Rolling the Dice: Understanding the Role of Game Design Elements in Gacha Game Addiction*

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Abstract

The success of new video games brings advantages, such as entertainment, cognitive stimulation, and social interaction, and disadvantages, such as addiction and dependency, and associated psychological, social, and health risks. Many studies have explored this topic, but researchers have yet to thoroughly examine how certain game design elements influence video game addiction. To address this issue, we used a mixed-method design focusing on the novel and emerging Gacha game genre. In Study 1, we identified seven relevant design elements. Based on this, we surveyed Gacha players (N=143) using an online questionnaire in Study 2. Our results showed that only the two design elements of progress and avatar contribute to video game addiction. These findings provide valuable insights into how video game design can balance an engaging gaming experience with the risks of addiction, ultimately promoting more inclusive and safer virtual environments.

Keywords

Gacha games, Video game addiction, Gamification, Game elements, Mixed-methods,

1. Introduction

Just over ten years ago, in 2013, the American Psychiatric Association (APA) decided to list Gaming Disorders as a disorder requiring further investigation for the first time [1]. Following this assessment, the World Health Organization (WHO) officially classified gaming disorder in the 11th revision of the International Classification of Diseases (ICD-11) in 2022 due to its negative impact on player's health and well-being [2]. These classifications reflect the growing importance of gaming disorder as a severe challenge that can impact the mental health of players and signal the need for awareness. Regarding content, gaming disorder is often described as "excessive or compulsive use of computer and video games that interfere with various life domains over a prolonged period of time" [3]. However, adopting an applied human-computer interaction (HCI) perspective in our study, we, like other researchers [4, 5, 6], prefer to use the term *video game addiction* rather than the clinical designation of *disorder*. Although video game addiction is an informal term used in everyday language to describe compulsive gaming behavior, and gaming disorder is a clinically recognized condition in ICD-11 that is diagnosed according to specific criteria by clinicians. However, both terms are used interchangeably and connected to similar negative consequences, such as social isolation, academic problems, and emotional distress.

Previous work has taken a closer look at video game addiction and provided some noteworthy findings that are helpful for a more profound understanding of the phenomenon. In particular, medicine [7, 8], psychology [9, 10, 11] and HCI research [4, 5, 6] should be mentioned here. On the one hand, previous research has already identified antecedents of video game addiction, such as the psychological factors of escapism, low self-esteem, and social isolation, as well as elements of game design including reward systems and social interaction [12, 13, 14]. On the other hand, previous research showed that video game addiction has various consequences, such as effects on mental health (e.g., anxiety and depression), physical health (e.g., sleep disorders and lack of exercise), social relationships, and financial

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stability [15, 16]. Such findings seem particularly valuable because they allow insights at the higher levels of digital engagement and entertainment. Furthermore, there are currently only sporadic but no holistic empirical attempts to determine what triggers video game addiction at the game design level, which is surprising, as such knowledge would allow for more targeted interventions and create a healthier gaming environment. A study by Sailer et al [17] showed, for example, that the motivational Self-Determination-Theory dimensions [18] competence and autonomy were influenced by the game design elements of a condition consisting of badges, leaderboards, and performance graphs. At the same time, avatars, a meaningful story, and teammates impacted social relatedness design elements in another experimental condition. However, in this study, different game design elements were selectively combined into two experimental conditions not allowing to explore the influence of a disjunctive feature . This significantly limits the reliability of the results and indicates the need to broaden the scope of the game design level.

To address this research gap, we propose a two-part mixed-methods study conducted with players of Gacha games that seem to be particularly prone to addictive behavior and a particularly suitable context to understand corresponding relationships better [19, 20]. In these mostly mobile games, players spend in-game currency, which can often be purchased with real money, to receive randomized virtual items or characters, much like a capsule-toy vending machine [21].We pick Gacha games as the context because they exemplify core gamification principles, such as reward systems and player engagement mechanics, while also being closely associated with behaviors linked to video game addiction (e.g., randomness), making them a particularly suitable context for examining these phenomena.To cover a wide range of potential game design elements and overcome existing blind sports of empirical research, we use a holistic gamification toolkit as a framework [22, 23] to understand better the connection between game design and video game addiction. In the first part (Study 1), we identify relevant game design elements in the context of Gacha games using a two-stage qualitative selection process based on previous literature and expert opinions. We then use a survey (Study 2) to examine the relationships between the identified list of relevant game design elements as predictors of video game addiction. Our results will comprehensively list game elements that trigger video game addiction. To summarize, the following research question guides our study:

- ***Research Question 1:*** *Which game design elements are relevant in Gacha games?*
- ***Research Question 2:*** *Which game design elements in Gacha games are associated with video game addiction?*

Overall, our study contributes to a more profound understanding of the intersection between how individuals use technology and how that technology should be designed to meet human needs. Specifically, our findings promise added value at the theoretical and practical levels for human-centered technology design by showing which game design elements determine gaming addiction in Gacha games. These results are particularly interesting for educating players at a young age about which game design elements to be cautious with, which would be insights that could also be interesting for lawmakers. We hope that our results will support ongoing efforts to create inclusive and safe virtual environments for people from a variety of backgrounds.

2. Background

In this section, we describe the background of our study. To this end, we inform about the context of our study Gacha games (Section 2.1), video game addiction (Section 2.2), and video game design (Section 2.3).

2.1. Gacha Games

A Gacha game is a video game that incorporates mechanics similar to gachapon (capsule-toy vending machines), where players spend in-game currency—earned through gameplay or purchased with real money—to receive random virtual items. These games, often free-to-play mobile role-playing games,

have become integral to Japanese mobile gaming culture and are increasingly popular in Chinese, Korean, European, and American markets. While they encourage team building and player improvisation, Gacha games have faced criticism for their addictive nature and similarities to gambling due to the chance-based rewards system [24].

Originating in Japan, Gacha games (such as Genshin Impact [25] or Honkai Impact 3 [26]) have been popular in Europe and North America for several years [27, 28]. They are unique among video games because they allow the acquisition of items at random (so called “gacha pulls”) that implement the mechanics of gachapon machines (e.g., describing machines that dispense small, collectible toys or items in a capsule, typically in a random or "blind box" manner, where users do not know which specific item they will receive until after the purchase), which, along with unique gameplay, regular game updates and social elements, keeps players motivated and connected [29]. Most Gacha games are also free-to-play (F2P) mobile games that can be played on a cell phone and downloaded for free. Like loot boxes, Gacha games entice players to spend in-game currency to obtain a random in-game item [19]). Part of the in-game currency can usually be earned by playing the game, and another part by purchasing it with real money from the game’s publisher [30]. Gacha games create a highly engaging and profitable game model by combining collecting-oriented gameplay with the randomization principle.

Due to their inherent characteristics, previous research has already drawn attention to the fact that Gacha games are psychologically designed to have a high potential for video game addiction, as they contain design elements such as loot boxes, microtransactions, and reward systems that link them to the principle of chance so that they can lead to addictive behavior [20, 29]. The use of variable rewards, where players receive unpredictable rewards, motivates players and makes them curious about the next big win, which is why the spending and buying behavior of players and the associated problematic social nature of the games have already been the subject of further research in the past [31, 32, 21]. In addition, free availability increases the attractiveness of the games and can make it more difficult to control gaming habits. Gacha games have also been shown to be used as a psychological coping mechanism for stress and anxiety [24]. In response to this, first studies have already been conducted dealing with Gacha games and addiction. Tang et al. (2022) surveyed Chinese young adults and found that Gacha spending and time spent in-game were linked to problem gambling, stress, and anxiety [24]. Lakic et al. (2023) further highlighted that long-term players spend more money because they are afraid of missing out due to items that are only available temporarily and at certain events, and emotional states such as the feeling of loneliness among players [20]. These studies collectively underscore how Gacha mechanics and psychological factors can fuel addictive behaviors. In summary, Gacha games are an emerging video game genre with unique characteristics that make it prone to problematic gaming behavior. However, which specific design elements influence potentially problematic gaming behavior is still unclear.

2.2. Video Game Addiction

Video game addiction has been proposed as a diagnostic entity and studied for over a decade. To better understand the phenomenon, we turn to two relevant medical classifications. In this context, the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) of the American Psychiatric Association (APA) and the International Classification of Diseases (ICD-11) of the World Health Organisation (WHO) are of fundamental importance.

In 2013, the American Psychiatric Association (APA) introduced nine criteria in its DSM-5 to characterize “Internet Gaming Disorder” [33, 34]. The criteria include aspects such as preoccupation with gaming, withdrawal symptoms when not gaming, the need to game more to achieve the same level of arousal, difficulty reducing gaming time despite a conflicting desire to give up other activities, gaming despite negative consequences. There is also the possibility that those affected hide their gaming habits, use gaming to escape negative emotions, and risk meaningful relationships or opportunities through excessive gaming [35]. The criteria presented illustrate how playing video games can develop from a leisure activity into harmful and potentially harmful behavior. In 2019, the phenomenon of video game addiction was also recognized by the WHO’s International Classification of Diseases (ICD-11) and

defined by three main characteristics: (1) limited control over gaming, (2) increasing priority of gaming over other activities, and (3) continued gaming despite negative consequences [36]. This categorization aligns with the concerns of HCI researchers who have been studying video game addiction since the 1990s when video games became a dominant form of entertainment. While the benefits of gaming, such as stress relief, cognitive enhancement and social networking opportunities, are well documented, the potential for video game addiction poses a significant risk.

Video game addiction are a particularly relevant dependent variable in HCI research because we, as HCI researchers, create interactive systems (e.g., games) and have an ethical responsibility to consider how they impact gamers' well-being and mental health [37]. By investigating how game mechanics and interface elements contribute to addictive behavior, HCI can support the development of human-centered designs that promote healthier player engagement. This research helps to identify harmful patterns of interaction, such as compulsive feedback loops (i.e., a cycle of behaviors that result in rewards, thereby reinforcing those behaviors [19]). It can be used as part of the development of interventions such as self-regulation tools or usage reminders. It also provides insights into how video game design influences player behavior and perception, supporting the development of systems that balance usability, safety, and societal well-being.

2.3. Game Design Elements

In recent years, various concepts of technology and game design have become the focus of HCI research and have become influential tools to better understand the motivation of individual player. One of these concepts is the gamification toolbox, which means nothing more than using specific design mechanisms and elements that are influenced by game experiences and can steer players' behavior and attitudes in certain desired directions [38, 22, 39, 40]. For our work, we follow the definition of Hamari et al. [41], according to which gamification is a process in which services are enriched with (motivating) affordances to elicit playful experiences and other behavioral outcomes of a gamified system (in our case, Gacha games) [41] We use the gamification concept, traditionally applied in non-game contexts, in the game itself to increase player engagement and motivation through elements and mechanisms such as rewards, progress monitoring and challenges.

Game design elements are also generally categorized into three motivational categories: achievement-related game design elements, immersion-related game design elements, and social-related game design elements [42, 43, 44, 45]. Table 1 defines these dimensions and highlights exemplary elements for each dimension [22]. Much of the literature on game design elements has used this three-dimensional structure to categorize game elements [46, 47, 48, 49, 50].

Previous work has already shown that gamification has both a positive side by increasing user engagement, with influences on education, health, and marketing [51, 43, 52], and a negative side with aspects that can lead to negative consequences such as unwanted competition or addiction [53]. In addition, our approach of using the gamification toolbox as a structuring element has already proven its added value in the context of commercially successful video games [23]. However, Gacha games rely on a chance-based mechanic where players spend in-game currency to obtain random virtual items or characters. In contrast, location-based games utilize real-world geography and encourage players to move around and interact with their physical environment to progress in the game.

Table 1
Game design dimensions

Dimension	Definition	Exemplary elements
Achievement	Elements that primarily aim to strengthen the player's sense of achievement and success	Challenges, progression
Social	Elements are primarily designed to facilitate and enhance user interaction within the game community	Customization
Immersion	Elements related to interactive experiences that deeply engage and absorb the player and encourage independent exploration	Avatars, in-game rewards

In our study, we attempt to test the influence of the game elements on video game addiction in the context of Gacha games. Specifically, we postulate the following three hypotheses, whereby we assume in each case that the perceived importance of the motivational dimension (through the increased engagement) positively influences video game addiction. Specifically, we postulate:

Hypothesis 1: Achievement-related game design elements influence video game addiction.
Hypothesis 2: Social-related game design elements influence video game addiction.
Hypothesis 3: Immersion-related game design elements influence video game addiction.

3. Mixed-Methods Approach

To better understand the relationship between game design elements and video game addiction, we used an exploratory sequential mixed-methods design utilized recently in HCI research (e.g., [23]). First, in Study 1, we identify and reduce a rich list of game design elements in a data-driven manner to identify relevant design elements in the context of Gacha games. Following this, we explore the influences of the identified relevant game design elements from Study 1, testing our hypotheses in Study 2. Figure Figure 1 summarizes our mixed-methods design.

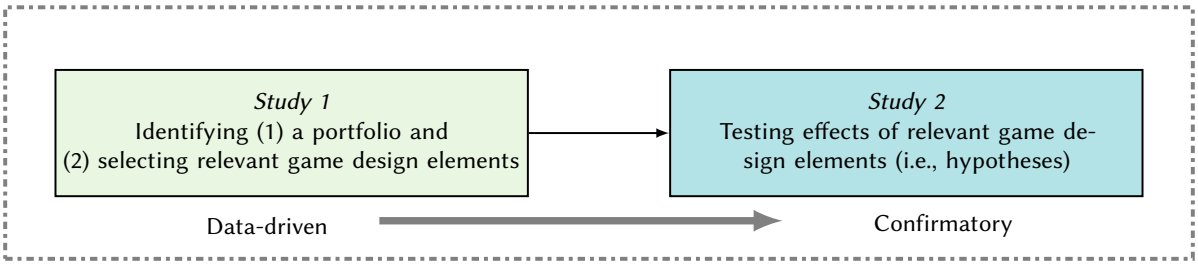

Figure 1: A description of the mixed-methods procedure in this study.

4. Study 1: Identifying relevant design elements

To identify relevant design elements in the context of Gacha games, we illustrate our approach in the following two subsections 4.1 Methodology and 4.2 Results.

4.1. Methodology

In the subsequent Sections, we elaborate on 4.1.1 Data Analysis and Procedure, and the 4.1.2 Data Collection and Participants that built the methodological framework of our Study 1.

4.1.1. Data Analysis and Procedure

We followed a two-step procedure combining a literature review and assessments of experienced Gacha players to identify relevant game design elements. First, we searched the literature for a study with an extensive portfolio of design elements (Step 1). In the second step, we used the identified portfolio of game design elements, presented them to four experienced Gacha players, and asked them to assess its relevance by rating all design elements as "not important" or "important". Based on this rating, we shortened the list of design elements and excluded all non-important design elements.

4.1.2. Data Collection and Participants

When conducting Step 2 of our Study 1, we recruited four long-time Gacha players over Reddit with extensive experience in the importance of Gacha gaming experience. The participants were between 27 and 37 years old, played Gacha games on average between one and three hours a day, and that both identified genders were represented in equal numbers.

4.2. Results

In the following, we illustrate identifying relevant design elements based on the two-step approach described in Sections 4.2.1 and 4.2.2.

4.2.1. Step 1: Finding a portfolio of design elements

Based on a literature search that screened reviews on design elements, we identified a study by Koivisto and Hamari [22] that included a portfolio of 46 design elements that seemed suitable for our study. The list consisted of (a) ten performance-oriented affordances (i.e., points, challenges, badges, leaderboards, levels, performance statistics, progress, quizzes, timers, and increasing difficulty), (b) seven social-oriented affordances (i.e., social network elements, cooperation, competition, peer rating, customization, multiplayer, and collective voting), (c) five immersion-oriented affordances (i.e., avatar, narrative, virtual avatar, narrative, virtual world, in-game rewards, and role-playing), (d) eight real-world related affordances (i.e., financial rewards, check-ins, movement tracking, cards, physical game boards, (e) real-world interactive affordances, physical objects, and dice), and (f) sixteen miscellaneous affordances (i.e., board games, virtual helpers, virtual currency, reminders, retries, onboarding, adaptive difficulty, game rounds, warnings, penalties, game slogans, funny movies, virtual pets, trading, making suggestions and virtual objects as AR).

4.2.2. Step 2: Identification of game design elements relevant in Gacha Games

Based on the initial portfolio of 46 game design elements, we selected the elements all four players agreed were important in the game. Only in two cases did different answers occur. We clarified these in a joint discussion round, so there were no more disagreements. We then shortened the list to seven design elements by excluding 39 from the original portfolio. Table 2 illustrates the game design elements.

Table 2
Descriptive statistics of the game design elements

Variable	*Motivation*	*N*	*Min*	*Max*	*M*	*SD*
Challenges (e.g., daily quests to test your skills)	Achievement	143	1	4	3.19	.730
Progress (e.g., leveling up of characters for better rewards)	Achievement	143	1	4	2.95	.762
Customization (e.g., design unique outfits for characters)	Social	143	1	4	2.79	.738
Avatar (e.g., create a personalized in-game character)	Immersion	143	1	4	2.80	.851
Narrative (e.g., uncover secrets through immersive story-line)	Immersion	143	1	4	3.31	.772
In-game rewards (e.g., collect rare items from event bonuses)	Immersion	143	1	4	3.38	.668
On-boarding (e.g., tutorial guides you through initial gameplay)	Miscellaneous	143	1	4	2.66	.758

5. Study 2: Analyzing Relationships

To test the relationships between the identified relevant game design elements and video game addiction, we illustrate relevant information in the following Sections 5.1 Methodology and 5.3 Results.

5.1. Methodology

Subsequently, we illustrate relevant information related to the methodology of Study 2 illustrating Data Analysis and Procedure in Section 5.1.1, Data Collection and Participants in Section 5.1.2, and Measurements in Section 5.1.3.

5.1.1. Data Analysis and Procedure

To analyze the relationships between the identified list of relevant game design elements and video game addiction, we used a cross-sectional survey collecting self-reported data from Gacha players. Subsequently, we analyzed the data with covariance-based statistics (i.e., regression analyses) and widespread software applications (i.e., SPSS 28).

About the procedure, we started by introducing participants to the topic and objectives of our study, followed by obtaining their informed consent for the storage and use of their data. Afterward, we asked participants to specify their favorite Gacha game, providing them an open text field. We used this variable as a filter in all items in the legal course of the questionnaire to ensure the semantic fit of the items to the player preferences. In the main content of the questionnaire, participants were sequentially presented with questions about design elements and items related to video game addiction. Subsequently, we collected demographic information (age, gender, education) and control variables (frequency of play, duration of play) to control our results from potential confounds. To ensure validity, we asked participants several attention-check questions (e.g., "Please multiply 2 by 2 and pick the corresponding number"). Finally, participants were thanked for their time and provided contact information in case they had further questions or concerns.

5.1.2. Data Collection and Participants

To test the relationships between design elements, and video game addiction, we collected data from 154 Gacha players. For this, we used a snowball sampling strategy that consisted of distributing the link to our survey with the support of (a) relevant Reddit forums, (b) X-accounts of long-time Gacha players, and (c) suitable Discord forums (e.g., in each case we asked for the link to our survey to be passed on). After cleaning the data and excluding cases with missing data and nonsensical answers, the final sample consisted of 143 participants. As an incentive to participate in our study, each participant was given a chance to win one of three €20 vouchers for the (European) Google Play Store, whereby the three winners were drawn after the data collection was finished.

In terms of participant characteristics, participants primarily played either 30% (43) Genshi Impact or 21% (30) Honkai Star Rail. 66% of participants identified as male (95), followed by 27% who identified as female (30), 6% (8) gave non-binary as their identification, and 1% (1) gave other as their identified gender. In addition, 66% of participants were between 20 and 29 years old, and 62% had (at least) a bachelor's degree. Moreover, 90% (128) of participants reported playing Gacha games daily, with 52% (75) reporting doing so for between one and three hours.

5.1.3. Measurements

Following the best practices of psychometric research, we used empirically validated scales and items from previous research asking participants for their self-reported perceptions and behaviors regarding Gacha games, design elements, and video game addiction. All items used in the questionnaire are illustrated in Table 3 in the APPENDIX.

First, we referred to our list of seven relevant design elements of Study 1 (challenge, progress, customization, avatar, narrative, in-game rewards, and on-boarding). For this, we asked participants, "Please rate the importance of interacting with the design element listed below while playing [your most favorite Gatcha game]". For their responses, we provided a scale ranging from 1, "not important," to 4, "very important".

Second, in line with previous work on video game addiction [54, 55], we used a validated scale from previous research asking participants 14 different items with questions such as ´´How often do you continue to play the games, despite your intention to stop?". We provided a 5-point Likert scale ranging from 1 "never" to 5 "always" as a response scale. We calculated the mean of all 14 items to derive a tendency of video game addiction ($M = 2.85, SD = .81, \alpha = .89$) for our analyses.

5.2. Common Method Bias

One potential risk of confounding results when using self-reported data is common method bias [56]. To address this issue, we followed Harman's recommendation [57] conducting a factor analysis including all items of our independent and dependent variable, specifying a single factor for extraction. The analysis revealed that the single factor accounted for less than 50% (the single factor accounted for only 24%) of the variance, indicating that common method variance did not significantly influence the results of our study.

5.3. Results

We conducted three subsequent multiple linear regression analyses to test the influences of the identified game design elements from Study 1 regarding video game addiction. In the first analysis (model 1 presented in Section 5.3.1), we specified the identified seven relevant *game design elements* as independent variables (challenge, progress, customization, avatar, narrative, in-game rewards, and on-boarding) to explain the dependent variable *video game addiction*. Following this, in the second analysis (model 2 presented in Section 5.3.2), we added demographic variables *age*, *gender*, and *education* to control for unwanted confounds. Third (model 3 presented in Section 5.3.3), we added the two control variables *frequency of play* and *duration of play*.

5.3.1. Model 1

The first regression analysis evaluated the assumptions of linearity, autocorrelation, and multicollinearity. The scatter plots, the Durbin-Watson statistic ($DW = 1.958$), and the variance inflation factors ($VIFs \leq 1.244$) indicated no issues with these assumptions [58]. Accordingly, we assumed that our data was suitable for a regression analysis. The regression equation showed a significant result ($F(7, 135) = 2.603; p = .015$) that explained 7% of the variance of *video game addiction*. Specifically, the predictor weights of the independent variables *progress* ($\beta = -.181, p = .042$), and *avatar* ($\beta = .183, p = .042$) showed significant results (all others $p \geq .071$).

5.3.2. Model 2

In the second regression analysis, the three demographic variables, age, gender, and education, were included as additional independent variables. The scatter plots, the Durbin-Watson statistic ($DW = 1.982$), and the variance inflation factors ($VIFs \leq 1.303$) revealed no issues with the assumptions. We assumed that our data were suitable for conducting a covariance-based linear multiple regression analysis [58]. The regression equation showed a significant result ($F(10, 132) = 2.515; p = .008$) that explained 10% of the variance of *video game addiction*. Once again only the predictor weights of *progress* ($\beta = -.229, p = .012$), and *avatar* ($\beta = .183, p = .040$) played significant roles (all others $p \geq .066$).

5.3.3. Model 3

For the third regression analysis, we added the two control variables *frequency of play* and *duration of play* as additional independent variables. When checking the assumptions of linearity, autocorrelation, and multicollinearity, neither the scatter plots, the Durbin-Watson statistic ($DW = 2.283$), nor the variance inflation factors ($VIFs 1.323$) seemed to be problematic [58]. Accordingly, we assumed that

our data appeared suitable for conducting a co-variance-based linear multiple regression analysis. The regression equation showed a significant result ($F(12, 130) = 4.575; p < .001$) that explained 32% of the variance of *video game addiction*. Specifically, the predictor weights of the independent variables *progress* ($\beta = -.219, p = .010$), *avatar* ($\beta = .189, p = .023$), *frequency of play* ($\beta = .193, p = .012$), and *duration of play* ($\beta = .323, p < .001$) showed significant influences (all others $p \geq .071$).

Regarding our hypotheses, we refer to model 3, in which a differentiated picture emerged empirically. On the one hand, we found support for two of the three hypotheses, as the motivational dimensions (i) achievement (hypothesis 1 and the game design element progress, whereby we will discuss the initially counterintuitive negative influence in detail in the discussion) and (ii) immersion (hypothesis 3 and the game design element avatar) showed significant influences on *video game addiction*. In contrast, none of the social dimensions of hypothesis 2 was over-randomly relevant for a better understanding of video game addiction.

6. Discussion

In the following sections, we move into the discussion phase, addressing key findings (Section 6.1), implications for practice (Section 6.2), and implications for theory (Section 6.3), as well as limitations and outlook (Section 6.4). In doing so, we explore the broader meaning of the results in the context of the existing literature and contribute to a deeper understanding of the relationships between game design, video game addiction, and Gacha games.

6.1. Key Findings

Based on the results of our mixed-methods design, we provide empirically-based answers to our two research questions (RQ1: Which game design elements are relevant in Gacha games? and RQ2: Which game design elements in Gacha games are associated with video game addiction?). In the following, we summarize our study's key findings with two points extending the current research on Gacha games, video game addiction, and game design.

- Firstly, in Study 1, we identified a list of seven relevant game design elements in the context of Gacha games in a data-driven manner that can help to engage players more.
- Secondly, Study 2 showed that only the game design elements' progress and avatar significantly influenced video game addiction, showing a mix of positive and negative effects. They provide designers with concrete reference points while expanding knowledge about game design theories.

6.2. Implications for Practice

The results of our study provide several conclusions relevant to practice, focusing on human-centered technology design and novel feedback mechanisms. We will discuss two of them below.

First, identifying seven relevant design elements in our Study 1 offers considerable added value for the practical design of games. On this basis, it is now possible to make a suitable selection from a manageable set of empirically proven elements to develop and implement more effective concepts and strategies. Highlighting a portfolio of relevant game design elements also enables better consideration of potential user preferences to achieve desired outcomes, such as designing for player engagement [59, 60, 61] or re-use intention [43]. With targeted insights into relevant game design elements to optimize user experience and interaction, more focused and efficient design strategies are enabled.

Secondly, in our Study 2, we showed that the design elements "progress" and "avatar" influence "video game addiction". These empirical insights allow for more technologically granular insights into the causal relationships between technology and the experience of addiction [24]. On the one hand, based on these results, we found significant positive influences of the immersion element manifested by the element "avatar" on video game addiction, as postulated theoretically [41, 22]. On the other hand, we showed that the game design element "progress" can be used as a tool for healthier player retention

due to its (also for us counterintuitive) decreasing effect on "video game addiction", suggesting that progress systems can help players set boundaries for game consumption. We explain this by the fact that Gacha games incorporate the randomness mechanism as a central design feature [19], and that the use of the progression game design element, in contrast, offers clear goals and structured milestones that promote more controlled and less impulsive gameplay. For example, clear milestones can provide players with well-defined and meaningful goals, so that the game encourages them to take breaks after reaching important milestones instead of playing non-stop. In doing so, developers are empowered to take a normative stance, as demanded by research on participatory design and "Responsible Research and Innovation" (RRI) [62]. As one of its core concepts, RRI calls for a partial shift of accountability and a sense of societal needs towards innovators [63], thus developers and designers of interactive media, such as games. The randomness trait of Gacha games and alike increases the moral accountability of developers and providers, which steers their decisions and actions (i.e., game design and publishing) in a morally accepted and gratified direction. Moral accountability is established by control and an epistemic condition [64]. Both apply to the described game mechanic since providers lack control and epistemic knowledge concerning the process outcomes and consequences. In controlling the game's progress and avatar mechanics, developers can increasingly take responsibility and align with normative expectations towards gaming and its entertaining nature.

6.3. Implications for Theory

Our study's results offer several implications that significantly contribute to the theoretical level of existing research. In the following, we address two that seem particularly relevant to us.

First, identifying seven relevant design elements from an initial portfolio of 46 design elements in our Study 1 has some notable theoretical implications for understanding the theoretical framework of game design used, especially those that add value to Gacha games. Compared to similar research, the design elements of "motivational immersion" (i.e., avatar, narrative, in-game rewards) were particularly relevant, which we understand as indications of the genre characteristics of Gacha games, in the form of rich narratives, captivating visual elements, and the interactive mechanisms that immerse players deeply in the game and foster a sense of escapism [19, 31].Accordingly, we consider our empirical findings as a call to critically reflect on existing theoretical conceptualizations of gamification. We suggest refining the widespread motivational categorization into the three dimensions of achievement, immersion, and social aspects of game design features [46, 47, 41, 49] to reflect better the dynamic nature of user preferences and the contexts of gamified systems. Furthermore, identifying a core set of elements challenges the universality of game design principles. It encourages researchers to investigate how domain-specific factors influence these elements' effectiveness, a problem already identified in research [65, 66, 67]. In summary, these theoretical implications call for a more flexible and empirically grounded understanding of game design dynamics that can adapt to the complexity of specific applications.

Second, identifying (i) progress and (ii) avatar as relevant antecedents of video game addiction in our Study 2 also has several theoretical implications. First, we take this as an occasion to reevaluate the role of progress. Theoretical frameworks often suggest that progress systems help retain players by creating a sense of achievement and continuous improvement [22]. However, if the game design element progress turns out to have a diminishing effect on video game addiction, it suggests it could promote healthier gaming behavior. On a meta-level, we interpret this result as a clear sign that designers must carefully evaluate competing design elements within the specific context of their application. Additionally, we argue that progress in Gacha games acts as a regulator, with its structured nature providing players with clear boundaries or goals and enhancing their sense of control over their gaming experience. Rather than leading to compulsive behavior, progression could enable players to stop playing once they have achieved a goal, thus reducing the tendency to binge play. In summary, both empirical insights add theoretical knowledge to existing work on player motivation [68, 17] as an antecedent of detrimental outcomes.

6.4. Limitations and Outlook

Like all empirical research, our work has limitations that must be acknowledged to classify the derived empirical knowledge properly. We outline these limitations below and discuss how future research can address them to strengthen the validity of our findings. First, we recruited four long-time Gacha players over Reddit. To buffer for potential effects of selection bias, we ensure diversity across demographic variables and that the players had substantial prior experience. Additionally, we collected data using a snowballing strategy for our Study 2 that consisted of spreading the link to our survey with the support of (a) relevant Reddit forums, (b) X accounts of long-time Gacha players, and (c) appropriate Discord forums, and then raffling off several vouchers to increase motivation to participate in our survey. We chose such sampling procedures because one of the central goals of our study was to collect data from players who might be prone to addiction. Nonetheless, we recommend that future research aims to replicate our study with samples from other sources to identify possible similarities and differences following other sampling procedures [69]. Second, participants in Study 2 were allowed to self-select and self-report their responses, which has some limitations. Our study aimed to gain insights into the self-perception of the relationships between context-specific game design in Gacha games and video game addiction. Nevertheless, we encourage other researchers to experimentally test the associations found in our study in future research, for example, by including behavioral data [70]. Third, we focused only on Gacha games in general as part of our study. This was intentional; we wanted to look at an entire game genre and not a single game to avoid potential confounds. Nevertheless, we strongly encourage future research to test our results in similar contexts such as multiplayer online battle arena games, exergames, or other game genres [71, 72, 73] that incorporate unique mechanics and may present varying risks for video game addiction. Understanding such distinctions could contribute to a more comprehensive empirical picture. Fourthly, we conducted a cross-sectional study. Accordingly, we recommend future work to replicate our findings longitudinally, which would allow for possibilities of interactions in game design and video game addiction over time [74]. Employing design science methods from Information Systems in such longitudinal research may further enhance our understanding by enabling the iterative evaluation of game mechanics and their psychological impacts [75].

7. Conclusion

Based on the results of our study, we can now make an evidence-based statement about how Gacha games influence video game addiction. The context-specific identification of the mixed effects of the two-game design elements of progress and avatar offers particular added value for existing research by opening up new possibilities on a practical and theoretical level. In summary, video game addiction is more relevant today than ever before, and the results of our study point to new ways in which game design can be used to influence the unhealthy gaming behavior of players in the direction of a safer and more inclusive gaming environment.

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APPENDIX

Table 3
Wording of the items of the questionnaire

Construct	ID	Wording	Ref.
Game Elements	GF_1	Challenges, quests, missions, tasks, clear goals	[22]
	GF_2	Progress, status bars, skill trees	
	GF_3	Customization, personalization	
	GF_4	Avatar, character, virtual identity	
	GF_5	Narrative, narration, storytelling, dialogues, theme	
	GF_6	In-game rewards	
	GF_7	Onboarding, benefits for - beginners	
Video Game Addiction			[55]
	VA_1	...do you find it difficult to stop gaming?	
	VA_2	...do you continue to use the games, despite your intention to stop?	
	VA_3	...do others say you should spend less time on games?	
	VA_4	...do you prefer to game instead of spending time with others ?	
	VA_5	...do you not get enough sleep because of gaming?	
	VA_6	...do you think about gaming, even when you are not online/-playing?	
	VA_7	...do you look forward to the next time you can game?	
	VA_8	...do you think you should be gaming less often?	
	VA_9	...have you unsuccessfully tried to spend less time on gaming?	
	VA_10	...do you feel restless, frustrated, or irritated when you cannot game?	
	VA_11	...do you rush through your chores to play games?	
	VA_12	...do you neglect to do your chores because you prefer to game?	
	VA_13	...do you game because you are feeling down?	
	VA_14	...do you game to forget about problems?	