

Dark Patterns in Games: An Empirical Study of Their Harmfulness

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Abstract: Dark patterns (DPs) are manipulative design strategies that exploit players' cognitive biases, often at their expense. DP in games can negatively affect players' experiences by coercing them into unwanted behaviors, often without informed consent. While previous research has categorized DPs and explored their impacts, an empirical evaluation of their perceived harmfulness remains unexplored. This study aims to create a catalog of DP and evaluate players' perceptions of them to gather insights into how they are experienced and understood by players. We extracted DPs and their definitions from prior academic work, refining them with examples from community forums. To evaluate players' perceptions, we developed a survey to assess each DP's harmfulness, problematic nature, and prevalence. We surveyed 30 participants representing a range of gaming engagement levels. Statistical tests were conducted to compare harmfulness scores across different patterns, identifying significant differences among them. Additionally, qualitative analysis provided insights into players' experiences and perceptions, highlighting key concerns regarding specific Dark Patterns. The results provide valuable insights into players' perceptions of DPs and how they may be unaware of these patterns, aiming to raise awareness and reduce their use in game design.


1 INTRODUCTION


The design of video games often aims to create engaging and enjoyable experiences. However, not all design practices prioritize the players' best interests. A notable example is the use of Dark Patterns (DPs). According to Brignull (2010), Dark Patterns are intentional design strategies that exploit cognitive biases or manipulate users into making decisions against their best interests. Initially introduced in user interface design (Brignull, 2010), Dark Patterns have since been identified and studied in the context of video games, where their impact can be particularly pronounced (Zagal et al., 2013). These patterns can coerce players into actions that are not fully consensual, such as excessive spending, tedious gameplay, or social pressures to engage. While some argue that these mechanics are necessary for commercial success, their negative impact on players raises ethical concerns, ranging from frustration to financial harm (Zagal et al., 2013; Aagaard et al., 2022).


Although prior studies have identified and categorized Dark Patterns, their focus has often been theoretical or qualitative, with limited empirical evidence on how harmful players perceive these patterns to be (Zagal et al., 2013; Aagaard et al., 2022; Dahlan and Susanty, 2022). Furthermore, the definitions and examples of Dark Patterns in the literature need more systematization to bridge theoretical knowledge with practical applications in game design. This reveals a gap in the existing literature regarding the severity of harm caused by Dark Patterns and how players interact with them.


While previous research has categorized dark patterns and examined their ethical and psychological impacts, a comprehensive catalog tailored to games, enriched with real-world examples, and systematically analyzed for harmfulness is still lacking. To fill this gap, we developed a detailed catalog of Dark Patterns in games, categorized and supported by examples drawn from player communities. We conducted a survey to assess players' perceptions of each pattern's harmfulness, problematic nature, and prevalence. We applied statistical analyses to identify differences in harmfulness across patterns and generate rankings. Additionally, we analyzed the feedback provided by participants in open-ended questions to gain further

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insights into their perceptions.

Our findings reveal significant variations in how players perceive the harmfulness of Dark Patterns. For instance, patterns like Impersonation stood out for their controversial nature and the challenges participants faced in fully grasping their examples, highlighting the need for more transparent communication of such patterns in the industry. On the other hand, most patterns were perceived with high clarity, demonstrating the reliability of the catalog as a tool for understanding these practices. These findings underscore the nuanced impact of Dark Patterns: while some are widely recognized as harmful, others may go unnoticed despite their pervasive presence in games. This research provides a foundation for addressing the ethical implications of game design, offering insights that can guide developers in minimizing harm and fostering a more player-centered approach to design. Additionally, the rankings of harmfulness, problematic nature, and prevalence serve as a practical framework for evaluating and mitigating the use of Dark Patterns in games.

This paper is organized as follows: Section 2 presents the definition of Dark Patterns and related work; Section 3 outlines the methodology of this study; Section 4 presents the catalog of Dark Patterns, including definitions and examples of each one; Section 5 presents the quantitative and qualitative results; Section 6 delves into the implications of the results; Section 7 addresses the threats to validity and the measures taken to mitigate them; and Section 8 concludes the paper by summarizing the key findings, contributions, and directions for future work.

2 BACKGROUND

This section explores the foundational concepts of dark patterns and discusses related work. It provides readers with the essential background to understand the motivations and significance of this study.

2.1 Dark Patterns in Games

According to Brignull (2010), Dark Patterns (DPs) are deliberate design strategies implemented in user interfaces to exploit cognitive biases, guiding users toward decisions that may not align with their intentions or best interests. These manipulative techniques are often subtle, capitalizing on users' lack of information, urgency, or emotional triggers (Gray et al., 2018). Unlike user-centered design, which prioritizes enhancing user experience and satisfaction, Dark Patterns are purposefully crafted to benefit busi-

nesses at the expense of user autonomy (Mathur et al., 2019). Examples include deceptive language, hidden fees, and confusing or misled interface designs. The essence of Dark Patterns lies in their intentionality; they are not accidental flaws but carefully engineered mechanisms to achieve specific outcomes, such as increased spending, prolonged engagement, or the surrender of personal data. While their origin is rooted in e-commerce and user interface design (Gray et al., 2018), their application has expanded into various domains, including video games, where their impacts can range from frustration to significant financial harm (Zagal et al., 2013).

Zagal et al. (2013) defines dark patterns in games as systemic features designed to create negative experiences, such as frustration, coercion, or regret, often without the player's informed consent. These patterns are not accidental; they are purposefully implemented to increase player retention, engagement, or monetization, frequently at the expense of user satisfaction. In this study, we adopted the three primary categories of Dark Patterns in games as defined by Zagal et al. (2013):

- **Temporal Dark Patterns in Games:** manipulate players' time, often requiring repetitive tasks or specific schedules to progress.
- **Monetary Dark Patterns in Games:** exploit players' financial investments through mechanisms such as microtransactions or loot boxes.
- **Social Capital Dark Patterns in Games:** leverage social relationships, sometimes coercively, to encourage engagement.

Dark patterns in games are particularly controversial due to their intersection of entertainment and exploitation (Zagal et al., 2013). While some mechanics may enhance gameplay when used ethically, their misuse can lead to significant negative consequences for players, such as financial loss, addiction, or reduced autonomy (Aagaard et al., 2022).

2.2 Related Work

Beyond games, dark patterns have been extensively documented in other domains. Brignull (2010) highlighted their presence in e-commerce, where manipulative designs nudge users toward undesired purchases. Gray et al. (2018) analyzed dark patterns in social media platforms, showing how they encourage data sharing and prolonged engagement. In mobile applications, Greenberg and Pashang (2020) identified patterns that leverage persistent notifications and gamification to retain users. Additionally, Mathur et al. (2019) revealed how health apps exploit user

anxiety to extract sensitive information, while McCoy and Luger (2020) described the use of autoplay and cancellation barriers in streaming services to increase consumption.

The ethical concerns surrounding dark patterns in games have garnered increasing attention in Human-Computer Interaction (HCI) and game design research. Zagal et al. (2013) laid the groundwork for understanding dark patterns in games by categorizing them and exploring their ethical implications. They argue that these patterns intentionally create negative experiences, often to maximize profits. This work has been instrumental in framing discussions about the trade-offs between player satisfaction and developer goals. Aagaard et al. (2022) examined how dark patterns are implemented in mobile games and their effects on players and industry professionals. Their findings highlight the complexity of ethical game design, noting that dark patterns often emerge from industry pressures rather than overt malicious intent. They advocate for more transparent and player-centered design practices to mitigate harm.

Dahlan and Susanty (2022) identified prevalent dark patterns in casual mobile games using heuristic evaluation. Their quantitative approach provides insights into the severity and frequency of patterns such as Grinding and Pay to Skip. This research offers a framework for evaluating dark patterns and highlights their potential harm to player experiences. Flankkumäki and Söderholm (2020) investigated the impact of dark patterns on user desirability in Candy Crush Saga. Their research highlights how specific manipulative design patterns influence players' engagement and decisions to continue or quit the game. Through a user experience survey, they identified that temporal and monetary dark patterns, such as time-limited boosters and excessive difficulty without in-game purchases, significantly decrease the game's perceived enjoyment. Hodent and Others (2024) explore ethical concerns in the gaming industry, highlighting issues such as dark patterns, microtransactions, gambling-like mechanics, and exploitative design choices. Their work provides an evidence-based perspective on safeguarding players and developers from manipulative and harmful game design practices. This aligns with our research focus on dark patterns in games, reinforcing the need for systematic evaluations of their harmfulness and prevalence from a player-centered perspective.

Together, these studies underline the growing need for ethical guidelines and countermeasures to reduce the occurrence of dark patterns in games. Despite these efforts, a significant gap remains in cataloging dark patterns systematically and assessing

their impact quantitatively, particularly from the players' perspective. This study addresses this gap by presenting a comprehensive catalog of game dark patterns, their categorizations, and an empirical evaluation of their perceived harmfulness and prevalence.

3 METHODOLOGY

Figure 1 illustrates the process of creating the catalog of dark patterns in games and evaluating them through an empirical study. The process began with a literature review to search for papers listing dark patterns in games. The next step involved gathering real-world examples from community discussions on Reddit forums and Discord groups. By combining the definitions of dark patterns with these real-world examples, we developed our catalog of Dark Patterns in Games. We then designed a survey to evaluate each dark pattern's definitions, examples, and perceived harmfulness. We conducted a pilot study to refine and assess the survey instruments. The survey included closed-ended and open-ended questions, providing the data for subsequent analyses. The quantitative analysis measured the harmfulness of each dark pattern and generated rankings based on their harmfulness, prevalence, and problematic nature. Finally, a qualitative analysis of the open-ended responses highlighted participant quotes and identified the most cited games associated with these patterns.

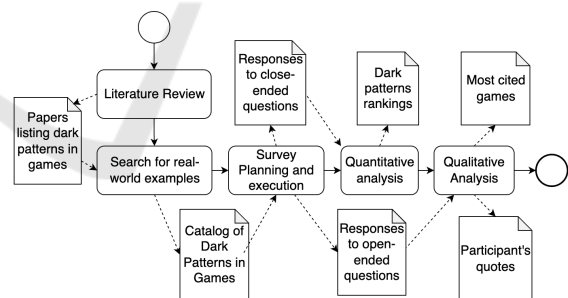


Figure 1: Diagram illustrating the methodology of this study.

This study aims to catalog dark patterns in games and quantitatively measure their perceived harmfulness. The dark patterns included in the catalog were identified based on the works of Zagal et al. (2013); Aagaard et al. (2022); Dahlan and Susanty (2022). We primarily adapted definitions from Zagal et al. (2013), as their work provides foundational insights into dark patterns in game design. Aagaard et al. (2022) contributed to understanding how dark patterns operate in mobile games and the tension between engagement and manipulation, enriching the

contextual scope of our catalog. Dahlan and Susanty (2022) provided a framework for identifying patterns in casual mobile games, guiding the selection of patterns most relevant to player experiences. We gathered real-world examples for each pattern through research in community discussions across online forums, such as Reddit¹, and gaming-focused Discord groups. This process involved carefully identifying and analyzing relevant conversations to extract illustrative examples. We choose these examples for their clarity and ability to demonstrate each Dark Pattern, enriching the catalog by grounding it in authentic player experiences. This step validated the patterns and ensured the catalog reflects the diverse ways these Dark Patterns manifest in real gaming scenarios.

We designed a survey to collect participants' perceptions to evaluate dark patterns' prevalence, harmfulness, and problematic nature. To enhance clarity and conciseness in question formulation, we considered the principles outlined by Kitchenham and Pfleeger (2008) as a reference for survey design. We conducted a pilot study with two participants to evaluate the catalog and the questionnaire. Feedback highlighted two main issues: the definitions of the dark patterns were overly lengthy, and the examples provided needed to be adequately illustrative. Based on this feedback, we simplified the definitions, polished the questions, and refined the examples to enhance clarity and relevance. Additionally, three researchers reviewed the revised survey to ensure consistency and comprehensibility before finalizing it. The final version incorporated these refinements to improve participant understanding. We used convenience sampling and referral-chain methods (Babbie, 2014) to recruit participants, reach out to players, and share the online survey link in gaming forums and Discord channels to ensure a diverse yet accessible sample.

We divided the survey into three sections, combining closed-ended and open-ended questions to quantify participants' perceptions of harmfulness, problematic nature, and prevalence of the identified Dark Patterns. Additionally, we included a consent form, ensuring participants provided informed consent to participate voluntarily. We assured participants anonymity, and all data collected was anonymized to maintain privacy and foster honest feedback.

The first section aimed to characterize participants by gathering information about their gaming habits, such as the time spent gaming per week and the types of games they play. We asked the following questions to help contextualize the feedback provided and ensured that the sample includes a diverse representation of players, enhancing the study's generalizability:

1. How many hours per week do you spend playing games?
 - (a) Less than 5 hours
 - (b) Between 5 and 10 hours
 - (c) Between 10 and 20 hours
 - (d) Between 20 and 30 hours
 - (e) More than 30 hours
2. What genres of games do you usually play? (multiple-choice)
 - (a) MOBA (Multiplayer Online Battle Arena)
 - (b) FPS (First Person Shooter)
 - (c) Battle Royale
 - (d) Action/Adventure
 - (e) Sports Games
 - (f) Single Player RPG (Role Playing Game)
 - (g) Fighting Games
 - (h) Racing Games
 - (i) Others (open-ended)

The second section focused on validating each of the 13 dark patterns in the catalog. We asked the participants to evaluate each Dark Pattern based on its clarity, harmfulness, and real-world presence. We used a 10-point Likert scale (Likert, 1932) ranging from 'Not Harmful' to 'Very Harmful' for the question 'How harmful do you think this dark pattern is?'. This choice was guided by established practices in empirical software engineering, as discussed by Wohlin et al. (2012), who recommend the systematic use of quantitative scales to capture nuanced participant feedback while maintaining statistical rigor. This scale improves sensitivity in measuring subjective evaluations, as outlined in evidence-based software engineering practices (Kitchenham and Pfleeger, 2008). Additionally, this section included open-ended questions, allowing participants to provide detailed insights. The following questions composed the second section of the survey:

1. Is the definition and example of Grinding clearly stated? (Yes/No)
2. If not, what is unclear?
3. Considering the provided definition, do you consider this issue to be a problem? (Yes/No)
4. If you'd like to justify, why do you think so?
5. Have you noticed this dark pattern in any game? (Yes/No)
6. If yes, in which game?
7. How harmful do you think this dark pattern is? (1 – Not Harmful / 10 – Very Harmful)

¹<https://www.reddit.com/>

The third section allowed participants to share their insights and experiences. This section aimed to capture qualitative data that could supplement the quantitative findings, though the primary focus of the analysis was on statistical evaluations. The following questions were presented to the participants in this section of the survey:

1. Do you agree that a forum-like website, where players could vote on games that use these patterns in their development, would help reduce their usage by companies? (Yes, I agree/No, I disagree)
2. If you'd like to justify, why do you think so?
3. How would you feel knowing, before playing a game, that the company responsible frequently uses these patterns in the development of their other games?
4. How can this catalog be used to reduce the occurrence of the listed Dark Patterns?
5. Do you have any suggestions to improve the Dark Patterns in Games catalog?

We used descriptive statistics, including mean, mode, median, and standard deviation, to summarize participant responses to the question 'How harmful do you think this dark pattern is?'. We conducted a series of statistical tests to test the hypothesis regarding differences in perceived harmfulness among dark patterns. Initially, we employed the Shapiro-Wilk test (Shapiro and Wilk, 1965) to assess whether the score samples for each pattern followed a normal distribution. Since data significantly deviated from normality, we chose non-parametric tests for further analysis. To examine differences in perceived harmfulness among dark patterns, we utilized the Kruskal-Wallis test (Kruskal and Wallis, 1952). To compare pairs of distributions, we applied Dunn's post-hoc test (Dunn, 1964). Ultimately, we generated three rankings of Dark Patterns to highlight the most and the least harmful, problematic, and prevalent ones.

Finally, we analyzed the open-ended responses to gain further insights into participants' perceptions of each dark pattern. It complemented the quantitative findings and provided additional context for understanding how players experience them. Additionally, we could identify the games with the most dark patterns perceived by participants.

4 CATALOG OF DARK PATTERNS IN GAMES

This section presents the catalog of Dark Patterns evaluated in the survey. Each dark pattern includes its name, category, definition, and real game examples.

4.1 Grinding

Category: Temporal Dark Patterns

Definition: Grinding refers to any repetitive and tedious activity required to achieve a goal in a game. It is typically used when no more convenient methods of progression are available. This approach often coerces players to spend significantly more time than initially intended.

Example: In role-playing games (RPGs) like *Black Desert Online* (Abyss, 2015), players must defeat monsters to earn in-game currency and items. As players progress, they realize they must dedicate more time to keep up with others, creating an endless cycle as the game is frequently updated with new content.

4.2 Playing by Appointment

Category: Temporal Dark Patterns

Definition: Playing by Appointment occurs when a game requires players to log in at specific times to achieve objectives, penalizing those who miss these designated times. This mechanic pushes players to adjust their routines around the game. Without penalties for missing these times, this becomes a non-issue.

Example: In online games, events may happen at set times, such as 8:00 a.m. and 6:00 p.m., and missing out means forfeiting valuable rewards, leading players to adjust their schedules. However, this issue is mitigated in games where these rewards can be obtained later.

4.3 Endowed Progress

Category: Temporal Dark Patterns

Definition: This pattern refers to a misleading sense of progression ceded to encourage players to continue playing beyond their initial intent. The initial advancement is often much faster than the progression required in later stages, forming a dark pattern.

Example: In a game with a battle pass, the first few levels are easy to achieve, creating a sense of progress. However, subsequent levels require much more time, coercing players to keep playing based on their initial progress, even if it demands more time than planned.

4.4 Fear of Missing out

Category: Temporal Dark Patterns

Definition: Fear of Missing Out (F.O.M.O.) is used in games through daily login rewards, battle passes, frequent updates, and surprise events with exclusive items. This mechanic pressures players to regularly check for updates to ensure they get all the potential rewards. The randomness and frequency of these events increase player anxiety, aggravating this dark pattern.

Example: In Final Fantasy XIV (Enix, 2010), surprise events can occur at any time, offering rare items available only for a few hours upon defeating certain enemies. The unpredictability and frequency of these updates lead players to remain vigilant and anxious about missing any opportunity.

4.5 Pay to Skip

Category: Monetary Dark Patterns

Definition: This pattern persuades players to spend money to overcome challenging stages, easing progression after payment. This creates the illusion that paying is worthwhile; however, new levels eventually require more payments, resulting in frustration and more significant expenses than anticipated. Pay to Skip is often linked to Grinding, where players pay to avoid repetitive tasks.

Example: A player encounters a difficult stage and buys an item to advance. The following levels become easier, but soon, another challenging stage appears, prompting more spending and creating a cycle of unexpected costs.

4.6 Loot Boxes

Category: Monetary Dark Patterns

Definition: Loot Boxes are randomized item containers, available through gameplay or real money. The problem lies in the lack of transparency about the odds of obtaining rare items, often hidden or difficult to access. Some countries, like China and South Korea, require companies to disclose these probabilities and set daily purchase limits (Gach, 2018), but this has yet to be a global standard, leading players to spend more than they intended.

Example: A player purchases a loot box hoping for a rare weapon but receives only common items. Unaware of the true odds, they continue buying boxes, spending far more than they initially planned.

4.7 Invested Value

Category: Monetary Dark Patterns

Definition: This pattern exploits the Sunk Cost Fallacy (Arkes and Blumer, 1985), making players feel compelled to continue playing due to the time or money they have already invested. The problem arises when games continually extend goals, making players feel that quitting would waste their past investments.

Example: In games like World of Warcraft (Entertainment, 2004), players invest years completing objectives. With each new paid expansion, more goals are added, compelling players to keep playing to avoid wasting their invested time and money.

4.8 Pay Wall

Category: Monetary Dark Patterns

Definition: This pattern imposes a cost for full participation in the game. Although payment is optional, non-paying players experience a limited game or a competitive disadvantage. This pay wall is often subtle and unexpected, creating frustration and pressure to spend money and forming a dark pattern.

Example: A player starts a free game but soon realizes important areas, characters, or items are locked behind a pay wall. Their experience is limited without payment, and in competitive games, they cannot fairly compete with paying players.

4.9 Pre-Delivered Content

Category: Monetary Dark Patterns

Definition: This pattern occurs when a game is marketed as complete but contains locked content that requires additional payment to access. These locked features, already present in the game from the start, are disguised as downloadable content (DLCs), deceiving players who thought they purchased the entire game.

Example: Fighting games like Mortal Kombat (Games, 1992) are sold as complete, but many characters and maps are only accessible through extra payment. These features were part of the game from launch, leaving players feeling they bought an incomplete game and forcing them to pay more to access everything.

4.10 Monetized Rivalries

Category: Monetary Dark Patterns

Definition: This pattern takes advantage of players' competitive drive, encouraging them to spend more to achieve or maintain a desired ranking, such as

on leaderboards, pushing them to spend beyond their initial budget.

Example: In a game with a leaderboard, players can buy items or upgrades to improve their ranking. Seeing their rank threatened, players feel pressured to spend more money to maintain their competitive status, often investing more than they initially intended.

4.11 Social Obligation

Category: Social Capital Dark Patterns

Definition: This pattern pressures players to participate in group activities to maintain their social status in the game. Those who opt out experience slower progress and lose access to certain content, feeling obligated to meet group goals.

Example: Guild systems exemplify this pattern, where leaders assign tasks to members and penalize non-participants, compelling players to invest more time in the game to maintain their social standing.

4.12 Impersonation

Category: Social Capital Dark Patterns

Definition: This pattern pretends to befriend players, using their name and image to motivate them to play more. While its effectiveness has declined over time, as players recognize the tactic, it persists.

Example: Some games send notifications or messages that appear as if they are from friends, encouraging players to return or perform actions in-game, attempting to manipulate players into spending more time playing.

4.13 Social Pyramid Schemes

Category: Social Capital Dark Patterns

Definition: This pattern slows player progress unless they recruit others to play, offering exclusive benefits in return. While pyramid schemes are illegal business models, this system is often covertly embedded in specific game designs.

Example: A game may require players to invite friends to obtain specific items or advance to new levels. Without these recruits, the player's progress is slower or even blocked, promoting the game's spread like a pyramid scheme.

5 RESULTS

In this section, we present the analysis of the results obtained from 30 participant responses to the survey.

Due to the open-access nature of the survey, precise control over recruitment was not feasible, and the response rate could not be determined. Before completing the survey, all participants signed a consent form that outlined the purpose of the study, the voluntary nature of their participation, and their right to withdraw at any time without any consequences. The consent form also assured participants of the anonymity of their responses and the confidentiality of all data collected, reinforcing the study's commitment to ethical research practices. This analysis includes insights into the harmfulness, prevalence, and clarity of the dark patterns evaluated. The survey's questions, participants' characterization and complete catalog of dark patterns used in this research can be found at our supplementary material ².

Most dark patterns achieved 100% clarity in their definitions and examples. However, Impersonation was an exception, with six participants reporting difficulty understanding its definition or example. The following subsections present the results of participants' characterization, the quantitative analysis of harmfulness, problematic nature, and prevalence, the dark pattern rankings, and the analysis of participants' feedback.

5.1 Participants' Characterization

Figure 2 shows a Pie chart presenting the responses to the question, 'How many hours per week do you spend playing games?'. The study included participants with varying levels of gaming engagement: 16.7% of participants play less than 5 hours per week, 23.3% between 5 and 10 hours, 26.7% between 10 and 20 hours, and 30% between 20 and 30 hours. A smaller proportion, 3.3%, reported playing more than 30 hours weekly. This distribution highlights a balanced representation of casual, moderate, and intensive gamers, ensuring that the sample captures a broad spectrum of gaming habits. Such diversity strengthens the generalizability of the findings by encompassing varied perspectives on dark patterns across different levels of gaming engagement.

Figure 3 shows a bar chart presenting the responses to the question, 'What genres of games do you usually play?'. It illustrates the distribution of game genres played by the participants, revealing a diverse range of preferences. Popular genres included RPGs, FPS, and Action/Adventure, while less frequent choices ranged from Racing to RTS games. This diversity underscores the varied gaming habits of the participants, ensuring the study reflects a broad

²<https://github.com/efmantyke/ICEIS-2025>

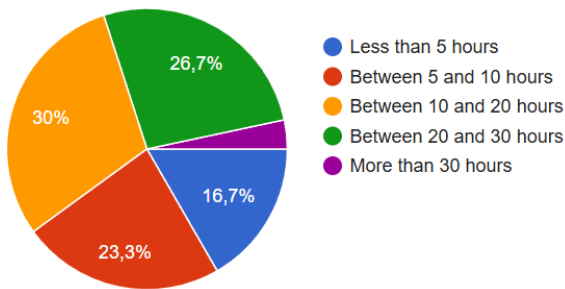


Figure 2: Pie chart showing the distribution of participants' weekly gaming hours.

range of player experiences and perspectives on dark patterns across different game genres.

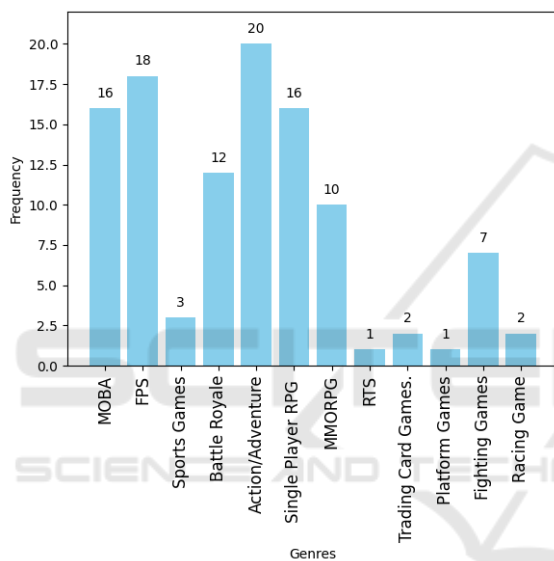


Figure 3: Bar chart presenting the distribution of game genres played by participants.

5.2 Harmfulness

Figure 4 shows a boxplot presenting the perceived harmfulness ratings for each dark pattern. Patterns like Grinding showed a tight interquartile range, indicating consistent agreement among participants about its harmfulness. In contrast, Impersonation and Pay Wall patterns displayed wider interquartile ranges, reflecting more varied experiences and perceptions of harm. The analysis reveals that the median harmfulness scores for all dark patterns, except Impersonation, fall within the high range on a 1 to 10 scale, indicating that participants generally perceive these patterns as highly detrimental. This underscores the significant negative impact of most dark patterns on players' experiences. Outliers were retained in the analysis, as they provided contextual insights without

significantly deviating from group medians. For example, while Impersonation had some unclear ratings, these did not substantially impact its overall harmfulness evaluation.

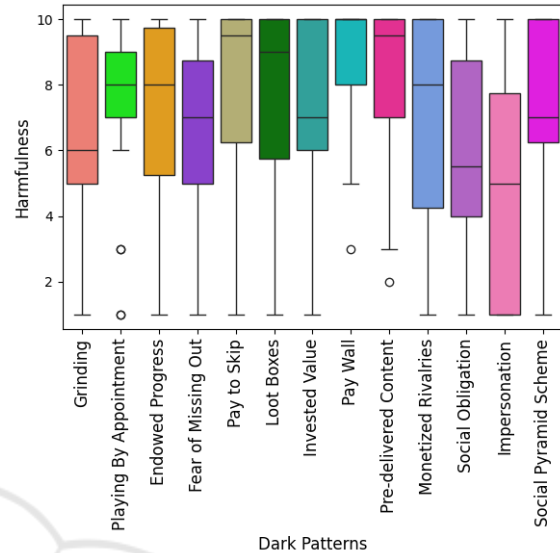


Figure 4: Boxplot illustrating the harmfulness ratings for each dark pattern.

We conducted a series of statistical tests to analyze the perceived harmfulness of dark patterns. First, the Shapiro-Wilk test revealed that the data significantly deviated from a normal distribution ($p < 0.05$), necessitating non-parametric methods for further analysis. Using the Kruskal-Wallis test, we confirmed significant differences in harmfulness scores among the dark patterns ($p < 0.05$), indicating that participants did not perceive all patterns equally. Therefore, we applied the post-hoc Dunn test, identifying specific patterns' differences. For example, Grinding demonstrated significant differences compared to Pay Wall, Impersonation, and Pre-delivered Content. Similarly, Impersonation differed significantly from most other patterns, except Social Obligation, Grinding, and F.O.M.O. Pay Wall, in particular, showed significant differences with F.O.M.O., Impersonation, Social Obligation, and Grinding.

Table 1 presents the ranking of harmfulness. The ranking is based on the harmfulness median of each dark pattern. We used the interquartile range followed by the median as tiebreaker measures. Pay Wall emerged as the most harmful pattern, reflecting players' frustration with being coerced into spending money to progress in games. This aligns with participants' feedback, highlighting the disruption of their autonomy and satisfaction. On the other hand, Grinding was perceived as one of the least harmful patterns,

suggesting that players view it as a standard aspect of many games rather than a manipulative tactic. The disparity between these patterns underscores the financial and emotional impact that monetary Dark Patterns can have compared to temporal ones.

Table 1: Ranking of Dark Patterns based on harmfulness.

Dark Pattern	Median	IQR	Mean
1. Pay Wall	10.0	2.0	8.83
2. Pre-delivered	9.5	3.0	8.16
3. Pay to Skip	9.5	3.75	7.83
4. Loot Boxes	9.0	4.25	7.83
5. Appointment	8.0	2.0	7.40
6. Endowed Progress	8.0	4.5	7.03
7. Monetized Rivalries	8.0	5.75	7.10
8. Social Pyramid	7.0	3.75	7.03
9. F.O.M.O.	7.0	3.75	6.63
10. Invested Value	7.0	4.0	7.26
11. Grinding	6.0	4.5	6.50
12. Social Obligation	5.5	4.75	5.86
13. Impersonation	5.0	6.75	4.86

5.3 Problematic Nature

Table 2 presents the ranking according to how problematic the dark patterns are. The ranking is related to the problematic nature based on the answers to the question, ‘Considering the provided definition, do you consider this issue to be a problem?’. As in the harmfulness ranking, Pay Wall appears in the first position. Patterns like F.O.M.O. (Fear of Missing Out) and Playing by Appointment ranked lower, suggesting that while these patterns can be frustrating, they are less likely to disrupt players’ overall gaming experience.

Table 2: Ranking of Dark Patterns based on problematic nature.

Dark Pattern	Problematic Nature
1. Pay Wall	100.00%
2. Pre-delivered	93.30%
3. Pay to Skip	86.70%
4. Loot Boxes	86.70%
5. Appointment	86.70%
6. Monetized Rivalries	80.00%
7. Invested Value	80.00%
8. F.O.M.O.	76.70%
9. Endowed Progress	70.00%
10. Social Obligation	66.70%
11. Impersonation	66.70%
12. Grinding	60.00%
13. Social Pyramid	53.30%

5.4 Prevalence

Table 3 presents the ranking of prevalence. The ranking presents the most common dark patterns based on the answers to the question: ‘Have you noticed this dark pattern in any game?’. It highlights that Monetary Dark Patterns, such as Loot Boxes and Invested Value, were the most commonly recognized dark patterns. This suggests that players frequently encounter these practices, potentially due to their widespread adoption in contemporary game monetization strategies. Participants identified patterns like Impersonation less frequently, which may be linked to the low perceived harmfulness and problematic nature.

Table 3: Ranking of Dark Patterns based on prevalence.

Dark Pattern	Prevalence
1. Loot Boxes	100.00%
2. Invested Value	96.70%
3. Endowed Progress	90.00%
4. Grinding	86.70%
5. Pre-delivered	86.70%
6. Pay to Skip	83.30%
7. Pay Wall	83.30%
8. F.O.M.O.	76.70%
9. Appointment	70.00%
10. Social Obligation	53.30%
11. Social Pyramid	53.30%
12. Impersonation	43.30%
13. Monetized Rivalries	40.00%

In the question ‘If yes, in which game?’ participants cited specific games where they had encountered dark patterns. Among the most mentioned were World of Warcraft (Entertainment, 2004), League of Legends (Games, 2009), and Genshin Impact (miHoYo, 2020), reflecting their widespread influence in the gaming community. World of Warcraft was highlighted for employing various dark patterns, mainly Grinding, often tied to its subscription model and endgame content. League of Legends was noted for using grinding in ranked play and battle passes. Genshin Impact, known for its gacha mechanics, stood out as a key example of Grinding and a type of Loot Boxes, emphasizing the psychological pressure these systems can exert on players (Xia and Hadden, 2021). These repeated references underscore how widely recognized dark patterns are in major games, particularly those with large and diverse player bases.

5.5 Qualitative Analysis of Participant Comments

Participants frequently expressed difficulty in recognizing the harmfulness of specific dark patterns, especially when these were integrated seamlessly into gameplay. For instance, in the case of Grinding, some participants noted that it often feels like a natural part of progression rather than an exploitative design. P15 reflected, “Grinding is not necessarily bad; it is only problematic when progression becomes impossible without dedicating hours to it.” Similarly, P16 highlighted Endowed Progress’s deceptive nature: “It can easily lead players to burnout as soon as they reach the plateau of their level progression.” These comments underline how dark patterns may go unnoticed until players experience negative impacts, such as burnout.

A recurring theme in responses was participants’ varying levels of awareness about the manipulative intent behind dark patterns. For example, several comments about F.O.M.O. revealed that it affects players’ psychological state. P25 remarked, “It directly impacts the player’s psychological state negatively, as it makes them anxious about the possibility of missing an opportunity.” Likewise, in discussions about Pay to Skip, P16 acknowledged how casual players or those with limited time might feel coerced into spending money, noting, “It is a cheap trick to get quick cash from players who do not have the time to grind.”

The qualitative responses also highlighted significant emotional and psychological impacts caused by dark patterns. P10 described the frustration and exclusion caused by Social Obligation, stating, “It disregards players who have less time to play or are not particularly inclined toward online socialization.” Similarly, participants critiqued Loot Boxes for their gambling-like mechanics, with P16 saying, “It is a system that exploits players vulnerable to gambling and probability mechanics to make its monetization opaque, thereby increasing profits.” These patterns create emotional pressure and financial harm, emphasizing the need for ethic in game design.

6 DISCUSSION

Among the three main categories of Dark Patterns, the Monetary category emerged as the most harmful, based on participants’ ratings. Patterns such as Pay Wall and Pre-Delivered Content consistently ranked highest in perceived harmfulness and problematic nature. The significant harmfulness of Pay Wall reflects participants’ frustrations with being coerced into spending money to progress in games, which dis-

rupts their sense of autonomy and satisfaction. Likewise, Pre-Delivered Content was perceived as highly harmful due to its deceptive nature, as it locks content that is already present in the game, creating a sense of unfair monetization. Similarly, Impersonation drew polarized reactions, as it manipulates players by mimicking relationships or personal relevance, making its social and emotional impact particularly contentious. Temporal patterns, such as Grinding, were deemed less harmful but problematic due to their exploitative demand for repetitive gameplay. While frustrating, these patterns were perceived as a standard aspect of many games rather than deliberate manipulations.

Participants demonstrated a strong ability to identify and understand dark patterns across most categories. The clarity ratings of 100% for nearly all patterns suggest that players know the mechanics used to manipulate them. This is particularly evident in patterns like Grinding and Playing by Appointment, which players frequently encounter in games and can easily recognize. However, six participants reported difficulties understanding Impersonation’s definition or example, underscoring the need to better articulate its characteristics. This may be related to the low ranking of Impersonation among the three rankings. The rankings highlight that players perceive some patterns as more problematic due to their immediate impact. For example, Monetary patterns like Pay Wall harm the player experience and evoke a sense of coercion, making them stand out as particularly egregious. On the other hand, Temporal patterns were seen as more subtle, often blending into the structure of games without immediate recognition as harmful.

The frequent mention of World of Warcraft, League of Legends, and Genshin Impact in participant responses highlights how dark patterns are deeply embedded in some popular games. The prominence of Grinding in both MMORPGs and competitive online games suggests that time-consuming mechanics are widely accepted but still perceived as problematic by players. We observed a relation between perceived harmfulness and problematic nature: patterns that directly exploited players financially, such as Pay Wall and Loot Boxes, were rated both highly problematic. In contrast, patterns that primarily affected players’ time or progression, such as Grinding and Endowed Progress, were considered less harmful but disruptive to the gaming experience. This relation highlights how players recognize immediate financial exploitation as more detrimental than time-based inconveniences.

These findings underscore the nuanced perceptions players hold about dark patterns. While they recognize the negative aspects of these patterns, their

tolerance or acceptance may vary depending on the context. For instance, Patterns like Grinding are seen as a trade-off for extended gameplay, suggesting that the player's gaming habits moderate their harmfulness. In contrast, Monetary patterns breach ethical boundaries more clearly, as they directly exploit financial commitments, often without offering meaningful in-game benefits. The results also suggest a growing awareness among players of manipulative design strategies, which could drive demand for transparency and ethical practices in game design.

7 THREATS TO VALIDITY

This study's validity assessment follows the framework proposed by Cook and Campbell (1979), encompassing threats to conclusion, internal, construct, and external validity.

Internal validity refers to the ability to ensure that the observed outcomes are causally related to the treatment rather than extraneous factors. In this study, internal validity was bolstered by conducting a pilot test of the survey instrument. The pilot allowed refinement of unclear definitions and examples, ensuring that participants fully understood the dark patterns being evaluated. However, potential biases, such as participant fatigue or differences in interpretation, may still exist. These were minimized by informing participants of the estimated time required to complete the survey, providing clear instructions, and ensuring a concise survey design.

External validity concerns the generalizability of results to broader populations. A primary limitation of this study is convenience sampling and a relatively small sample size ($N=30$). While this limits the generalization of findings, the sample included participants with diverse gaming engagement levels, which helps capture varied perceptions.

Construct validity relates to the alignment between theoretical constructs and their operationalization in the study. To address this threat, the dark patterns catalog was developed systematically using established literature and real-world examples sourced from gaming communities. We refined definitions and examples iteratively, ensuring they accurately represented the intended constructs. Additionally, the final survey included clarity assessments, confirming that most participants found the definitions understandable. Despite these efforts, the pattern Impersonation had a lower clarity rating, indicating room for further refinement.

Conclusion validity refers to the statistical soundness of the results. This study ensured conclusion va-

lidity through robust statistical testing. The Shapiro-Wilk test confirmed that data did not follow a normal distribution, leading to the appropriate use of non-parametric tests. We provided descriptive statistics to contextualize the findings and identify outliers, which were retained to preserve the integrity of the analysis.

8 CONCLUSION

This study presents a catalog of dark patterns in games. The definitions were derived from previous research and clarified with practical examples from actual games. Using a survey administered to 30 participants with varying levels of gaming engagement, we analyzed the perceived harmfulness, problematic nature, and prevalence of each dark pattern. As a result, we generated three rankings and discussed the participants' feedback on each dark pattern.

The results revealed that Monetary Dark Patterns, such as Pay Wall and Loot Boxes, were perceived as the most harmful and highly problematic, reflecting players' heightened sensitivity to financial exploitation. In contrast, Temporal Dark Patterns, like Grinding and Endowed Progress, were deemed less harmful but disruptive to the gaming experience. The relation between harmfulness and problematic nature underscores how different dark patterns affect player enjoyment and well-being in distinct ways. The generated rankings provide a nuanced perspective on these patterns, highlighting the varied psychological and emotional impacts of financial versus time-based exploitation.

This research extends previous studies by providing an empirically validated perspective on the harmfulness of dark patterns in games. While earlier work mainly focused on theoretical categorization or heuristic evaluations, this study adds value by incorporating player perceptions into the analysis. Furthermore, the rankings of harmfulness, problematic nature, and prevalence offer a practical framework for assessing and reducing the use of dark patterns in games. The findings underscore the importance of ethical game design practices prioritizing player engagement and well-being.

Future work could expand this research by increasing the sample size, exploring additional patterns, or examining the cultural and demographic factors influencing perceptions of dark patterns. Moreover, longitudinal studies could provide insights into how player attitudes toward dark patterns evolve, particularly in the context of emerging game monetization strategies.

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