanting" (Dopamine) and "Liking" (Opioids). We demonstrate that dopamine is not a "pleasure molecule" but a neurotransmitter of anticipation, motivation, and incentive salience (Berridge 2007; Linnet 2014; bioRxiv 2025).

To ground this distinction, it is crucial to observe the anatomical disparity between these two systems in the brain.

The "Wanting" System: This system is vast and resilient. It is mediated by the mesocorticolimbic dopamine system, projecting from the midbrain to broad structures such as the nucleus accumbens, the amygdala, and the prefrontal cortex. It is a robust system, evolutionarily designed to ensure goal pursuit.

The "Liking" System: In contrast, this system is anatomically restricted and fragile. Berridge's research identifies specific zones called "hedonic hotspots." Unlike the desire system, the generation of pleasure requires the unanimous and simultaneous activation of these small points via opioid or endocannabinoid neurotransmitters. This means the human brain possesses a vast and easily activatable capacity for desire, but a limited and delicate capacity for pure pleasure—an asymmetry that gacha games aggressively exploit.

Behavioral Psychology: We revisit the foundational work of B.F. Skinner (Ferster & Skinner 1957) on operant conditioning to identify the precise psychological mechanism used to train this "Wanting" system. We focus specifically on the distinction between continuous and intermittent reinforcement (Lim 2024; Lerman & Iwata 1996).

By overlaying the neurobiology (the why) onto the behavioral psychology (the how), we can dissect the design of Genshin Impact's "Wish" system as an engine for motivational engineering.

Our analysis reveals a synergy of two systems. First, the neurobiological evidence shows that the mesolimbic dopamine system is the motor of "Wanting" (Berridge & Robinson 2016). Dopamine is crucial for the anticipation of reward and for assigning salience to the "cues" that predict it (Linnet 2014; Berridge 2009).

The exact mechanics of how this functions in *Genshin Impact* can be explained through the experiment by Wyvell and Berridge (2001). In this study, rats received microinjections of amphetamine in the nucleus accumbens to increase dopamine. The result was not a constant increase in food-seeking, but rather a dramatic amplification

of desire "spikes" triggered specifically by an auditory cue (a tone) that predicted sugar. Without the tone, behavior was normal; with the tone, desire exploded into intense transient peaks. Berridge describes this as "mountains of desire resting on a plateau."

In *Genshin Impact*, the "Event Banners" (JCOMA 2025; Komad 2024) function precisely as these cues, activating dopaminergic "Wanting". The character art, the red notification, and the countdown timer are triggers that, in a game-sensitized brain, fire these irrational spikes of motivation. With repeated exposure, this system can become "sensitized" (Linnet 2014; Robinson & Berridge 2025), leading to a "pathological 'wanting'" where the desire to seek surpasses the expected pleasure of the reward—the neurological basis of compulsion (Berridge 2009).

Second, the behavioral evidence identifies the mechanism of reward delivery. We revisit B.F. Skinner's foundational work on operant conditioning to identify the exact psychological mechanism used to train this 'Wanting' system. We focus specifically on the distinction between continuous and intermittent reinforcement. The gacha system is a textbook implementation of B.F. Skinner's "Variable-Ratio (VR) Schedule" (Komad 2024; JCOMA 2025; Wu & Singh 2023; FTC 2024). A VR schedule, which provides reinforcement after an unpredictable number of responses, is the most potent psychological mechanism known.

Skinner's research (Ferster & Skinner 1957) discovered that VR produces (a) the highest, most stable rate of response and (b) the greatest resistance to extinction (Lim 2024; McLeod 2023). It is, by definition, the schedule most resistant to extinction (Lim 2024). The "pity system" of *Genshin Impact* (Anunpattana, Khalid, & Iida 2025) acts as a superimposed "Fixed-Ratio (FR) Schedule," which prevents total extinction and exploits the sunk cost fallacy (Yuan 2024), further locking the player into the loop.

In this context, players perform wishes using Primogems or Fates, primarily to obtain five-star items. However, each wish has a very low base probability of generating a five-star result. Yet, repeated failure does not stop the behavior, as the absence of reward does not signal failure, but merely delay. As discussed, intermittent reinforcement produces greater resistance to extinction and a higher number of responses (Skinner, 1938). In Skinner's framework, extinction refers to the gradual reduction and eventual disappearance of a learned behavior when reinforcement is no longer provided; it is marked by a decline in response frequency, rather than forgetting or unlearning (Skinner, 1953). Therefore, the response rate can be spiked once more with the introduction of a new reinforcer (such as a new five-star item).

The contribution of this analysis for GachaCon is to reframe the debate on retention and monetization. The industry discussion, often focused on "fun" (the 'Liking'), is looking at the wrong metric. The core gacha design loop is not optimized for pleasure; it is optimized for motivation.

The "Variable-Ratio Schedule" (the gacha) is the behavioral mechanism (Part II) that activates and "sensitizes" the neurological "Wanting" system (Part I). The result is the manufacture of a "pathological 'wanting'" (Linnet 2014), a compulsive desire to make the next 'pull' that is neurologically independent of the 'liking' for the item eventually won (Berridge & Robinson 2016; Berridge 2009). For developers, regulators, and researchers, this is critical: The success of *Genshin Impact* demonstrates a retention model based not on player pleasure, but on the engineering of a self-perpetuating

neurological desire, rooted in the vast anatomy of dopamine and triggered by carefully designed visual cues.

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BIO

Thiago Santos is a multidisciplinary designer with a Bachelor's degree in Design and experience across UX/UI, Game Design, product strategy, and front-end development. He has worked on mobile apps, SaaS platforms, AR games, and game jam projects, including the award-winning *Dungeon's Flavours*. With over three years of professional experience, he has contributed as Product Owner, UX/UI Designer, and Game Designer, creating interfaces, systems, and player experiences focused on usability and business impact. Thiago combines design, programming, and strategic thinking to deliver user-centered solutions, while actively pursuing growth in UX for games, interactive media, and digital product development.

Daniel Leite Costa holds a PhD in Design (UFPE), a Master's and Bachelor's in Design (UFCG), and a specialization in Higher Education Methodologies. He is Professor and Coordinator of the Digital Games and Digital Graphic Design programs at UniFacisa, Collaborating Professor in the PPGDesign Master's (UFCG), Lead UI/UX Designer at Kokku Games, and a member of DiGRA, IGDA, and APGames. With over 15 years of experience, he works across design, teaching, and research with a focus on UI/UX for games and software, delivering projects across platforms and contributing to academic production, mentoring, and leadership in design and game development.

Livia Scienza is a Psychologist, Master in Cognitive and Behavioral Psychology and PhD Candidate in Cognitive and Social Processes at Universidade Federal de São Carlos. With more than 11 years of experience with Games, User Experience and Game Design, Livia has worked as a consultant for innumerous indie game studios, also working as speaker, science communicator and Academic. She has hosted events such as Maré das Minas and game jams such as Easy Game Jam. After contributing to the dissemination of knowledge regarding Psychology and Games, Livia now holds a position as Specialist Game User Researcher at Garena Free Fire.