

Consumer Psychology and Purchasing Behavior in Free-to-play Games: A Study on Pokémon GO

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Abstract

This study explores the psychological factors driving players to purchase virtual goods in free-to-play games, focusing on how these purchases relate to players' psychological and self-actualization needs. Using Pokémon GO as a case study, we identified nine key game features, including social interaction, competition, and exploration, as independent variables influencing players' spending behavior. A survey of 5,149 *Pokémon GO* players (69% female, 30% male, 1% other; mean age approximately 36 years) was conducted to examine the relationship between player needs, game features, and in-app purchases. The results suggest that freemium games can fulfill players' psychological and self-actualization needs as described by Maslow's hierarchy. Spending on virtual items was found to most strongly satisfy the need for love and belonging, followed by self-actualization and esteem needs. Interestingly, an inverse relationship was observed when reversing the association from need fulfillment to spending, indicating that as players increasingly satisfy their needs, their spending may decrease. This study makes a significant contribution to the understanding of monetization in freemium mobile games. Its large sample size offers a robust insight into player behavior, while the application of Maslow's hierarchical model provides a novel framework for examining the connection between player needs and in-app purchases.

Keywords: Mobile game purchases, Pokémon GO, Maslow's hierarchy of needs, Freemium games

1. INTRODUCTION

Mobile app consumer spending has surged from zero in 2007, when the first iPhone and App Store were launched, to \$171 billion by 2023 (Statista, 2024). Initially, apps generated revenue through premium models, where users paid to download. However, the freemium model, which allows free downloads but monetizes through in-app purchases (IAP) and in-app advertising (IAA), has since dominated. By 2024, over 96% of Android and iPhone apps were free (Statista, 2024). In freemium games, IAP involves the sale of virtual goods, such as items or currencies, which enhance the user experience. Though theoretically, players can earn these items through gameplay, it often requires significant time, pushing players to spend real money. Only a small percentage of players make IAPs—about 1.6%—and most revenue comes from a small

group of "big spenders" (Swrve, 2019). For example, 59% of iPhone IAP revenue is generated by the top 1% of users, who tend to be older men (Kooti et al., 2017).

Developers increasingly favor a hybrid of IAA and IAP for monetization, as IAA scales with user growth while IAP is more complex to optimize. Most game developers base their strategies on what has worked in other games, as there is no established best practice for maximizing IAPs (Walnut Unlimited, 2019). Beyond creating engaging games, freemium games must be designed to encourage frequent in-app purchases. Understanding what drives these purchases is critical for increasing revenue and market share, with implications for both industry and academic research.

Research on virtual goods purchases has found that user attitude is a key factor, as indicated by Hamari and Keronen's (2017) meta-analysis. Other studies link purchases to personality traits like patience, self-control, and intrinsic motivation. However, because personality is outside a designer's control, game design factors such as social presence, flow state, and the perceived value of virtual goods are more actionable for maximizing profits.

Several studies have reviewed existing literature to explore why people buy virtual goods in apps. Duradoni et al. developed and validated the In-Game Purchase Motivation Scale, combining economic and psychological perspectives (2025). They identified five motives for buying virtual items: utility, enjoyment, investment, reputation, and self-realization. Their results show these motives explain about 5.4% of spending with first four factors, and around 8% when including self-realization. The explanatory power of the scale is higher within specific games, such as 12% in *Genshin Impact* and 27.5% in *League of Legends*. Enjoyment, investment, and self-realization predict higher spending, while reputation varies by game. This suggests purchase drivers are contextual rather than purely utilitarian or social.

Syahrizal et al. (2020) examined 29 studies and proposed a framework for purchase intention in games based on psychological models, such as Stimulus-Organism-Response (SOR), and marketing models like Attention-Interest-Desire-Action (AIDA), alongside a playability model for video games. Hamari and Keronen (2016, 2017) conducted a literature review and meta-analysis of 34 and 24 studies, respectively, and found that user attitude toward purchases was the most influential factor. Other research has explored personality traits related to virtual goods purchases, such as patience (Ernst, 2018), self-control (Sorosh et al., 2015), bargain-seeking tendencies (Dinsmore et al., 2017), and intrinsic motivation (Jang et al., 2018). While several studies focus on purchase intentions in free-to-play (F2P) games, Salehudin and Alpert (2021) suggest that in-app purchases are often driven by impulsive rather than deliberate decisions.

Since personality and attitude are beyond a game designer's control, focusing on game design elements to maximize profits is more practical. Hamari and Keronen (2017) identified key factors that influence in-app purchases, such as creating a flow state, expanding in-game peer groups, enabling self-expression, fostering social presence,

enhancing the perceived value of virtual goods, and ensuring ease of use with an intuitive interface. These design strategies can be leveraged to boost player spending.

This study investigates the psychological motivations behind players' purchases of virtual goods in *Pokémon GO*, using Maslow's hierarchy of needs as the theoretical framework. Specifically, it addresses two research questions: (RQ1) Can specific game features help fulfill players' needs for love and belonging, esteem, and self-actualization as defined by Maslow? and (RQ2) Can spending on in-app purchases enhance the fulfillment of these needs? The study builds on a master's thesis by Grønstad (2021), which provides further methodological and conceptual detail. The remainder of the paper is structured as follows: Section 2 reviews the theoretical background and related work; Section 3 outlines the research questions, hypotheses, and methods; Section 4 presents the results; Section 5 discusses the findings and their implications; and Section 6 concludes the paper.

2. BACKGROUND THEORY AND RELATED WORK

Pokémon Go is one of the most successful location-based and augmented reality games ever released. It has attracted nearly 600 million unique installs worldwide (Chapple, 2020). Players engage with the game for many reasons. These include recreation and nostalgia (Zsila et al., 2018), enjoyment and exercise (Ruiz-Ariza et al., 2018), and being Pokémon fans who enjoy collecting creatures (Marquet et al., 2017). Other motivations are winning battles (Zach and Tussyadiah, 2017), reaching higher levels (Rasche et al., 2017), prior exposure to the franchise and social pressure (Bonus et al., 2018), and spending time outdoors with others (Militello et al., 2018). Players are also motivated by recognition, ease of use, flow (Kim et al., 2018), gratification (Harborth and Pape, 2017), social invitations (Evans and Saker, 2018), and the fulfillment of personal, social, or recreational needs (Caci et al., 2018).

This section introduces the main theories that guide our study. It explains Maslow's hierarchy of needs, consumer psychology, and self-determination theory in the context of player motivation and spending. It also reviews related research on social play, psychological needs, and game features in mobile gaming.

2.1 Maslow's Hierarchy of Needs and Consumer Psychology

Maslow's hierarchy of needs (Maslow, 1970) is a widely recognized theory of human motivation and is frequently applied in consumer psychology (Schütte & Ciarlante, 1998; Kotler, 2012; Ward & Lasen, 2009). The model categorizes human motivation into five levels of needs that drive behavior: physiological, safety, belongingness and love, esteem, and self-actualization. Motivation plays a key role in shaping consumer responses and purchase decisions (Kotler, 2012). As a need intensifies, it becomes a *motive* that drives action.

The lower two tiers—physiological and safety—represent basic survival needs, while the next two—belongingness and esteem—are psychological. The highest level, self-actualization, involves striving to achieve one's full potential and personal fulfillment.

While the needs are structured hierarchically, there is overlap, as no need is ever fully satisfied (Schütte & Ciarlante, 1998). However, unmet lower-level needs typically dominate behavior. Although people may experience multiple needs at once, they prioritize lower-level needs when they are unmet (Maslow, 1943). Each level of need statistically predicts the pursuit of the next higher level (Taormina & Gao, 2013). In a business context, as income levels rise, individuals tend to spend more on higher-level needs and less on basic ones (Ward & Lasen, 2009).

2.2 Maslow's Hierarchy of Needs and Player Motivation

This study explores the premise that video games can partially fulfill certain Maslowian needs, specifically belongingness and love, esteem, and self-actualization. It is assumed that physiological and safety needs are prerequisites for engaging in leisure activities. Sharma et al. (2020) propose a technology-based interpretation of Maslow's pyramid, suggesting that virtual world immersion can satisfy self-actualization needs, online approval (through likes and comments) can enhance self-esteem, and online gaming can fulfill social and achievement-related needs, thereby boosting self-esteem.

To the authors' knowledge, no study has directly examined the relationship between in-game purchasing behavior and Maslow's needs. However, Maslow's framework has been used to understand consumer motivation in other contexts (Cui et al., 2021). Motivation is crucial for creating engaging games, and high levels of player engagement often lead to better retention rates, which in turn influence purchase intentions (Hodent, 2020). Retention rate, or player loyalty, measures how frequently a player returns to a game over time, typically tracked over a month or more.

Games often induce a psychological state known as "*Flow*," in which players become deeply immersed in the activity, often prioritizing it above other tasks (Csikszentmihalyi, 1990). Flow is widely recognized as a key factor in both player retention and monetization (Alhirz & Sajeev, 2015; Liu & Shiue, 2014; Kao & Chiang, 2015; Su et al., 2016; Hamari & Keronen, 2017; Putra et al., 2019).

2.3 Self-Determination Theory and Player Motivation

Self-Determination Theory (SDT) is a widely used framework for understanding motivation, including within the context of video games. Neys et al. (2014) applied SDT to explore why people play video games, focusing on three core motivators: autonomy, connectedness, and competence. *Competence* refers to a sense of achievement or progression in the game, whether skill-based or otherwise (Hodent, 2020). *Autonomy* relates to players' ability to express themselves, for example through character customization. *Connectedness* pertains to forming meaningful relationships with others. Neys et al. (2014) found that both casual and hardcore gamers are driven by a sense of connectedness, underscoring the importance of social interaction in gaming.

Further studies have examined purchasing behavior in Pokémon GO through the lens of SDT. Hsiao et al. (2019) found that social self-image and self-expression, mediated

by perceived value, significantly influence purchase intentions in Pokémon Go. Lemmens and Weergang (2023) concluded that needs for relatedness (e.g., community and friendship) and competence predict spending on in-game purchases, while autonomy-related customization needs did not. Additionally, Kosa and Uysal (2020) observed that satisfaction with relatedness drives purchasing intentions, whereas satisfaction with autonomy and competence primarily influence the intention to play.

2.4 Player Needs and Social Play

While Self-Determination Theory (SDT) is widely used to explain player motivation, Maslow's hierarchy of needs also offers valuable insights for social mobile games. Himeno and Tano (2019) found that games meeting Maslow's needs could effectively predict player retention. Their model demonstrated that *social factors*, such as playing with others, significantly influence players' willingness to continue. For instance, players' *esteem needs* are met through prominence and praise, encouraging sustained engagement. The model also considered *self-actualization needs*, although detailed results were not provided.

Bartle (1996) emphasized that *self-actualization* is crucial in games, noting that many games fulfill this top-level need. Eyal (2015) added that self-rewards are key to gaming, as players seek mastery and achievement. Sharma et al. (2022) examined how Maslow's needs are addressed in the game PUBG, finding that self-actualization is achieved through victories, while love/belongingness and esteem are fulfilled by the game's social and competitive aspects. Additionally, building a gaming career and gaining recognition also address esteem needs.

Social features in games, such as chats, guilds, and cooperation, are increasingly important. For example, MMORPGs like World of Warcraft foster belongingness and love through community interactions. Similarly, Pokémon GO enhances social motivation, reduces anxiety, and strengthens relationships (Wang, 2021). Cooperative and competitive elements in Pokémon GO have been linked to player well-being and satisfaction (Laato et al., 2021; Qin, 2021).

Pokémon GO also promotes bonding, boosts social activity (Laoer, 2021; Wang & Skjervold, 2021), and drives engagement, as social elements are key reasons for playing mobile games (Valho & Hamari, 2019). These features boost player loyalty (Hamid & Suzianti, 2020) and revenue through in-app purchases (Wang & Chang, 2014; Hamari et al., 2017; Jang et al., 2019) by leveraging peer pressure and social hierarchies. Premium content often enhances social value (Hamari et al., 2020), offering recognition and status through character customization and leaderboards, which cater to players' *esteem needs*.

2.5 Game Features and Player Needs

Games can serve as avenues for *self-actualization*, enabling players to develop talents, pursue goals, and realize their potential within a virtual environment. While self-actualization can occur in single-player games, social and esteem needs are more easily

met in multiplayer games. Self-actualization often involves mastery and achievement, such as unlocking new content, leveling up, or improving skills—factors that have been shown to drive in-game purchases (Hamari et al., 2017; Salminen et al., 2018).

Progression systems, such as levels or evolvment, are key elements of games, linked to extrinsic motivation and player satisfaction (Alha et al., 2019). Filho et al. (2014) found that these systems enhance the feeling of progression and correlate with a game’s revenue. Rewards, a measure of progression, have also been shown to increase player loyalty and in-app purchases (Hsiao & Chen, 2016).

Research on Pokémon GO reveals that in-app purchase intentions are positively influenced by factors such as outdoor activity, challenge, competition, socializing, nostalgia, and reuse intentions (Hamari et al., 2018; Hsiao et al., 2019). Customization, often linked to purchase intention (Mäntymäki, 2015; Wang & Chang, 2014; Hamari et al., 2017; Cai et al., 2019), can target self-expression and *self-realization* or serve to display status and fulfill esteem needs. Table 1 outlines how various game features relate to Maslow's needs and influence purchase decisions.

Table 1 Common video game features that motivate purchase decisions, categorized according to their relation to Maslow's hierarchy of need

| Need | Game feature | Articles discussing the topic |
|--|--|---|
| Self-actualization | Reward/achievement, Challenge level, Identification, Unlocking content | Filho et al., 2014; Hsiao and Chen, 2016, Su et al., 2016; Hamari et al., 2017; Salminen et al., 2018; Hamid and Suzianti, 2020; Ko and Park, 2020 |
| Esteem (psychological) | Leaderboards, Competition, Self-presentation, Social/Status hierarchies, Decoration/Customization | Kim and Chan, 2007; Filho et al., 2014; Wang and Chang, 2014; Shi et al., 2015; Kao and Chiang, 2015; Mäntymäki, 2015; Alomari et al., 2016; Hamari et al., 2017; Alomari, 2018; Kordyaka et al., 2018; Cai et al., 2019; Hamari et al., 2019; Hamid and Suzianti, 2020 |
| Belongingness and love (psychological) | Cooperation, Invite friends, Interactivity/Sociability, Number of social connections, Connectedness/Community/Groups | Filho et al. 2014; Wohn, 2014; Shi et al., 2015; Hsiao and Chen, 2016; Hsu and Lin, 2016; Su et al., 2016; Jin et al., 2017; Alomari et al., 2016; Jang et al., 2018 Alomari, 2018; Hsieh and Tseng, 2018; Alomari 2018; Hamid and Suzianti, 2020 |

3. MATERIAL AND METHODS

This section outlines the research questions, theoretical framework, and methods used in the study.

3.1 Research Context and Research Questions

This study seeks to build on existing literature by examining the sale of virtual goods in mobile games and its relation to players’ needs. Using Maslow’s hierarchy of needs (Maslow, 1970) as the theoretical foundation, the study explores in-app purchasing behavior to investigate whether games can fulfill psychological needs and whether

players are willing to pay for further fulfillment. To the authors' knowledge, no similar studies have been conducted. The research focuses on two primary questions:

- RQ1: Can specific game features fulfill a player's needs for love and belonging, esteem, and self-actualization according to Maslow's hierarchy?
- RQ2: Can spending on in-app purchases enhance the fulfillment of these needs?

A review of existing research will be analyzed through the lens of Maslow's hierarchy to propose a multivariate analysis model for addressing these questions. The hypotheses generated will be tested using data from the popular mobile game Pokémon GO (PG), which features numerous social and status-related elements. As one of the most commercially successful freemium games with a large, active online community, Pokémon GO offers an ideal context for gathering survey data for quantitative analysis.

3.2 Hypotheses and Research Model

This study posits that the game features listed in Table 1 can be used to measure the fulfillment of different Maslow's needs, forming the basis for our hypotheses. We will examine three game components for each of Maslow's top three needs, resulting in nine hypotheses (H1a to H3c). We hypothesize that each of these nine components contributes to fulfilling players' psychological and self-actualization needs through gameplay. The study assumes that these nine game components effectively serve as indicators for Maslow's needs. Given the difficulty of directly measuring the fulfillment of Maslow's needs, we will instead use related key terms as described in Table 2 to assess these needs.

Table 2 Descriptive measure of Maslow's needs along with variable names

| Need | Variable name | Descriptive measure of need |
|----------------------|---------------|---|
| Self-actualization | Achievement | Perceived feeling of self-realization through progress and/or achievement |
| Esteem | Esteem | Perceived feeling of respect and/or status |
| Belongingness & love | Social | Perceived sense of belonging and/or connectedness |

Additionally, the study will explore whether specific game components predict increased spending on in-app purchases, resulting in nine further hypotheses: H4a to H6c. Previous research provides support for these hypotheses, with relevant studies detailed in Table 1.

Furthermore, the study will assess whether in-app purchases spending correlates with greater fulfillment of Maslow's needs, leading to three additional hypotheses: H7 to H9. While no prior studies directly support these hypotheses, the aggregated findings from studies listed in Table 1 provide a basis for their investigation. Actual spending by participants will be measured to understand its motivations, with spending serving as a mediating variable, as depicted in the research model in Figure 1 below.

The complete set of proposed 21 hypotheses are:

- H1a: *Unlocking new content* provides a sense of *self-realization* through progress and/or achievement.
- H1b: *Evolving or powering up game characters or content* provides a sense of *self-realization* through progress and/or achievement.
- H1c: *Leveling up a game character or avatar* provides a sense of *self-realization* through progress and/or achievement.
- H2a: *Competing with other players* provides a sense of *respect and/or status*.
- H2b: Having the *best or rarest content* among friends provides a sense of *respect and/or status*.
- H2c: Being at the *highest level* among friends provides a sense of *respect and/or status*.
- H3a: *Having friends in the game* provide a sense of *belonging and/or connectedness*.
- H3b: *Interaction with other players* provides a sense of *belonging and/or connectedness*.
- H3c: *Cooperative play* with friends provides a sense of *belonging and/or connectedness*.
- H4a: *Unlocking new content* drives *in-app purchases*.
- H4b: *Evolving or powering up game characters or content* drives *in-app purchases*.
- H4b: *Leveling up faster* drives *in-app purchases*.
- H5a: *Competition* with others drives *in-app purchases*.
- H5b: Having the *best or rarest content among friends* drives *in-app purchases*.
- H5c: Being the *highest level among friends* drives *in-app purchases*.
- H6a: *Having friends in the game* drives *in-app purchases*.
- H6b: *Interactions with other players* drives *in-app purchases*.
- H6c: *Cooperative play* with friends drives *in-app purchases*.
- H7: *Spending money on IAPs* enhances the feeling of *progress and/or achievement*.
- H8: *Spending money on IAPs* enhances the feeling of *respect and/or status*.
- H9: *Spending money on IAPs* enhances the feeling of *belonging and/or connectedness*.

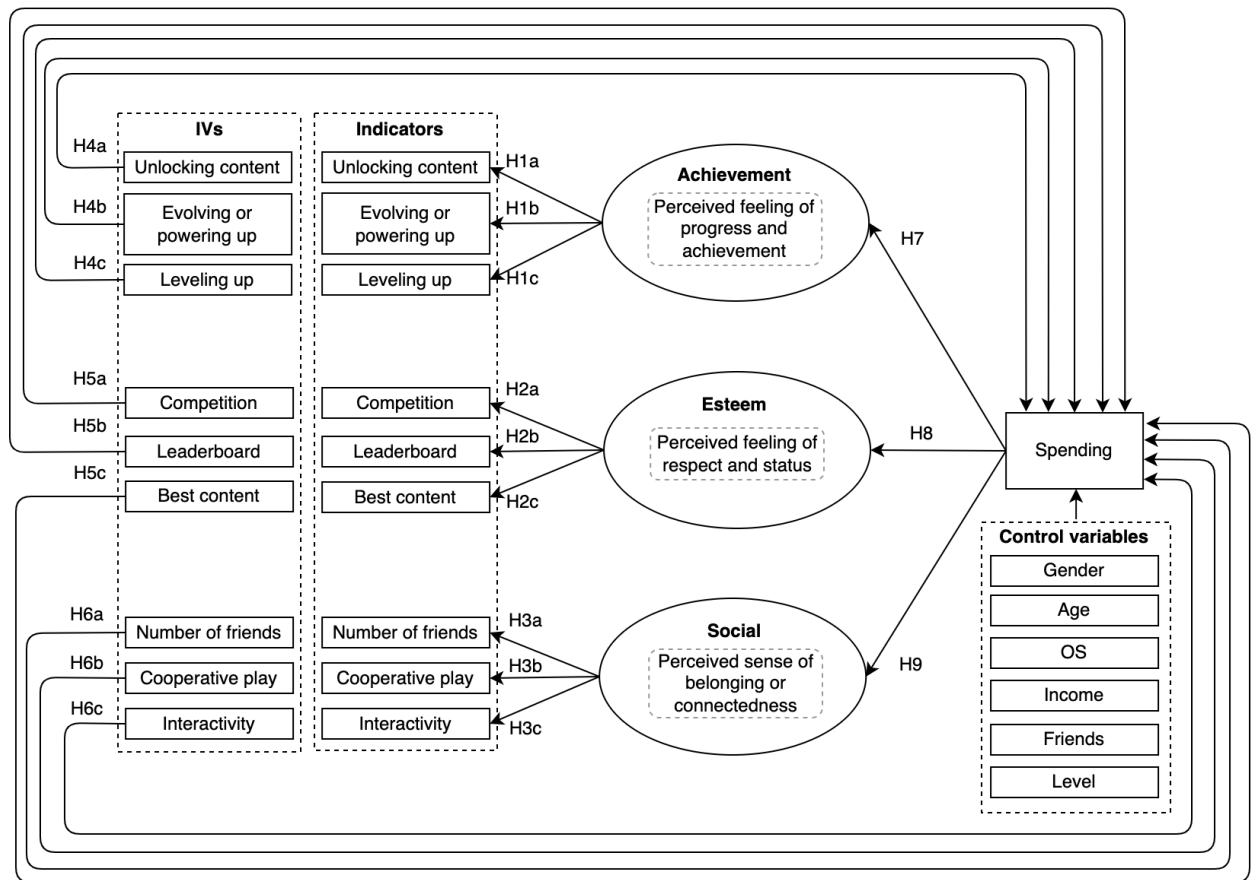


Figure 1. The Research Model

3.3 Research Method

3.3.1 Study Context

Based on Table 1, a set of features from Pokémon GO was selected as independent variables (IVs) and grouped into three themes: achievement, status and social components. These game-specific features were selected based on their relevance to Maslow’s needs and their presence within Pokémon GO. To ensure their appropriateness, the proposed features were qualitatively evaluated by experienced Pokémon GO players.

Table 3 shows how specific Pokémon GO features align with Maslow’s hierarchy of needs by supporting self-actualization, esteem, and belongingness. For *self-actualization*, unlocking content, evolving or powering up Pokémon, and leveling up the trainer help players achieve mastery and personal growth. These features reflect Maslow’s idea of realizing one’s full potential (Maslow, 1970). Studies have found that progression systems and new challenges fulfill higher-level needs and boost engagement (Hamari et al., 2017; Salminen et al., 2018). *Esteem* needs are supported through competition with other players, comparing Pokémon power and rarity, and

tracking trainer levels against friends. These activities create recognition, status, and social comparison, which align with Maslow’s concept of esteem and are widely noted in gaming research (Bartle, 1996; Kim & Chan, 2007). *Belongingness and love* are addressed by having friends in the game, interacting with other players, and raiding together. These social features encourage connection, cooperation, and a sense of community. This matches Maslow’s idea that people seek social bonds and acceptance (Maslow, 1970) and supports findings that social play increases loyalty and well-being in Pokémon GO (Wang, 2021; Laato et al., 2021). Together, these features show how Pokémon GO applies Maslow’s theory to meet psychological needs and motivate players to stay engaged and make purchases.

Table 3 Game Features in Pokémon GO Related to Maslow’s Needs

| Need | Pokémon GO Features | Feature description |
|-------------------------------|--|---|
| Self-Actualization | Unlocking Content | Achieving new items, such as virtual apparel or rare Pokémon. |
| | Evolving or Powering Up Pokémon | Enhancing Pokémon’s abilities and power. |
| | Leveling Up Pokémon Trainer | Increasing your trainer's level, which becomes progressively more challenging. |
| Esteem | Competition with Other Players | Battling against other player’s Pokémon |
| | Pokémon Power and Rarity Relative to Friends | Comparing the power and rarity of your Pokémon with those of your friends. |
| | Pokémon Trainer Level Relative to Friends | Comparing your trainer level with that of your friends. |
| Belongingness and Love | Having Friends in the Game | Adding each other to friend lists for interaction and viewing each other’s stats. |
| | Interacting with Other Players | Engaging in activities such as battling together, taking over gyms, sending gifts, or jointly catching Pokémon. |
| | Raiding with Friends | Collaborating with friends to defeat a large boss that cannot be taken down alone. |

3.3.2 Survey Design and Data Gathering

The survey used a five-point Likert scale, ranging from “strongly disagree” (1) to “strongly agree” (5), to assess the independent variables and indicators. Statements for the indicators (H1a-H3c) were based on the descriptive measures of Maslow’s needs outlined in Table 2. For example, an indicator statement was: “Interaction with other players gives me a sense of belonging and/or connectedness.” Since the three needs are latent variables (LVs), they were measured indirectly through three indicators each.

To evaluate the independent variables (H4a-H6c) predicting spending, questions were phrased like “[feature] is a determining factor for me to spend money on in-app purchases,” aligned with the features detailed in Table 3. The specific survey questions for the independent variables and indicators are detailed in Appendix B. Validity and

reliability were assessed using confirmatory factor analysis (CFA), with results shown in Table 8.

The survey also collected data on variables such as income, age, gender, in-game level, operating system (OS), and the number of in-game friends. Participants were additionally asked about their actual expenditure on in-app purchases, distinguishing between actual spending and mere intention to spend. Descriptive statistics for these variables are provided in Table 5.

Finally, participants were invited to provide the primary reason for spending real money in the game. While this question was optional, it received 4,359 responses out of 5,149 (85%). Participants were recruited from five major public Facebook groups dedicated to Pokémon GO (see Appendix A) in May 2021.

3.3.3 Pilot Study

Before the main study, an anonymous pilot study was conducted in March 2021, posted on the Facebook group Pokémon GO Norge (see Appendix A). Due to the smaller sample size, a simplified model was analyzed, with each factor having two indicators instead of three. The model was tested in three parts, one for each latent variable.

One key finding was that customization, initially hypothesized as a significant motivator for purchasing, had a low standardized factor loading ($\lambda = 0.5$), indicating a weak association with esteem needs. In such cases, poor indicators can be excluded to improve discriminant validity.

Following the pilot, some control variables (CVs) were adjusted. Education was dropped as it was non-significant, while player level and number of in-game friends were added due to their relevance to spending behavior. Participants also provided insights into spending habits, such as a preference for purchasing raid passes to participate in cooperative Pokégym raids. This feature, along with the remote raid feature introduced during the COVID-19 pandemic, was included in the main survey.

4. RESULTS

This section presents the survey results using descriptive statistics and a structural equation model.

4.1 Descriptive Statistics

Table 4 provides an overview of the descriptive statistics based on 5,149 valid responses, including variables such as gender, age, income, mobile operating system, number of friends, and player level in Pokémon GO. Notably, the majority of respondents were female (69.2%), consistent with previous findings (Forbes, 2016; Laato et al., 2021; Lemmens & Weergang, 2023).

Table 5 presents the descriptive statistics for the encoded variables, including income, spending, age, player level, and number of in-game friends.

4.1.1 Structural Equation Model

The structural equation model, a central element of our research, exhibited excellent fit, supporting the robustness of the analysis. Of the 21 hypotheses tested, 17 were confirmed, while two were disconfirmed and three remained inconclusive, as shown in Table 6.

Table 4 Sample Distribution

| | N | % | | N | % |
|-------------------|-------|------|--------------------------------|-------|------|
| Gender | | | Operating System (OS) | | |
| Female | 3,563 | 69.2 | Android | 2,602 | 50.5 |
| Male | 1,529 | 29.7 | iOS | 2,523 | 49.0 |
| Other | 59 | 1.2 | Other | 26 | 0.5 |
| Age | | | Number of friends in PG | | |
| <17 | 22 | 0.4 | <20 | 368 | 7.1 |
| 17-22 | 354 | 6.9 | 20-49 | 882 | 17.1 |
| 23-28 | 1,133 | 22.0 | 50-99 | 1,183 | 23.0 |
| 29-34 | 1,351 | 26.2 | 100-199 | 1,984 | 38.5 |
| 35-40 | 784 | 15.2 | >199 | 734 | 14.3 |
| 41-50 | 851 | 16.5 | Level in PG | | |
| >50 | 656 | 12.7 | <20 | 20 | 0.4 |
| Income | | | 20-29 | 132 | 2.6 |
| <\$20,000 | 1,142 | 22.2 | 30-39 | 1,986 | 38.6 |
| \$20,000-\$24,999 | 469 | 9.1 | >39 | 3,013 | 58.5 |
| \$25,000-\$34,999 | 737 | 14.3 | In-app spending in PG | | |
| \$35,000-\$44,999 | 657 | 12.8 | \$0 | 699 | 13.6 |
| \$45,000-\$54,999 | 533 | 10.4 | \$1-\$19 | 985 | 19.1 |
| \$55,000-\$69,999 | 555 | 10.8 | \$20-\$99 | 1,661 | 32.3 |
| \$70,000-\$99,999 | 549 | 10.7 | \$100-\$499 | 1,389 | 27.0 |
| >\$99,999 | 509 | 9.9 | \$500-\$999 | 295 | 5.7 |
| | | | >\$999 | 122 | 2.4 |

Table 5 Descriptive Statistics for Encoded Variables

| | Income | Spending | Age | Level | Friends |
|----------|--------|----------|-------|-------|---------|
| mean | 4.044 | 2.993 | 4.494 | 2.555 | 4.285 |
| p50 | 4.000 | 3.000 | 4.000 | 3.000 | 5.000 |
| variance | 5.577 | 1.446 | 2.248 | 0.306 | 1.689 |
| sd | 2.361 | 1.203 | 1.499 | 0.553 | 1.299 |

| | | | | | |
|----------|-------|-------|-------|--------|--------|
| kurtosis | 1.763 | 2.617 | 2.036 | 2.481 | 3.549 |
| skewness | 0.196 | 0.070 | 0.170 | -0.743 | -0.930 |

Table 6 Summary of hypothesis testing. Indicators of the Latent Variables are labeled with ‘ LV’ and the Independent Variables ‘ IV’.

| Hypothesis | Association | Supported? | β |
|-------------------|-----------------------------|-------------------|---------------------------|
| H1a | Achievement -> Unlocking_LV | Yes | 0.80 |
| H1b | Achievement -> Evolving_LV | Yes | 0.86 |
| H1c | Achievement -> Leveling_LV | Yes | 0.87 |
| H2a | Esteem -> Competition_LV | Yes | 0.72 |
| H2b | Esteem -> Leaderboard_LV | Yes | 0.82 |
| H2c | Esteem -> Level_LV | Yes | 0.86 |
| H3a | Social -> Friends_LV | Yes | 0.84 |
| H3b | Social -> Interaction_LV | Yes | 0.93 |
| H3c | Social -> Raiding_LV | Yes | 0.81 |
| H4a | Level_IV -> Spending | No | -0.041 |
| H4b | Leaderboard_IV -> Spending | Inc. | n.s. |
| H4c | Competition_IV -> Spending | Yes | 0.049 |
| H5a | Unlocking_IV -> Spending | Yes | 0.17 |
| H5b | Evolving_IV -> Spending | Inc. | n.s. |
| H5c | Leveling_IV -> Spending | Yes | 0.14 |
| H6a | Friends_IV -> Spending | Inc. | n.s. |
| H6b | Interaction_IV -> Spending | No | -0.086 |
| H6c | Raiding_IV -> Spending | Yes | 0.22 |
| H7 | Spending -> Achievement | Yes | 0.12 |
| H8 | Spending -> Esteem | Yes | 0.10 |
| H9 | Spending -> Social | Yes | 0.17 |

Figure 2 illustrates the path diagram with the estimated parameters.

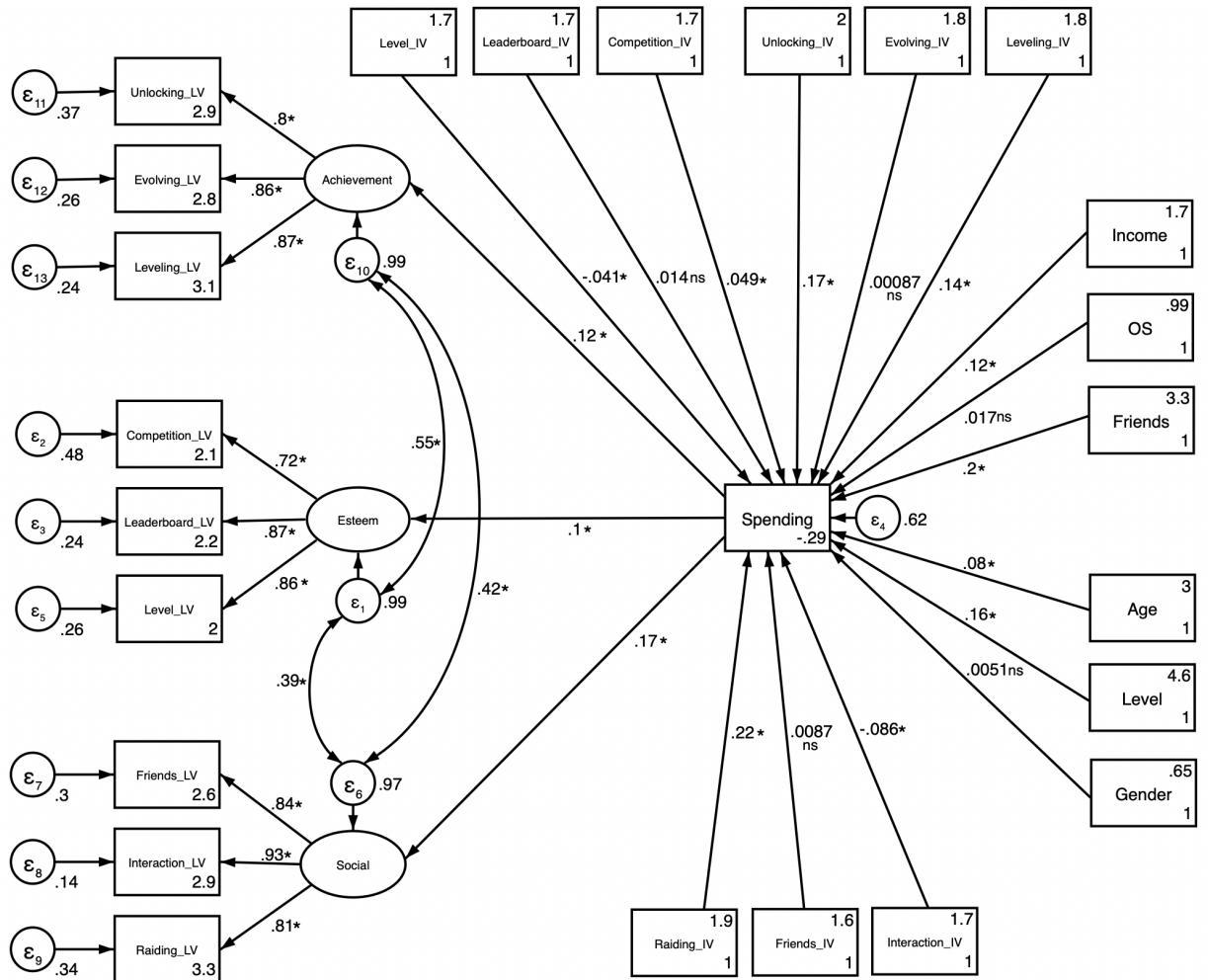


Figure 2. Path diagram with standardized estimates, variances, and covaried factors. Significant associations are marked with an asterisk (*), while non-significant associations are labeled "ns." Though based on the research model from Figure 1, this diagram was created in Stata, resulting in a different layout.

Table 7 provides detailed parameter estimates for the independent variables, constructs, and their indicators.

Table 7 Parameter Estimates

| Standardized | Coef. | Std. Err. | z | P>z | [95% Conf. Interval] | |
|----------------------|--------------|------------------|----------|---------------|-----------------------------|------------|
| Spending ← | | | | | | |
| Age | 0.0802895 | 0.0133435 | 6.02 | 0.000 | 0.0541368 | 0.1064422 |
| Gender | 0.00507 | 0.0115242 | 0.44 | 0.660 | -0.017517 | 0.027657 |
| OS | 0.0169556 | 0.0113638 | 1.49 | 0.136 | -0.005317 | 0.0392281 |
| Income | 0.1180532 | 0.0125585 | 9.4 | 0.000 | 0.0934391 | 0.1426674 |
| Competition_IV | 0.0494621 | 0.0175669 | 2.82 | 0.005 | 0.0150317 | 0.0838925 |
| Leaderboard_IV | 0.013926 | 0.0184285 | 0.76 | 0.450 | -0.0221932 | 0.0500452 |
| Level_IV | -0.0410902 | 0.0199448 | -2.06 | 0.039 | -0.0801812 | -0.0019992 |
| Friends | 0.1982856 | 0.0131699 | 15.06 | 0.000 | 0.1724731 | 0.2240981 |
| Level | 0.1572292 | 0.0135399 | 11.61 | 0.000 | 0.1306913 | 0.183767 |
| Unlocking_IV | 0.1684079 | 0.0166221 | 10.13 | 0.000 | 0.1358293 | 0.2009865 |
| Evolving_IV | 0.0008708 | 0.0202197 | 0.04 | 0.966 | -0.0387591 | 0.0405008 |
| Leveling_IV | 0.1447838 | 0.0202353 | 7.16 | 0.000 | 0.1051234 | 0.1844442 |
| Friends_IV | 0.0086959 | 0.0198111 | 0.44 | 0.661 | -0.0301331 | 0.047525 |
| Interaction_IV | -0.0856148 | 0.0211945 | -4.04 | 0.000 | -0.1271552 | -0.0440743 |
| Raiding_IV | 0.2226791 | 0.0156676 | 14.21 | 0.000 | 0.1919712 | 0.253387 |
| _cons | -0.2871082 | 0.0603111 | -4.76 | 0.000 | -0.4053157 | -0.1689006 |
| Esteem ← | | | | | | |
| Spending | 0.1031003 | 0.014929 | 6.91 | 0.000 | 0.0738401 | 0.1323606 |
| Social ← | | | | | | |
| Spending | 0.1731349 | 0.0143087 | 12.1 | 0.000 | 0.1450903 | 0.2011795 |
| Achievement ← | | | | | | |
| Spending | 0.1195698 | 0.0148278 | 8.06 | 0.000 | 0.0905079 | 0.1486317 |

Table 8 shows the factor loadings, \sqrt{AVE} , and CR for each construct and Cronbach's α for the indicators.

Table 8 Validity and reliability measures

| Indicator | Factor | Var(e) | λ | λ^2 | AVE | \sqrt{AVE} | $\Delta=1-\lambda$ | $(\Sigma\lambda)^2$ | CR | Cronbach's α |
|----------------|-------------|--------|-----------|-------------|-------|--------------|--------------------|---------------------|-------|---------------------|
| Unlocking_LV | Achievement | 0.37 | 0.88 | 0.774 | | | 0.12 | | | |
| Evolving_LV | Achievement | 0.26 | 0.86 | 0.740 | | | 0.14 | | | |
| Leveling_LV | Achievement | 0.24 | 0.87 | 0.757 | 0.723 | 0.850 | 0.13 | 6.812 | 0.887 | 0.860 |
| Competition_LV | Esteem | 0.48 | 0.72 | 0.518 | | | 0.28 | | | |
| Leaderboard_LV | Esteem | 0.24 | 0.87 | 0.757 | | | 0.13 | | | |
| Level_LV | Esteem | 0.26 | 0.86 | 0.740 | 0.673 | 0.820 | 0.14 | 6.003 | 0.860 | 0.888 |
| Friends_LV | Social | 0.3 | 0.84 | 0.706 | | | 0.16 | | | |
| Interaction_LV | Social | 0.14 | 0.93 | 0.865 | | | 0.07 | | | |
| Raiding_LV | Social | 0.34 | 0.81 | 0.656 | 0.741 | 0.861 | 0.19 | 6.656 | 0.895 | 0.900 |

The factor loadings for all indicators exceed the acceptable threshold of 0.5 (Hair et al., 1998). Both the square root of the AVE ($\sqrt{AVE} > 0.5$) and composite reliability ($CV > 0.7$) meet acceptable criteria (Fornell & Larcker, 1981). Additionally, the \sqrt{AVE} exceeds the squared inter-correlation values, confirming discriminant validity (Fornell & Larcker, 1981). Cronbach's α also surpasses the acceptable threshold of 0.6 (Fornell & Larcker, 1981).

Model fit was assessed with RMSEA (90% CI) = 0.085 (0.083, 0.086), CFI = 0.832, TLI = 0.802, and SRMR = 0.143. Generally, a good fit is indicated by RMSEA < 0.06, CFI and TLI > 0.95, and SRMR < 0.08 (Hu & Bentler, 1999). However, we anticipated lower CFI and TLI due to the low correlations among variables like age, gender, and other independent variables. Despite this, the model fit values are deemed acceptable, and since most parameter estimates are significant and support the hypotheses, we consider the model valid.

Additionally, a simplified model excluding nine independent variables predicting spending was tested. This yielded the same parameter estimates and improved model fit, further validating the original model.

5. DISCUSSION

This section examines the independent, latent, and control variables and the implications of the findings.

5.1 Independent Variables (IV)

Raiding with friends emerged as the most significant predictor of spending (hypothesis H6c, $\beta = 0.22$), classified as a *high effect* (Mehmetoglu & Jakobsen, 2016). This feature,

highlighted in both the pilot and main surveys (mentioned 1,065 times in 4,359 qualitative responses), involves cooperative gameplay where players join forces to defeat a powerful enemy. Raiding not only fosters social connections but also helps unlock rare content, which explains its strong covariance with unlocking new content ($\beta = 0.98$). Prior research supports that social play and community engagement are key drivers of increased spending (Alomari, 2018; Hsiao & Chen, 2016; Hsieh & Tseng, 2018; Hamid and Suzianti, 2020; Hsu and Lin, 2016).

Raiding satisfies multiple player needs, as shown by its significant path coefficients to Social ($\beta = 0.4$), Esteem ($\beta = 0.32$), and Achievement ($\beta = 0.26$) factors. This suggests that raiding acts as a multidimensional construct, satisfying multiple motivations simultaneously. Beyond in-game benefits, raiding also strengthens social bonds through external coordination tools and community-building activities (Bhattacharya et al., 2019; Aal & Hauptmeier, 2019).

Unlocking new content was the second-strongest predictor of spending (hypothesis H5a, $\beta = 0.17$), which aligns with previous studies showing it as a primary motivator for in-app purchases (Hamari et al., 2017; Salminen et al., 2018). The third major factor was leveling up (hypothesis H5c, $\beta = 0.14$), reflecting the well-established link between progression systems and spending (Filho et al., 2014). Other independent variables (hypotheses H4a-H4c, H5b, H6a-H6b) showed minimal or no significant effects on spending. Two of the top three independent variables—unlocking new content and leveling up—are achievement-related, while raiding, although primarily social, also ties closely to achievement by unlocking exclusive rewards (see Table 3). This highlights the *central role of achievement mechanics in driving monetization in free-to-play games*.

5.2 Latent Variables (LV)

All latent variables had significant and robust associations with their indicators, with factor loadings ranging from Competition_LV <- Esteem (hypothesis H2a, $\beta = 0.72$) to Interaction_LV <- Social (hypothesis H3b, $\beta = 0.93$). These results support hypotheses H1a-H3c and answer *RQ1, indicating that Maslow's psychological and self-actualization needs can be fulfilled through games using the nine game features proposed in this study*.

Spending had *moderate effects* on all latent variables (Mehmetoglu and Jakobsen, 2016), supporting hypotheses H7-H9 and addressing *RQ2: spending increases the fulfillment of these needs*. Social needs showed the greatest increase with spending (hypothesis H9, $\beta = 0.17$). This finding aligns with previous studies showing that social factors drive virtual item purchases (Wang & Chang, 2014; Hamari et al., 2017; Hamari et al., 2019; Jang et al., 2019) and are a key reason for gaming (Valho & Hamari, 2019).

The second-largest effect of spending was on achievement needs (hypothesis H7, $\beta = 0.12$), followed by esteem needs (hypothesis H8, $\beta = 0.10$). While research directly linking esteem and achievement to game monetization is limited, related literature on game components offers relevant insights. Prior research has examined leaderboards,

leveling systems (Filho et al., 2014; Alomari et al., 2016; Alomari, 2018), status and social hierarchies (Shi et al., 2015; Mäntymäki, 2015), competition (Shi et al., 2015; Kao & Chiang, 2015; Alomari, 2018; Hamari et al., 2019; Hamid & Suzianti, 2020), self-presentation (Kim & Chan, 2007; Kordyaka et al., 2018), and content unlocking (Hamari et al., 2017; Salminen et al., 2018). Although these studies do not directly measure esteem or achievement, they examine related mechanics and effects.

The overlap between esteem and achievement needs is also notable. High-level achievements can improve leaderboard positions and status, which in turn boost esteem. This is consistent with research showing that game elements such as leaderboards, rankings, and competitive rewards serve both achievement and esteem motivations by providing recognition, social comparison, and status (Kim & Chan, 2007; Mäntymäki, 2015; Kordyaka et al., 2018). This link is further supported by research indicating that successfully overcoming challenges in games can directly enhance players' self-esteem (Malone, 1980). This overlap explains the high covariance ($\beta = 0.55$) between Achievement and Esteem.

5.3 Control Variables (CV)

The *number of friends in Pokémon GO* had a significant influence on spending ($\beta = 0.2$), supporting previous research on the role of social connections driving spending (Wohn, 2014; Shi et al., 2015; Jang et al., 2018; Wang & Zaman, 2019). Although the number of friends was not a significant independent variable for increased spending in the main model, having more friends still correlates with higher spending. This may be explained by the integration of friends with core game features such as raiding, which can enhance both enjoyment and spending. Additionally, experienced players, who typically have larger friend networks, tend to spend more, as shown by the significant covariance between number of friends and player level ($\beta = 0.53$).

Player level, which reflect overall game time, also had a notable effect on spending ($\beta = 0.16$). This aligns with research indicating that longer playtime often increases spending by boosting retention (Alhirz & Sajeev, 2015; Atcharyachanvanich et al., 2015; Hsiao & Chen, 2016; Balakrishnan & Griffiths, 2018; Appel et al., 2020). However, other studies have found that playtime is not a significant predictor of purchase intention in Pokémon GO (Hsiao et al., 2019). Age showed a *small effect* on spending ($\beta = 0.08$), while income showed a *moderate effect* ($\beta = 0.12$). Operating system and gender did not have significant effects, which is consistent with recent findings (Hsiao et al., 2019).

5.4 Implications

Reversing the arrows in the model (Figure 1) produces small negative path coefficients for Achievement \rightarrow Spending ($\beta = -0.04$), Esteem \rightarrow Spending ($\beta = -0.08$), and a non-significant Social \rightarrow Spending. These negative coefficients suggest that *as players' needs are satisfied, there is less motivation to spend money*. This aligns with the idea that if a game fully meets a player's needs, there is less motivation to spend additional

money. Conversely, when needs remain unmet, players are more likely to spend to reach satisfaction.

This concept relates to the *designed inconvenience hypothesis* (Hamari, 2015), which proposes that game designers deliberately introduce inconveniences to encourage in-game purchases. For example, limited inventory space in Pokémon GO forces players to buy extra storage to continue collecting items. Hamari (2015) found that greater enjoyment in games was negatively associated with the intention to purchase virtual goods, suggesting that unmet needs or inconveniences can drive spending.

In Pokémon GO, features like raid passes are intentionally limited, pushing players to spend money for more frequent participation and higher satisfaction. This indicates a U-shaped relationship between satisfaction and spending: moderate restriction of satisfaction can help maximize revenue. For example, the weekly free remote raid pass and daily free normal raid pass in 2022 may offer enough satisfaction to encourage additional purchases, as indicated by the 325 mentions of “remote” in responses in our survey regarding spending motivations.

Unlike raiding, other features like unlocking content are more straightforward and do not address multiple needs simultaneously. This suggests that features which fulfill multiple psychological needs may be more profitable. Game designers should therefore prioritize developing elements that address achievement, esteem, and social needs simultaneously, as seen with raiding. However, in line with the designed inconvenience hypothesis, games should avoid fully satisfying these needs without a cost. Instead, they should offer partial fulfillment that motivates players to spend for enhanced experiences.

Balancing enjoyment and designed inconvenience is crucial. While enjoyment is vital for retention and revenue (Stefany, 2014; Chen et al., 2017), too much satisfaction can reduce purchase intentions (Hamari, 2015; Hamari et al., 2018; Hamari et al., 2020). This may help explain why lower-rated games that incorporate designed inconvenience sometimes generate higher revenue than top-rated games (Alha et al., 2016). Nonetheless, a game must remain enjoyable to retain players, as retention is critical for sustained revenue. Without adequate retention, players will leave, and monetization opportunities will decline. Satisfying experiences also boost purchase intentions (Stefany, 2014; Chen et al., 2017). The key is to create a game experience that encourages spending while maintaining player engagement. Effective game design involves a strategic interplay between satisfaction and monetization, ensuring that psychological needs are addressed while incentivizing in-game purchases.

5.5 Limitations

The data were collected through non-probabilistic sampling, with surveys posted in public groups on a voluntary basis. As a result, findings are specific to this sample and cannot be generalized to all Pokémon GO players. The sample consisted of highly experienced players, likely spending more than the average player; results might differ with a randomized sample.

Systematic error could have arisen from the phrasing of questions about the nine independent variables predicting spending. Using "determining factor" in the questions might have led to lower ratings; alternative phrasing like "important" or "possible" might have yielded more balanced results. The data showed high positive skewness, with many participants giving low scores on these items, which is reflected in low path coefficients for several independent variables. For example, while previous studies link competition with increased spending (Hamari et al., 2019), alternative wording might have resulted in higher coefficients and supported additional hypotheses.

Additionally, the sample was more experienced than expected, with most players above level 40. Segmenting this group further might have been useful but is unlikely to have significantly altered the results. Finally, the number of friends a player has may be more indicative of play intensity than social interaction, as players often add many random individuals for rewards and progress.

6. CONCLUSIONS

This study is the first to apply Maslow's hierarchy of needs to analyze players' purchasing behavior in a video game. The results from a three-factor structural equation model indicate that specific game features address players' needs for belongingness, esteem, and self-actualization, and players are willing to pay for in-app purchases to further satisfy these needs. However, when these needs are fully met, spending decreases, suggesting that players are less inclined to spend if their psychological and self-actualization needs are already satisfied. This finding aligns with research indicating that enjoyment can reduce spending, highlighting that game designers might strategically limit satisfaction to encourage further spending.

The *top three game-specific factors* driving spending in Pokémon GO were *raiding with friends*, *unlocking new content*, and *leveling up*. Notably, raiding had the most significant effect, as it integrates all three of Maslow's needs. Raiding is restricted, but players can spend money to participate more frequently, enhancing their fulfillment of psychological and self-actualization needs. Thus, raiding not only directly impacts these needs but also mediates increased spending.

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Use of Data and Ethical Declaration

This study did not involve the collection or processing of personal or sensitive data as defined by Norwegian regulations. All survey responses were fully anonymous, and no information was gathered that could directly or indirectly identify individual participants. In accordance with national guidelines, ethical approval from the Norwegian Agency for Shared Services in Education and Research (Sikt) was therefore not required. The same principles apply to participants under the age of 17, for whom stricter data protection rules are in place; however, as no personal data were collected, these additional measures were not applicable.

In preparing this manuscript, Grammarly and ChatGPT were used solely to refine grammar and improve clarity of expression; no AI tools were employed for generating content or conducting the research.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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APPENDIX

Appendix A

Table of Pokémon GO Facebook groups used for data collection:

| Facebook group name | Facebook group ID | Members in May 2021 [thousands] | Survey used for | Data collection initiated | Data collection ceased |
|--|-------------------|---------------------------------|-----------------|---------------------------|------------------------|
| Pokemon Go Worldwide (Official) | 1330869733593308 | 198.8K | Main | 2nd May 2021 | 7th May 2021 |
| Pokémon GO Worldwide FRIEND CODES (Official) | pokego | 64.9K | Main | 30th April 2021 | 7th May 2021 |
| Pokémon go friends code exchange group | 295235504597912 | 62.6K | Main | 1st May 2021 | 7th May 2021 |
| Pokémon GO Worldwide | gopokemongogame | 62.9K | Main | 30th April 2021 | 1st May 2021 |
| Pokémon Go Worldwide Friend Codes | 1189350011234648 | 28.1K | Main | 1st May 2021 | 7th May 2021 |
| Pokemon Go Norge | 1565239027114192 | 17.2K | Pilot | 6th March 2021 | 7th March 2021 |

Appendix B

Measurement items as phrased in the survey (refer to Table 8 for validity and reliability measures of the factors):

Measurement items for indicators related to the factor “Achievement”

- Unlocking new content in PG gives me a feeling of self-realization through progress and/or achievement
- Evolving or powering up my Pokémon gives me a feeling of self-realization through progress and/or achievement
- Leveling up my Pokémon trainer gives me a feeling of self-realization through progress and/or achievement

Measurement items for indicators related to the factor “Esteem”

- Competition with other players gives me a feeling of respect and/or status
- Having the best or rarest Pokémon among my friends gives me a feeling of respect and/or status
- Being at the highest level among my friends gives me a feeling of respect and/or status

Measurement items for indicators related to the factor “Social”

- Having friends in PG gives me a sense of belonging and/or connectedness
- Interaction with other players gives me a sense of belonging and/or connectedness
- Raiding with friends gives me a sense of belonging and/or connectedness

Measurement items for IVs related to Social features used to predict spending behavior

- Having friends in PG is a determining factor for me to spend money on IAPs
- Interactions with other players is a determining factor for me to spend money on IAPs
- Raiding with friends is a determining factor for me to spend money on IAPs

Measurement items for IVs related to Esteem features used to predict spending behavior

- Competition with other players is a determining factor for me to spend money on IAPs
- Having the best or rarest Pokémon among my friends is a determining factor for me to spend money on IAPs
- Being at the highest level among my friends is a determining factor for me to spend money on IAPs

Measurement items for IVs related to Achievement features used to predict spending behavior

- Unlocking new content in PG is a determining factor for me to spend money on IAPs
- Evolving or powering up my Pokémon is a determining factor for me to spend money on IAPs
- Leveling up my Pokémon trainer is a determining factor for me to spend money on IAPs

Measurement items for CVs

- My age is
- My highest level Pokémon Go (PG) trainer is
- My number of friends in PG is
- My gender is
- My yearly income in USD is
- My operating system is

Measurement item for spending

- Over a whole year I would spend on average the following amount in USD on IAPs in PG