BI Norwegian Business School - campus Oslo

# GRA 19703

Master Thesis

Thesis Master of Science

Gotta catch ‘em all: The effects of game mechanics on usage intensity and user experience in gamification


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|---|---|
| Start: | 15.01.2019 09.00 |
| Finish: | 01.07.2019 12.00 |

# GRA 19702 - Master Thesis

## MSc in Strategic Marketing Management

# Gotta catch ‘em all:

## The effects of game mechanics on usage intensity and user experience in gamification

**Study programme:**
MSc in Strategic Marketing Management

**ID numbers:**

**Hand-out date:**
15.01.2019

**Hand-in date:**
01.07.2019

**Supervisor:**
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**BI Norwegian Business School, campus Oslo**

# Acknowledgements

We would like to sincerely thank our supervisor, Professor Erik Olson of the BI Norwegian Business School, for his passionate supervision and encouragement throughout the project from August 2018 to July 2019. Professor Olson always willingly helped whenever we needed a steering hand from an experienced researcher. We would also like to thank Professor Olson for the freedom he provided us, allowing us to make this research our own work.

A thank you is also in place for the Pokémon Go brand community in Oslo, Norway, and the global online Pokémon Go community, for welcoming us and contributing with their experiences about the game for our research purposes.

# Abstract

The present paper examines gamification and which effects the common game mechanics *missions, contest, streaks* and *luck* have on consumers. Specifically, the paper examines how these game mechanics influence usage intensity and user experiences through the mediators flow and stress. Moreover, the study investigates if and how gamification increases the likelihood of becoming addicted to a gamified application in order to create awareness of the potential ethical issues regarding gamified design. The research was conducted through two studies. Study 1 was an ethnographic study of Pokémon Go among brand community members in Oslo, Norway. Study 2 provided quantitative triangulation of the ethnographic findings through a survey among Pokémon Go users ($N$ = 1,540). Results found that the usage intensity of a gamified application increased significantly from flow and stress. While flow enhanced the user experience, stress diminished it. Gamification also increased the likelihood of developing an addiction to the gamified application, mediated by flow and stress. The game mechanics *missions, contests* and *good luck* induced flow, while *streaks* created a fear of missing out, and *bad luck* led to frustration. Discussion of the current findings focuses on their contribution to extending academic knowledge of gamification's effects, and managerial guidelines for designing gamification in accordance with business objectives. Our findings suggest utilizing *contests* and *missions* for objectives related to user experiences, such as improving user satisfaction and customer-brand relationships. Objectives related to usage intensity, such as stimulating micro-transactions or ad revenue, is best served through the implementation of *luck* and *streaks*.

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# 1 Introduction

In today's digital world, the fight for consumers' attention and time is fiercer than ever, and marketers aim to create loyalty to their products and services. To do so, the concept of gamification has become a trending tool in the business world (Hamari, Koivisto & Sarsa, 2014, p. 3025), defined as "the use of game design elements in non-game contexts" (Deterding, Dixon, Khaled & Nacke, 2011, p. 9). Examples range from friend streaks on Snapchat, health and fitness challenges on smart watches, points-based tiers in airline bonus programs, even to the experience of swiping and matching with other users on online dating apps. In fact, due its widespread use, the gamification market is estimated to grow from $4.91 billion in 2016 to $12 billion in 2021 (Business Wire, 2019).

Despite the increased managerial interest in gamification, academia has failed to explain which effects it has on consumers and their brand relationships. Without an underlying academic understanding, managers lack knowledge on how to effectively apply gamification in accordance with their business objectives. Thus, there is both an academic and a managerial need for more insight on gamification and its mediators and moderators.

The present paper examines the effects that different game mechanics used in gamification have on consumers. We investigate how the game mechanics *missions, contests, streaks* and *luck* affect the usage intensity and user experience of a gamified application through the induction of flow and stress.

Flow is a state achieved by immersion in everyday activities and individuals' strive to achieve specific goals (Csikszentmihalyi, 1988a). By allowing users to achieve goals and obtain rewards through everyday activities, gamification can increase user engagement and enjoyment. For example, millions of Apple Watch users worldwide report living more active lives because of the smart watch's daily activity challenges and competitions with friends.

On the other hand, gamification might evoke feelings of pressure, frustration or a fear of missing out – all factors that lead to stress. The social media platform Snapchat has garnered attention to such negative effects through its use of daily *streaks*. Mass media and parents show great interest in youths' pressure to maintain and fear of missing their *streaks* with friends (Laeder, 2018, p. 6-7). Furthermore, the example of Snapchat raises an important question of the addictive potential inherent in gamification. Addressing this question can start a discussion about the ethics of using game mechanics to get users 'hooked'.

Hence, we also investigate if and how gamification increases the likelihood of developing an addiction to a gamified application.

Through two studies, an ethnographic fieldwork and a survey, we delve into the world of Pokémon Go. Here, we explore how this application uses game mechanics to achieve a strong and loyal user base – one that spends nearly every waking hour trying to catch ‘em all. We find that game mechanics induce both flow and stress among users, resultantly increasing their usage intensity and user experience. Simultaneously, we find that users who experience more flow and stress increase their likelihood of developing an addiction to the gamified application. These findings provide an important academic contribution that expands and connects the fields of gamification, product development and marketing. Furthermore, it offers managerial implications on how to design gamification that contributes to the achievement of important business objectives.

# 2 Literature review

## 2.1 Gamification

Due to its behavioral influence and motivational potential, the use of game design elements outside of traditional games have gained extensive attention. This practice is widely known as gamification, which Deterding et al. (2011, p. 9) define as "the use of game design elements in non-game contexts".

With its broad use, it might be difficult to establish a clear scope of gamification. An important distinction is between *serious games* and *gamified applications*. Serious games are full-fledged game designs as found in video games, while gamified applications need only contain some of the gamified elements from such games (Brathwaite & Schreiber, 2008; Deterding et al. 2011, p.11). In other words, serious games, by incorporating gamified elements, are a form of gamified applications, although gamified applications are not necessarily serious games.

### 2.1.1 Effects on motivation, usage intensity and user experience

The common purpose of gamification is to encourage participation and increase engagement through emotional involvement and motivation to achieve certain goals (Dale, 2014, p. 85-89). This is stimulated by using game elements (Rigby & Ryan, 2011; Sailer, Hense, Mayr & Mandl, 2017). Particularly, gamification has a significant effect on intrinsic needs satisfaction, by fulfilling the needs for

competence, social relatedness and autonomy through task meaningfulness (Sailer et al., 2017; Ryan & Deci, 2000, p. 56).

While the majority of extant research on gamification show positive effects on usage intensity (frequency and duration) and user experience, results have been conflicting as some found negative effects (Dong et al., 2012; Li, Grossman & Fitzmaurice, 2012; Montola, Nummenmaa, Lucero, Boberg & Korhonen, 2009; Hamari et al., 2014). Extant academic research provide no explanation for these conflicting findings, as research have mainly been limited to descriptive results without inferring about relationships between constructs (Hamari et al., 2014). Based on this, we propose the following research questions:

***RQ1:*** *Does the implementation of gamified elements in a product affect usage intensity?*
***RQ2:*** *Does the implementation of gamified elements in a product affect user experience?*

## 2.2 Internet gaming addiction

Internet gaming addiction is defined as a "persistent and recurrent use of the Internet to engage in games, often with other players, leading to clinically significant impairment or distress as indicated by five (or more) [criteria] in a 12-month period" (Kuss, 2013, p.131; American Psychiatric Association, 2013). The criteria include (1) *preoccupation with internet games*, (2) *withdrawal symptoms*, (3) *tolerance* (need to engage in increased amounts of gaming), (4) *inability to control usage*, (5) *loss of previous interests*, (6) *use despite negative consequences*, (7) *deception*, (8) *mood modification*, and (9) *jeopardizing or losing a relationship, job and similarly important aspects of life* (Kuss, 2013, p.131; American Psychiatric Association, 2013).

Since internet gaming addiction literature is mainly based in psychology, it provides a limited understanding of how gamified design can cause addiction. By incorporating internet gaming addiction literature into a marketing and product design perspective, we introduce flow and stress as two paths to internet gaming addiction. Further, we investigate how different game mechanics contribute to these two paths (section 2.3).

### 2.2.1 Flow and internet gaming addiction

The concept of flow is important in the context of addictive behavior and user experiences. Flow accounts for the pleasure found by individuals' immersion in everyday activities and strive to achieve specific goals (Csikszentmihalyi, 1988a,

1988b, 1997; Csikszentmihalyi & Csikszentmihalyi, 1988; Nakamura & Csikszentmihalyi, 2002; Sherry, 2004). Csikszentmihalyi (1993; Sherry, 2004) describes flow as a state, characterized by (1) *intense and focused concentration*, (2) *merging of action and awareness*, (3) *loss of reflective self-consciousness*, (4) *distortion of temporal experience*, (5) *a sense of control* and (6) *an intrinsically rewarding experience*. Video games are one of the activities most likely to create a flow state (Sherry, 2004, p. 339).

Studies on the correlation between flow and addiction have been conflicted. A number of studies find that flow is associated with addiction (Chou & Ting, 2003; Seah & Cairns, 2007; Kuss & Griffiths, 2012). Khang, Kim and Kim (2013) refer to media flow as the stage prior to media addiction, and Young (1999) and Wan & Chiou (2007) argues that the enjoyment experienced in the state of flow positively reinforces addictive media use. This has been found to increase game persistence, which over time develops into, and reinforces, addictive behavior (Chumbley & Griffiths, 2006).

Contrary, other studies find a negative correlation between flow and addiction (Wan & Chiou, 2006; Kuss & Griffiths, 2012). Yee (2006a; 2006b) argue that addicted users do not experience flow, because addiction by definition excludes enjoyment. Further, Khang et al. (2013) theorize that users develop a tolerance to media through repeated and addictive use, which inhibits the experience of flow. On the other hand, they find that users seek stronger stimuli to make up for the development of tolerance, thus pursuing behavior that characterize them as being addicted to the state of flow.

The contradicting findings regarding flow's mediation of addiction constitutes a weakness in flow literature. Therefore, we find it necessary to investigate the following research question:

> ***RQ3:*** *Does flow increase the risk of developing addictive behavior towards a gamified application?*

### 2.2.2 Stress and internet gaming addiction

Stress is defined as "the process by which any highly challenging, uncontrollable, and overwhelming emotional or physiological event or series of events result in adaptive or maladaptive processes requires to regain homeostasis and/or stability" (Sinha & Jastreboff, 2013, p. 827; Sinha, 2008; McEwen, 2007). According to

Weiten (2007), there are four major types of stress: (1) *frustration*, (2) *conflict*, (3) *change* and (4) *pressure*.

Stress is related to a feeling of losing control and mastery, often resulting in emotions such as irritation, emotional drain and exhaustion (McEwen, 2007). Often, individuals engage in cognitive coping processes to deal with these emotions (Lazarus, 1993). This is shown by Lescop & Lescop (2014) to be used actively in gamified design, where developers aim to control and release users' stress using game mechanics and built-in coping mechanisms.

Research on stress and internet gaming addiction is scarce, despite a significant amount of academic literature covering the effect of stress on substance addiction. Individuals often engage in addictive behavior to cope with tensions caused by stress (Goeders, 2003; Sinha, 2008), and behavior that develops into addiction is often motivated by its ability to cope with stress (Kuss & Griffiths, 2012). The counterintuitive nature of this relationship is that addiction itself can induce stress or anxiety (Goeders, 1997; Goeders, 2002), meaning that the addictive behavior becomes self-reinforcing. Although these findings provide interesting indications, we cannot generalize them, since they were done in a strict scope of substance abuse. With the following research question, we aim to extend extant research on stress and addiction:

> ***RQ4:*** *Does stress increase the risk of developing addictive behavior towards a gamified application?*

## 2.3 Game mechanics

Game mechanics are the components used in gamified design (Dale, 2014, p. 84; Zichermann & Cunningham, 2011, p. 36). Game mechanics generate game dynamics (Ruhi, 2015, p. 8), which is the gamified application's behavior in reaction to player inputs, actions and choices (Hunicke, LeBlanc & Zubek, 2004). When subjected to game dynamics, users experience emotional responses. Hence, one could argue that game mechanics affect usage intensity and user experience, through eliciting emotional responses such as flow and stress.

Academia provides limited research on the specific effects of different game mechanics on usage intensity and user experience, having failed to explore which factors mediate this relationship. The present study aims to make this contribution, by investigating the prevalent game mechanics *missions*, *contests*, *streaks* and *luck* in the context of flow and stress.

***RQ5:*** *Which game mechanics (if any) induce or interrupt flow?*
***RQ6:*** *Which game mechanics (if any) induce or reduce stress?*

In the next sections, we build a basis for these RQs by discussing the possible relationships between the four game mechanics and elements of flow and stress.

### 2.3.1 Missions

*Missions* require a set of behavior from users in order to solve problems and enable specific rewards (Kappen & Nacke, 2013; Dale, 2014, p. 85). *Missions* are for example found in the daily activity goals on Apple Watch, which challenges users to exercise for 30 minutes every day to achieve activity badges.

According to Csikszentmihalyi (1997), flow occurs only when there is a balance between the task's difficulty and the individual's skill level. Users can indulge in *missions* at their own pace to overcome challenges, providing them with flexibility and a sense of control that should help induce flow (Jegers, 2009, p. 95). Furthermore, *missions* can require users to engage in intense concentration and immersion, and completing such *missions* is likely to fulfill their need for competence (Sailer et al., 2017). It is therefore reasonable to argue that *missions* as a game mechanic should be flow-inducing.

On the other hand, should *missions* be designed in such a way that completing the task is too difficult, it might remove users' sense of control, which in turn could create pressure and frustration (Weiten, 2007).

### 2.3.2 Contests

*Contests* are game mechanics from which users receive rewards for beating a set of competitors (Kappen & Nacke, 2013; Dale, 2014, p. 85), thereby introducing social elements to the gamified application. As an example, Apple Watch users compete with their friends to see who is the most active throughout a week.

In a marketing context, contests often take place in brand communities (BCs), defined as "a specialized, non-geographically bound community, based on a structured set of social relationships among users of a brand" (Muniz & O'Guinn, 2001, p. 412). No research has investigated gamification in BCs, although studies have found that BC participation in general lead to a higher level of brand commitment and engagement (Wirtz et al., 2013, p. 235; Casaló, Flavián, & Guinalíu, 2007), similar to elements of flow.

Contrary, BC participation has also been shown to establish normative pressure, in which participants feel pressured to conform with the community's

general opinions and behavior to preserve consumer-brand community identification (Algesheimer, Dholakia & Herrmann, 2005, p. 30-31). Although no extant research explicitly investigates this relationship, the existence of normative pressure in BCs suggest that *contests* can induce stress, as pressure is classified as one of the main types of stress (Weiten, 2007).

### 2.3.3 Streaks

*Streaks* have users perform an unbroken chain of daily actions to achieve rewards. In Snapchat, every continuous day of interactions with friends increase users' *streaks*, which is shown to induce addictive behavior (Laeder, 2018, p. 6-7).

A main characterization of *streaks* are their time constraints on how and when progress can be made – often, only once per day. This creates a limitation on users' task control, which should interrupt the state of flow that stems from a user's sense of control and ability to achieve goals (Csikszentmihalyi, 1993; Sherry, 2004; Jegers, 2009).

Despite identifying that *streaks* increase the risk of developing an addiction among social media users (Laeder, 2018; Pendergrass, 2018), no research has attempted to investigate which mechanisms explain this phenomenon. However, other academic fields provide interesting indications. Fear of missing out (FOMO) is "a pervasive apprehension to be absent from rewarding experiences" (Przybylski, Murayama, DeHaan & Gladwell, 2013). When absent from the gamified application, we suggest that users might experience stress due to their fear of missing out on time-constrained rewards and progress from *streaks*. Users engage in the gamified application as a cognitive coping process to reduce this stress, consistent with Lazarus (1993). Although extant research has established the link between stress and FOMO, academia does not discuss how gamified design facilitates and moderates this effect.

### 2.3.4 Luck

*Luck* is a randomized and probability-based game mechanic that determines if users obtain certain rewards (Dale, 2014). An example is Coca-Cola's Shake It campaign (Kuo, 2013) where users were randomly selected to earn rewards and discounts when using an app.

The effects of *luck* should be strongly dependent on the outcome. To our knowledge, no academic literature has attempted to investigate the possibly polarizing effect of *good* and *bad luck*.

When users experience *good luck* in a gamified application, it helps them achieve their goals and creates an intrinsically rewarding experience, which in turn is a characteristic of flow (Csikszentmihalyi, 1993; Sherry, 2004).

On the other hand, should a user encounter *bad luck*, they will most likely experience frustration as it inhibits their goal achievement. *Bad luck* creates a situation with low controllability and predictability, and the resulting frustration of being unlucky should therefore cause stress (Levine, 2000).

# 3 Study context

The context of our studies is the mobile video game Pokémon Go. While our earlier discussion focuses on non-game applications of gamification, we identify Pokémon Go as an application that incorporates all the focal game mechanics of the present paper. This allows us to investigate all game mechanics in a uniform setting, meaning that the results are not affected by confounds that would present themselves if we used different gamified applications to investigate separate game mechanics in isolation.

Further, Pokémon Go implements these game mechanics in a way that is consistent with non-game applications of gamification, such as the examples described in our literature review. Therefore, we expect findings from Pokémon Go to be generalizable to several other gamified applications. The game also has a large user base and active BC from which data can be readily collected.

Our study design consists of two stages of data collection: Study 1 is an ethnographic study of the Pokémon Go BC in Oslo, Norway. By conducting exploratory ethnographic research, we gain access to a group of product users eliciting the behaviors that we want to better understand. Further, we develop a firsthand understanding of what impact our focal game mechanics have on users, through observation and experience. Moreover, as academic literature on game mechanics is scarce in the context of marketing, an exploratory study helps us gather useful insights on how topics covered in our literature review are related. The findings from our ethnographic fieldwork can help us fill gaps in academic literature, allowing us to develop a theoretical framework of gamification. Importantly, through ethnographic fieldwork, we are able to observe existing addictive behavior and thus avoid ethical issues that would arise if we were to use intervening research methods.

Based on our ethnography, we develop a theoretical framework and propose hypotheses. Study 2 provides quantitative triangulation through a survey conducted among BC participants to test and quantify our ethnographic findings.

## 3.1 About Pokémon Go

Pokémon Go is a mobile video game developed and released by software developer Niantic, Inc. In the game, users can catch the fictional creatures Pokémon in the real world, through the game's incorporation of geographical location and augmented reality. Users walk around in their neighborhoods or travel to new places to catch different Pokémon species, and battle friends. The goals of the game are to collect all Pokémon species, level up and collect badges.

Due to social aspects of Pokémon Go, joint online and offline BCs devoted to the game is an important part of the user experience. In Oslo, Norway, the local BC, Pokémon Go - Oslo & Akershus, have more than 9,500 members on Facebook as of January 2019. Through their online engagement, the BC arranges meet-ups and events in the real world.

### 3.1.1 Game features in Pokémon Go

When catching a Pokémon, users are rewarded Candies and Stardust. Candies are used to evolve Pokémon to new species, and Stardust to increase Pokémon's strength. Users also walk certain distances to hatch eggs, from which they receive Pokémon. In addition to Pokémon, the map in Pokémon Go features PokéStops and Pokémon Gyms. From PokéStops, users pick up Research Objectives, which are missions they complete in order to gain various rewards. The game also features a friendship system, where friends compete against one another in Trainer Battles. Battling in Pokémon Go is also done in teams, through Raid Battles, where groups gather to defeat and catch rare Pokémon together.

Through these features, Pokémon Go utilizes the game mechanics *missions*, *contests*, *streaks* and *luck* to engage and incentivize users to play.

- ***Missions*** are present through Research Objectives and Raid Battles that users complete in order to receive rewards and progress in the game.
- ***Contests*** take place mainly through Trainer Battles, which are often organized through BC participation.

- ***Streaks*** are featured in the game through a number of tasks that yield daily rewards when completing them several days in a row, such as daily PokéStop spins, daily Pokémon catches, and daily Research Objective completion.
- ***Luck*** is implemented in Pokémon Go through the randomization of egg hatches and an implementation of shiny Pokémon, which are rare special editions that have a probability of approximately 1/450 to appear when encountering a Pokémon (The Silph Road, 2019).

# 4 Study 1: Ethnographic fieldwork

## 4.1 Methodology

Our fieldwork consists mainly of participant observation among BC members in Oslo, Norway. Data collection lasted for 2 months, from January to March 2019. During this period, we observed discussions in online chat groups and forums, and participated in monthly events and organic meet-ups to play the game and conduct informal interviews. We documented our observations and interviews through field notes, photography and transcribed interview recordings.

The research team consisted of two researchers. Of these, one (researcher 1) had prior experience with the game and BC, while the other (researcher 2) had no prior experience. The experience of researcher 1 helped us gain access to the BC and special events, while researcher 2 acted as a neutral participant that was able to observe events and conduct interviews without bias. Both researchers acted as participant observers, and through their experience were therefore able to describe the results with more precision and validity.

## 4.2 Interpretive analysis

The analysis of data from the ethnographic fieldwork was conducted at three levels. In the first level of analysis, we individually reflected on the data, and compared it to previous data as well as our expectations from the literature review. The second level of analysis was done in weekly meetings on a group level, where we compared data, discussed themes, findings and discrepancies, and identified focus areas for subsequent data collection. During the third level of analysis, we conducted an intense study of all recorded data from the fieldwork, and critically reviewed and elaborated on the data to identify our findings.

## 4.3 Procedure

Throughout the study period, we devised a structured fieldwork schedule with sessions dedicated to activities that allowed us to thoroughly investigate specific

RQs and areas of interest. In addition, we had open sessions with the objective of obtaining a general overview of the usage and experience of the game, and to generate findings that might not have been covered by our literature review and RQs. Table 4.3 details our data collection procedure.

***Table 4.3:*** *Ethnographic fieldwork schedule*

| Date(s) | Session focal point | Session gameplay |
|---|---|---|
| Jan 12, 2019 | *Luck* | Community Day event |
| Jan 16-18, 2019 | General overview | Observation and participation in BC |
| Jan 19, 2019 | *Missions* and *luck* | Field Research Day event |
| Jan 22, 2019 | *Missions* | Raid Battles |
| Jan 25-26, 2019 | General overview | General play with a focus on usage intensity and user experience |
| Jan 27, 2019 | *Contests* | Boulder Cup tournament |
| Jan 28-Feb 3, 2019 | *Streaks* | Maintaining streaks |
| Feb 5, 2019 | *Missions* | Special Research and Field Research missions, general play |
| Feb 16, 2019 | *Luck* | Community Day event |
| Feb 23, 2019 | *Missions* and *luck* | Field Research Day event |
| Feb 24, 2019 | *Contests* | Twilight Cup tournament |

# 5 Ethnographic findings

In this section, we discuss our ethnographic findings, structured in accordance with the RQs. Based on our findings, we propose hypotheses that help further verify our findings.

## 5.1 Gamification's effect on usage intensity and user experience

With regards to RQ1, informal interviews uncovered that users mostly play Pokémon Go for Raid Battles (*missions*), Special Research (*missions*), Trainer Battles (*contests*), Gym Battles (*contests*), shiny Pokémon (*luck*) and egg hatching (*luck*), indicating that gamified elements increases usage intensity. During our fieldwork, we also found ourselves drawn towards the elements of the game that incorporated game mechanics.

> "You might think that Pokémon Go is a game for kids. However, some of the older users are definitely the most engaged. Some users structure their life around the game, challenging themselves to have the best Trainer Battle teams, or to be able to complete a Raid with the least amount of players, get the most shiny Pokémon, or be the first to complete Special Research missions." (Magnus, lvl 40).

Indications from our fieldwork show that users' usage intensity reflect several characteristics of addictive behavior (section 5.2 and 5.3). One user spent 10,000 NOK monthly on Raid Battles and egg hatching, and had completed 5,000 Raid Battles in a period of 1.5 years. Another user walked approximately 90 km weekly while playing the game, overcoming significant health issues in doing so. On Feb 16, an active BC participant started playing the game at 4:00 AM in freezing cold to prepare for an upcoming event.

Further, we investigated RQ2. Our findings indicate that the user experience improved after the introduction of the game mechanics *missions, contests* and *luck,* while it decreased as a result of *streaks*. Users reportedly enjoy being challenged and having goals to work towards, which was facilitated by game mechanics.

> "When the mechanisms were introduced to the game it became a lot more fun to play, and it increased my interest in playing. There are emotions in this game, such as enjoyment, relief or even frustration, and that is a strong motivator to play." (Truls, lvl 40).
>
> "I actually just re-downloaded the game on my phone this past weekend. I saw my GF [editor's note: girlfriend] was playing secretly on her own and I was so surprised how much Niantic had poured into the game. Me and my GF had so much fun playing together. Boosted myself from level 3 to level 17 and did my first raid and gym battle with her help." (nelsonavocado, posted on r/thesilphroad, Sep 4, 2018).
>
> "I enjoy that there is more to do together [with friends] such as the raids and such. We have so much fun doing so. On community day we all go to a cemetery close by with lots of gyms and have a little community of people who all go there on those days and play." (chayes46, posted on r/thesilphroad, Sep 4, 2018).

In line with Hamari et al. (2014), our data indicates a positive relationship between gamification and usage intensity and user experience. We therefore propose that we will find the following main effects:

***$H_1$:*** *Gamification increases usage intensity of the gamified application*
***$H_2$:*** *Gamification improves the user experience of the gamified application*

## 5.2 Flow and addiction

Our fieldwork uncovered that gamification in Pokémon Go induce flow. Particularly, we observed that users had an intrinsically rewarding experience while engaging in the game, fulfilling their need for competence (through *missions*) and social relatedness (through *BC engagement*) (Sailer et al., 2017). Additionally, users stated that they often forget time while playing the game, indicating entering a state of flow (Csikszentmihalyi, 1993; Sherry, 2004).

As users progressed, achieving the same state of flow required them to increase their usage intensity. In the process, they showed signs of addictive behavior. A level 40 user told us that he in one month managed to achieve

progress similar to what casual players spent two years achieving. Other users also explained how the state of flow influenced their usage intensity:

> "I just become hypnotized, and I walk around without paying attention to the outside world. I am completely focused." (Edward, lvl 40).
>
> "I started playing the game to recover from health issues. After that, I've continued to play in the same way as before because it is fun. I grind [editor's note: play intensely with a single focus for the session] a lot." (Kenneth, lvl 40).
>
> "I'm kind of scared because I never get bored. [..] I love Pokemon [sic] Go, I really enjoy walking outside and catch Pokemon [sic], but I feel like I'm playing too much and I'm scared to play even more when Niantic will drop new features." (deklol37, posted on r/thesilphroad, Aug 27, 2017).

Hence, our fieldwork revealed that many players elicit an inability to control their usage when entering the state of flow, as they become consumed and preoccupied by the game's enjoyable features. Large groups of users play the game every day before and after work, which in turn affects other aspects of their life. In an encounter with a user on Jan 16, we were told:

> "I haven't played today, because I've been to work until now. I was actually supposed to meet someone right now, but decided that I had to complete some raids first." (Anonymous male, lvl unknown).

These findings are consistent with many of the characteristics of addiction (Kuss, 2013, p.131; American Psychiatric Association, 2013), showing that users experience preoccupation, tolerance, and an inability to control their usage.

Our findings indicate that the enjoyment from interacting with the game and the experience of flow have a positive effect on user experience, and at the same time increase usage intensity due to the development of tolerance. Hence, in their hunt for rewarding experiences, users become addicted to the state of flow. Therefore, we suggest that flow could lead to the development of internet gaming addiction, and hypothesize the following:

***$H_3$:*** *The experience of flow increases the likelihood of developing an addiction to a gamified application*
***$H_4$:*** *Flow increases the usage intensity of a gamified application*
***$H_5$:*** *Flow enhances the user experience of a gamified application*

## 5.3 Stress and addiction

Stress repeatedly emerged in our observations and conversations with users. Particularly, FOMO was found to be a key motivator of increased usage intensity among Pokémon Go users, especially through time-limited opportunities and events. Of particular significance, we observed that players engage in coping behavior for FOMO despite experiencing fatigue rather than enjoyment:

> "I don't play actively anymore, but every time there is an event, I have to go out and play. I find it stressful, but I don't want to miss out on anything that happens in the game now, because I might regret it in the future." (Terje, lvl 40).

> "[..] you can not just take a break, you'll miss things which you can NEVER get again." (PhantomPhoton, posted on r/thesilphroad, Jan 20, 2019).
>
> "Does anyone else feel like there are too many events? I've been playing since day one, spent a certain amount of money even though I promised myself I wouldn't. But Niantic has me constantly out there, moving my schedule around to be free for three hours to try and catch a shiny Clamperl, while I'm trying to keep the weekend generally free to catch a Shiny Latias. (Neither of which I've caught, after also walking around three hours whenever it was and not seeing a shiny Feebas.) Obviously my bad luck is part of the reason for my displeasure, but more generally I'm just getting tired. Pokemon [sic] is demanding too much of my time." (gafalkin, posted on r/thesilphroad, Feb 24, 2019).

During an event on Jan 19, users were visibly upset about the time-consuming tasks they had to complete, paired with a low probability of achieving a shiny Pokémon as a reward. However, users still stayed for the entirety of the event. When asked why, a group agreed that they would have felt unease by leaving and would ask themselves what they might have missed. Our observations indicate that FOMO leads to stress as a withdrawal symptom if users do not engage in the game during events. The coping mechanism is to engage in the behavior, and users told us that they even took time off from work to do so.

Furthermore, users exhibited an inability to control their usage. On multiple occasions, users completed tasks despite not enjoying them, to not miss out on the potential rewards. Additionally, users stayed out in the cold during the entirety of the events on Jan 12, Jan 19 and Feb 16 while fearing becoming sick, indicating continuous behavior despite negative consequences. These findings are consistent with characteristics of addiction (Kuss, 2013, p.131; American Psychiatric Association, 2013).

Pressure and frustration also emerged as stressors that increase usage intensity, stimulated by the game mechanics *contests* (normative pressure) and *luck* (frustration). Interestingly, we found that the intensity of the negative emotions increase in accordance with the usage intensity, in turn making users more determined to release tension.

Thus, we find an indication that addictive behavior and stress create a self-reinforcing cycle through inducing and releasing stress. This results in a negative loop of maladaptive behaviors that increase the risk of developing an internet gaming addiction, as indicated by Young (2009) and Kuss & Griffiths (2012). We therefore propose the following hypotheses:

***$H_6$:*** *The experience of stress increases the likelihood of developing an addiction to a gamified application*
***$H_7$:*** *Stress increases the usage intensity of a gamified application*
***$H_8$:*** *Stress diminishes the user experience of a gamified application*

Interestingly, our observations point to an interaction between stress and flow. Specifically, on events such as Community Days, FOMO was the main driver of usage intensity, getting users to go out and play. Subsequently, users experienced flow when engaging in *missions* and *luck*, leading them to enjoy the experience. Thus, Pokémon Go combines elements of stress and flow to increase usage intensity and user experience concurrently. As a result of our observation that stress has the strongest impact on behavior, we suggest the following hypothesis:

***$H_9$:*** *Stress has a stronger impact on usage intensity than flow*

## 5.4 Missions

Overall, our fieldwork experience and observations indicate that *missions* engage users by providing challenges and rewarding them through goal achievement and progress. According to users, the most enjoyable aspect of the game was the Special Research *missions* that provided them with a storyline filled with challenges and rare rewards.

> "Special researches have been of [sic] the most entertaining things to do in the game in a long time." (Tacote, posted on r/thesilphroad, Feb 11 2019).

> "Being Level 40 already, Special Research gives me goals to work towards." (redneckrockuhtree, posted on r/thesilphroad, Feb 11 2019).

While playing together with a group on Jan 12, we observed how Special Research *missions* motivate people to play. One of the participants, Camilla, finally managed to encounter a rare Pokémon she needed to catch in order to complete a mission. We observed her display of joy, and inquired her about it:

> "I always have fun when I complete missions. It can be difficult to complete them, but it's so satisfying when you do so. But then I also get a bit sad, since I have to wait for the next one." (Camilla, lvl 38).

Smaller, more immediate *missions* also stimulate flow by continuously providing small achievements and intrinsic rewards. In the process, *missions* induce a merging of action and awareness, distortion of temporal experiences, and a sense of control (Csikszentmihalyi, 1993; Sherry, 2004).

The challenges of *missions* might also create pressure for users if they find it difficult or beyond their skill level or control. On the other hand, we expect the effect of pressure to be relatively weak, since *missions* provide flexibility and let users control their progress. These findings suggest the following two hypotheses:

***$H_{10a}$:*** *The action of completing missions in a gamified application induces flow*
***$H_{10b}$:*** *The action of completing missions in a gamified application induces pressure*

## 5.5 Contests

During the Boulder Cup tournament on Feb 27, we observed that *contests* induce high tension and engagement among participants. Close battles created an adrenaline rush for users, who tapped their phones furiously and celebrated defeating their opponents. *Contests* provide an intrinsically rewarding experience for participants, which together with a balance between skills and challenges of close-fought battles, stimulate flow (Csikszentmihalyi, 1993; Sherry, 2004).

> "I had no expectations about this before going in to it, but when you see how the close battles are, you are of course engaged and can get a bit carried away." (Kenneth, lvl 40).

Consistent with extant research (Wirtz et al., 2013, p. 235; Casaló et al., 2007), our observations indicate that BC participation increases brand engagement. Participation in *contests* was mainly motivated by the opportunity to connect and engage with other BC participants.

> "If it weren't for the tournaments, I would probably not play much at the moment. It's a great way of getting out and meet like-minded users that you can talk to and discuss the game with." (Simon, lvl 40).

> "We don't really get any rewards for winning here, except for honor. The main reason I'm part of this is that it gives us an arena to engage with the community. We challenge each other, it gives us some extra objectives to play through preparations, and competing against these other players makes the game richer." (Edward, lvl 40).

On the other hand, some users withdrew from participating due to a pressure from the high skill level required to be competitive. This indicates a presence of normative pressure (Algesheimer et al., 2005, p. 30-31). Furthermore, driven by the pressure to be competitive, contest participants reported spending hours doing research online in preparation for the tournament.

> "I spend two hours every evening looking through Pokémon I've caught to determine which are worth keeping or not, with regards to battles. But right now, I don't think I would be competitive, so I haven't signed up for the tournament." (Truls, lvl 40).

> "I am preparing for the event by reading up on tips online, catching Pokémon, powering them up and making sure they have the right moves to be competitive and to meet the challenges I'll face. I use a calculator that calculates the stats of my Pokémon, and use that information to decide which one will be best suited for the event." (Torbjørn, lvl 40)

> "In addition to doing online research, I have spent 7 million stardust to prepare my Pokémon for the tournament." (Edvard, lvl 40)

We form the following hypotheses to investigate these findings further:

> ***$H_{11a}$:*** *Participating in gamified contests among BC participants induces flow*
> ***$H_{11b}$:*** *Participating in gamified contests among BC participants increases normative pressure*

## 5.6 Streaks

Throughout our observations, users reported being frustrated by *streaks* in Pokémon Go, as they feel it takes away their sense of control and hinders them in

making progress. These characteristics show the effects of *streaks* to be obverse from the characteristics of flow, indicating that *streaks* are flow-interrupting (Csikszentmihalyi, 1993; Sherry, 2004; Jegers, 2009).

> "It's frustrating when you have to have a certain number of days on a streak to achieve rewards. It makes progress slower, and don't let us set our own tempo in the game." (Magnus, lvl 40).
>
> "I find streaks annoying, because you have to do something without controlling when you want to do it. You have until midnight, and that's it." (Silje, lvl 37).

At face value, *streaks* do not seem to create the same amount of FOMO among Pokémon Go users as initially expected. The consensus seems to be that the few users who care about maintaining their *streaks* are never in a situation where they risk losing them, as they complete them while engaging in other aspects of the game. We should therefore be careful about generalizing these findings.

> "I haven't missed a streak in the two years I have been in the game. But at the same time, I don't stress about it. I maintain them because I play anyway, but I wouldn't stress too much if I missed them. It's easy to catch up again." (Truls, lvl 40).
>
> "I never go out just to maintain a streak, but whenever I go out for other reasons, I make sure to open the game and do what is required to maintain them." (Silje, lvl 37).

Furthermore, since *streaks* are tasks that are difficult to observe, we had to rely on informal interviews to collect information about users' view on *streaks*. While many stated that *streaks* are not important to them, we do find it curious that users still report having maintained *streaks* every single day since they were introduced in the game. These results might therefore be influenced by a social desirability bias or self-reporting errors. However, our own experiences are consistent with the finding that *streaks* simply become routine tasks, but we recognize that they might develop into such because of FOMO.

Based on this, we hypothesize the following:

***$H_{12a}$:*** *The action of maintaining streaks in a gamified application interrupts flow*
***$H_{12b}$:*** *The action of maintaining streaks in a gamified application induces FOMO*

## 5.7 Luck

Investigation of *luck* came mostly from observations of emotional responses during shiny hunting on Community Days. Our observations and fieldwork experience indicate that *bad luck* creates frustration among users, due to it hindering them in achieving a specific goal (Weiten, 2007). Additionally, *luck* is low on controllability and predictability, further increasing the experience of stress (Levine, 2000). Interestingly, frustration leads users to increase their usage intensity. We observed that *bad luck* increases their determination to turn their

luck around and achieve their goal. Moreover, the presence of time-limits seemed to moderate pressure, resulting in a significant effect both on users' emotions and usage intensity:

> "With just a few minutes left of the event, I was definitely stressed. I had to sprint in order to check one more, but I just managed to do so. And then I got a shiny Pokémon on the last one! I understand that it is about random luck, but of course we get frustrated when we don't get what we are working for. It's very frustrating, and you can get irritated." (Truls, lvl 40).

> "I feel like an addict that can't get her fix. My job is a spawn point, and Ponyta and Cubone are spawning out the [censored]. I've caught about 70 ponyta [sic] – and not a single shiny. A new ponyta [sic] pops up and my heart races and I click and I cry." (rizcriz, posted on r/pokemongo, Nov 6, 2018).

On the other hand, when users experienced *good luck*, it created an immediate mood change. Users' previous frustration turned to joy in an instant, and they reported feeling relief, becoming more motivated to play and enjoying the experience more. When a participant that had been unlucky during an event on Jan 12 finally encountered her first shiny Pokémon, she joyously exclaimed "Yes I finally found one!". She further explained:

> "Now, I got a real energy boost. Suddenly, the cold weather and my flu isn't an issue anymore. When you get that shiny, your mood turns in an instant." (Camilla, lvl 38)

The change in luck seemed to be intrinsically rewarding, as users finally achieve their goals and receive the reward they have been working for. This indicates a link between *luck* and the experience of flow (Csikszentmihalyi 1993; Sherry, 2004). Interestingly, we also observed that the more *bad luck* users experienced, the more satisfying the *good luck* was perceived. Our findings indicate that *good* and *bad luck* indeed have polarizing effects, where *good luck* induces flow and *bad luck* induces stress. We therefore propose the following hypotheses:

***$H_{13a}$:*** *The experience of good luck in a gamified application induces flow*
***$H_{13b}$:*** *The experience of bad luck in a gamified application induces frustration*

# 6 Study 2: Quantitative triangulation

Study 2 consist of an online survey that obtains quantitative data in order to triangulate and quantify the effects from our ethnographic findings, and test the hypotheses generated from Study 1.

We employed a cross-sectional approach to our survey design and analysis. The population of the study is active users of Pokémon Go, with an estimated population of 147 million active users as of May, 2018 (Phillips, 2018). 1,540 members of the two Pokémon Go online BCs *r/pokemongo* and *Pokémon*

*Go - Oslo & Akershus* participated in the survey, which was distributed online in March, 2019 using a non-probability, convenience sampling.

In order to test the hypotheses developed from our ethnography, we measured levels of usage intensity, user experience, addiction, flow and stress experienced by respondents. Usage intensity and user experience were measured on continuous single-item scales (Appendix B). The items internet gaming addiction, flow and stress were measured on a balanced seven-point bipolar Likert scale, ranging from "strongly disagree" (-3) to "strongly agree" (3). We used multi-item scales to capture the different dimensions of these constructs, adapting items from validated scales by Lemmens, Valkenburg and Peters (2009) for internet gaming addiction, Jackson and Marsh (1996) for flow, and Przybylski et al. (2013) for FOMO (Appendix B). The inclusion of constructs was informed by our ethnographic findings, aiming to provide content validity. Our study design also included measurement of relevant control variables (Appendix A).

To remove response-order biases, the scales measuring flow, stress and addiction were mixed and randomized. With the use of online distribution, we minimized social desirability bias by eliminating human interference. Further, to minimize self-selection bias, we offered an unrelated incentive for participating by selecting three participants who received a gift bag sponsored by a large Nordic confectionery company.

## 6.1 Pre-test

To ensure the unambiguity of our questions, we conducted a two-stage pre-test consisting of qualitative interviews and a small-scale quantitative study.

For the qualitative interviews, we distributed the survey directly to seven individuals in Norway and asked them to provide feedback. This allowed us to get in-depth information about participants' interpretation and understanding of the questions' wording and meaning, as well as ensuring that the length and structure of the survey was manageable for participants.

After making the necessary adjustments, a small-scale quantitative study was carried out in the same way as planned for the main study. We distributed the survey to members of a closed Facebook chat group (consisting of 100 members) for Pokémon Go users in a small geographic area of Oslo. By doing so, we were able to gain indications on whether the data would allow us to conduct the necessary analysis to test our hypotheses.

# 7 Results

## 7.1 Data cleaning

Through manual exploration of the initial data set (1,540 respondents), we removed respondents who did not belong to the population of active Pokémon Go players (0 hours played per week). Further, we also found extreme numbers that were inaccurate, such as reporting more hours played or having more spare time weekly than number of hours in a week. These respondents were also removed. For the variables *Usage intensity* and *Spare time*, some respondents provided a range instead of one specific number (for example 20-30). In such instances, we recoded the answer by using the middle point of their provided range.

## 7.2 Data exploration

The final data set consisted of 1,374 respondents, of which 68.3% were male ($n$ = 938) and 31.5% female ($n$ = 433), with 3 missing values. The average age of respondents was 27.63 years ($SD$ = 8.66, $Q1$ = 21, $Q3$ = 31, range 13-67). 50.5% ($n$ = 694) of respondents reported to be full-time employed, while 37.6% ($n$ = 517) were students. This indicates that males and students seem to be overrepresented in the population, which is not unexpected based on other academic research on gaming (Ghuman & Griffiths, 2012).

The average weekly amount of time spent playing was 11.87 hours, but the data indicated a great amount of heterogeneity ($SD$ = 10.78). On a scale from 0-100, participants rated their enjoyment of playing the game highly ($M$ = 83.43, $SD$ = 11.07), indicating a substantially positive user experience.

## 7.3 Gamification main effects

To assess $H_1$ and $H_2$, we used One-Sample T-Tests. $H_1$ states that gamification increases usage intensity of a gamified application. On the item "I spend more time playing Pokémon Go after the introduction of these game features", participants report a significant increase in their usage intensity ($M$ = 1.91, $SD$ = 1.34), $t(1373) = 53.02$, $p < .001$, after the introduction of gamified elements in the game. This finds support for $H_1$.

Furthermore, $H_2$ hypothesizes that gamification improves the user experience of a gamified application. The item "I enjoy playing Pokémon Go more after the introduction of these game features" finds significant support for $H_2$ ($M$ = 2.10, $SD$ = 1.11), $t(1373) = 53.02$, $p < .001$. Thus, we conclude that

gamification has the potential to increase both usage intensity and user experience of a gamified application.

***Table 7.3:*** *Overall measures of flow and stress*

| Construct | Item | Operationalization |
|---|---|---|
| **Flow** | *Action-awareness merging* | I do things spontaneously and automatically without having to think |
| | *Distortion of temporal experience* | Time seems to speed up |
| | *Intrinsically rewarding experience* | I find the experience to be rewarding |
| **Stress** | *FOMO* | It bothers me when I miss an opportunity to take part in things that are happening in the game |
| | *Frustration* | I become frustrated by things in the game |
| | *Pressure* | I feel a sense of pressure to keep up with other players |

## 7.4 Determinants of usage intensity

To assess $H_4$ (Flow increases the usage intensity of a gamified application) and $H_7$ (Stress increases the usage intensity of a gamified application), we used stepwise regression with the item *Usage intensity* (hours played per week) as the DV.

As IVs, we included overall flow (3 items) and stress (3 items) measures, as well as the control variables *Spare time* and *Play with others.* Through backwards elimination, we removed insignificant variables one at a time. In four steps, we removed items *Frustration* ($p$ = .81), *Spare time* ($p$ = .49), *Pressure* ($p$ = .42), and *Action-awareness merging* ($p$ = .24). The item *Frustration* does not belong at a conceptual level, explaining its insignificance, while the three other items had too much variance to significantly predict usage intensity.

The final model includes the items *FOMO* ($\beta$ = .13, $p$ <.001*)*, *Distortion of temporal experience* ($\beta$ = .11, $p$ <.001*)*, *Intrinsically rewarding experience* ($\beta$ = .05, $p$ = .05*)*, and *Play with others* ($\beta$ = .09, $p$ <.001*)*. These results indicate that both elements of flow and stress increases usage intensity, in support of $H_4$ and $H_7$. *FOMO* has a more extreme coefficient than other IVs in the model. This supports $H_9$, stating that stress has a stronger impact on usage intensity than flow.

***Table 7.4:*** *Linear regression model for usage intensity*

| | *B* | *SE B.* | *ß* | *t* | *sig.* |
|---|---|---|---|---|---|
| (Constant) | 8.00 | .70 | | 11.52 | .00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $H_4$ | Distortion of temporal experience | .77 | .19 | .11 | 3.99 | .00 |
| $H_4$ | Intrinsically rewarding experience | .59 | .30 | .05 | 1.94 | .05 |
| $H_7$ | FOMO | .98 | .21 | .13 | 4.66 | .00 |
| | Percentage play with others | .03 | .01 | .09 | 3.37 | .00 |

*Note:* Fit for model $R^2 = .058$, $R^2_{Adj} = .055$, $F(4,1309) = 20.28$, $p < .001$

## 7.5 Determinants of user experience

In addition to their influence on usage intensity, we hypothesize that flow enhances the user experience of a gamified application ($H_5$) while stress diminishes it ($H_8$). Here, we conducted another stepwise regression, this time with *User experience* (enjoyment rating) as the DV.

Our initial set of IVs consisted of overall flow (3 items) and stress (3 items) measures, as well as the control variables *Play with others* and *Prior Pokémon knowledge*. Through backwards elimination, we removed insignificant variables in three steps. Items *Pressure* ($p = .76$), *Action-awareness merging* ($p = .21$), and *Prior Pokémon knowledge* ($p = .08$) were all removed.

The final model (Table 7.5) consists of the five items *Distortion of temporal experience* ($\beta = .12$, $p < .001$), *Intrinsically rewarding experience* ($\beta = .38$, $p < .001$), *FOMO* ($\beta = .09$, $p < .001$), *Frustration* ($\beta = -.18$, $p < .001$), and *Play with others* ($\beta = .11$, $p < .001$). As expected, flow variables have positive coefficients, supporting $H_5$. The coefficient of *Frustration* is negative, meaning that the experience of *frustration* diminishes the user experience. Surprisingly, *FOMO* has a positive coefficient, meaning that the experience of *FOMO* enhances user experience. Thus, we only find partial support for $H_8$.

***Table 7.5:*** *Linear regression model for user experience*

| | | *B* | *SE B.* | *β* | *t* | *sig.* |
|---|---|---|---|---|---|---|
| | (Constant) | 74.39 | .64 | | 115.93 | .00 |
| $H_5$ | Distortion of temporal experience | .88 | .18 | .12 | 4.92 | .00 |
| $H_5$ | Intrinsically rewarding experience | 4.37 | .28 | .38 | 15.59 | .00 |
| $H_8$ | FOMO | .66 | .20 | .09 | 3.35 | .01 |
| $H_8$ | Frustration | -1.21 | .17 | -.18 | -7.32 | .00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Percentage play with others | .04 | .01 | .11 | 4.43 | .00 |

*Note:* Fit for model $R^2 = .251$, $R^2_{Adj} = .249$, $F(5,1308) = 87.86$, $p < .001$

## 7.6 Likelihood of developing internet gaming addiction

$H_3$ and $H_6$ hypothesizes that the more flow ($H_3$) and stress ($H_6$) a user of a gamified application experiences, the more likely they are to develop an addiction to the gamified application. A linear regression model was used to assess the influence of flow and stress on likelihood of developing an addiction. Cronbach's alpha found the addiction scale to be sufficiently reliable (4 items; $\alpha = .69$), and these four items were subsequently coded into a single addiction index variable (*AddIndex*), which we used as a DV for the regression model.

Overall ratings of flow (*Action-awareness merging, Distortion of temporal experience, Intrinsically rewarding experience*) and stress (*FOMO, Frustration, Pressure*) were added as IVs in the regression model. The model accounts for 37% of explained variance in the population's addiction index ($R^2_{Adj.} = .37$, $F(6,1367)=135.14$, $p < .001$). All items reveal significant ($p < .001$) and positive beta coefficients (Table 7.6). Thus, we find support for $H_3$ and $H_6$, indicating that both flow and stress increase the likelihood of developing an addiction to a gamified application.

***Table 7.6:*** *Linear regression model for internet gaming addiction*

| | | *B* | *SE B.* | *ß* | *t* | *sig.* |
|---|---|---|---|---|---|---|
| | (Constant) | -1.08 | .05 | | -20.31 | .00 |
| $H_3$ | Action-awareness merging | .10 | .02 | .13 | 5.70 | .00 |
| $H_3$ | Distortion of temporal experience | .20 | .02 | .26 | 11.33 | .00 |
| $H_3$ | Intrinsically rewarding experience | .15 | .03 | .12 | 5.38 | .00 |
| $H_6$ | FOMO | .17 | .02 | .20 | 8.33 | .00 |
| $H_6$ | Frustration | .09 | .02 | .12 | 5.52 | .00 |
| $H_6$ | Pressure | .14 | .02 | .22 | 9.07 | .00 |

*Note:* Fit for model $R^2 = .372$, $R^2_{Adj} = .370$, $F(6,1367) = 135.14$, $p < .001$

## 7.7 Effects of game mechanics on flow and stress

Next, we turn our attention to the effects of game mechanics. We tested these hypotheses by using One-Sample T-Tests, and used a cluster analysis and

subsequent One-Way ANOVA to take a closer look at some variables and understand differences between different types of users.

### 7.7.1 Cluster analysis

In an effort to understand the heterogeneity among cases in our data, we used cluster analysis to generate more homogeneous subsamples. Using the four addiction items in a K-Means Clustering set to 3 clusters, we generated the optimal cluster solution (in 11 iterations) for our analysis.

Using a One-Way ANOVA and *Tukey HSD* to assess the differences between clusters (Appendix C), we found that the 3 clusters showed systematic differences across variables in the data set. Cluster 1 ($n$ = 416) systematically experienced significantly more flow and stress than Cluster 3 ($n$ = 440) across all scenarios, while Cluster 3 experienced significantly more flow and stress than Cluster 2 ($n$ = 518). The exception was items measuring pure enjoyment, where Cluster 1 was not significantly different from Cluster 3.

Demographically, males were predominant in Cluster 1 (66.7%), Cluster 2 (68.5%) and Cluster 3 (69.9%). The average age of Cluster 1 ($M$ = 29.74, $SD$ = 10.14) was slightly higher than Cluster 2 ($M$ = 26.49, $SD$ = 7.65) and Cluster 3 ($M$ = 26.99, $SD$ = 7.90). Our interpretation of these clusters are as follows: Cluster 1 are Addicts, who experience more flow and stress from the game, and play significantly more ($M$ = 15.98, $SD$ = 12.71) than other users. Cluster 3 are Fun-seekers, who play the game less ($M$ = 11.36, $SD$ = 8.97) than Addicts, but enjoy it as much nonetheless, while otherwise not experiencing the same degree of flow and stress. Cluster 2 are Casuals, who play the game less ($M$ = 8.99, $SD$ = 9.40) than other users, and do not experience significant flow and stress. Differences between the clusters are also significant and stable when measuring degree of flow and stress induced by the four game mechanics *missions*, *contests, stress* and *luck* (Appendix C).

### 7.7.2 Missions

$H_{10a}$ (The action of completing missions in a gamified application induces flow) and $H_{10b}$ (The action of completing missions in a gamified application induces pressure) were assessed through One-Sample T-Tests of flow and stress variables.

With regards to flow, we tested *Action-awareness merging, Distortion of temporal experience,* and *Intrinsically rewarding experience*. *Action-awareness merging* was not found significant ($M$ = -.02, $SD$ = 1.55), $t(1373)$ = -.47, $p$ = .64.

However, a One-way ANOVA reveals significant differences between clusters, $F(2, 1371) = 43.03$, $p < .001$. Cluster 1 experience *Action-awareness merging* ($M = .45$, $SD = 1.46$) when completing missions, while we do not find the same among Cluster 2 ($M = -.46$, $SD = 1.57$) and Cluster 3 ($M = .05$, $SD = 1.45$).

Further, a One-Sample T-Test unexpectedly finds that missions create a negative *Distortion of temporal experience* ($M = -.59$, $SD = 1.49$), $t(1373) = -14.64$, $p < .001$, in the opposite direction from our hypothesis. We do, however, find a significant presence of *Intrinsically rewarding experience* ($M = 1.45$, $SD = 1.16$), $t(1373) = 46.09$, $p < .001$, in missions. These results partially support $H_{10a}$, as there is an element of *Intrinsically rewarding experience* among all users, and an element of *Action-awareness merging* among Cluster 1, Addicts.

Stress was tested with the variables *Frustration* and *Pressure*. A One-Sample T-Test indicates that *Frustration* is not present when completing missions ($M = -.19$, $SD = 1.63$), $t(1373) = -4.21$, $p < .001$. However, respondents report feeling a slight sense of *Pressure* ($M = .32$, $SD = 1.82$), $t(1373) = 6.44$, $p < .001$, especially among Cluster 1 ($M = .88$, $SD = 1.72$), who are the users most involved in the game. Thus, our findings support $H_{10b}$.

### 7.7.3 Contests

One-Sample T-Tests were used to assess $H_{11a}$ (Participating in gamified contests among BC participants induces flow) and $H_{11b}$ (Participating in gamified contests among BC participants increases normative pressure).

Our results find significant support for the presence of all flow variables, *Intense and focused concentration* ($M = .71$, $SD = 1.60$), $t(267) = 7.30$, $p < .001$, *Skill-challenge balance* ($M = .50$, $SD = 1.49$), $t(267) = 5.54$, $p < .001$, and *Intrinsically rewarding experience* ($M = .93$, $SD = 1.43$), $t(1373) = 10.67$, $p < .001$. However, it is important to note that *Skill-challenge balance* is weak. These results support $H_{11a}$, and indicate that contest participation induces flow.

We tested *Pressure* both among contest participants and non-participants, in order to determine if *Pressure* is the reason that users choose not to participate in contests. For participants, *Pressure* in their preparation to contests is significant but weak ($M = .37$, $SD = 1.93$), $t(267) = 3.13$, $p < .01$. However, a One-Way ANOVA between clusters reveals significant main effects, $F(2, 1371) = 43.03$, $p < .001$. We find that Cluster 1 ($M = .88$, $SD = 1.88$) experience significantly more *Pressure* than Cluster 2 ($M = -.24$, $SD = 1.95$) and Cluster 3 ($M = .02$, $SD = 1.83$).

We did not, however, find that *Pressure* is a reason that users withdraw from contests ($M$ = -.37, $SD$ = 1.20), $t(475) = -3.99$, $p < .001$. Therefore, the results only find partial support for $H_{11b}$.

### 7.7.4 Streaks

To assess $H_{12a}$ (The action of maintaining streaks in a gamified application interrupts flow) and $H_{12b}$ (The action of maintaining streaks in a gamified application induces FOMO), we conducted One-Sample T-Tests of flow and stress variables.

The test did not find significant effects of *Action-awareness merging* ($M$ = -.06, $SD$ = 1.48), $t(1373) = -1.44$, $p = .15$, meaning that we cannot state that there is a presence of *Action-awareness merging* in maintaining streaks. *Distortion of temporal experience (*$M$ = -.62, $SD$ = 1.45), $t(1373) = -15.76$, $p < .001$, is found to be significant and negative, meaning that streaks interrupt this element of flow. However, *Intrinsically rewarding experience* ($M$ = .84, $SD$ = 1.32), $t(1373) = 23.62$, $p < .001$, is significant and positive, going in the opposite direction of our hypothesis. Therefore, we only find partial support of $H_{12a}$.

Addressing $H_{12b}$, a One-Sample T-Test of *FOMO* reveals a significant presence ($M$ = .55, $SD$ = 1.74), $t(1373) = 11.82$, $p < .001$, confirming $H_{12b}$, that streaks induce *FOMO*. Interestingly, a One-Way ANOVA between clusters show a significant main effect, $F(2, 1371) = 47.84$, $p < .001$. The presence of *FOMO* in Cluster 1 ($M$ = 1.14, $SD$ = 1.58) is significantly higher than in Cluster 2 ($M$ = .06, $SD$ = 1.80) and Cluster 3 ($M$ = .58, $SD$ = 1.63), meaning that streaks create significantly more *FOMO* among the most involved users.

### 7.7.5 Luck

A One-Sample T-Test of flow and stress variables was used to assess $H_{13a}$ (The experience of good luck in a gamified application induces flow) and $H_{13b}$ (The experience of bad luck in a gamified application induces frustration). Further, we tested users' *Determination to keep playing* when encountering bad luck.

The experience of good luck induces a significant presence of *Intrinsically rewarding experience* ($M$ = 2.14, $SD$ = .91), $t(1373) = 86.69$, $p < .001$, *Intrinsic motivation* ($M$ = 1.66, $SD$ = 1.22), $t(1373) = 50.46$, $p < .001$, and *Reinforcement of behavior* ($M$ = 1.91, $SD$ = 1.13), $t(1373) = 62.72$, $p < .001$. *Distortion of temporal experience* ($M$ = 0.27, $SD$ = 1.55), $t(1373) = 6.43$, $p < .001$, is significant, but the effect is weak. Significant main effects of *Distortion of temporal experience* are

found with a One-Way ANOVA between clusters, $F(2, 1371) = 63.94$, $p < .001$. Cluster 1 ($M = .79$, $SD = 1.38$) experiences a significantly larger *Distortion of temporal experience* than Cluster 2 ($M = -.28$, $SD = 1.57$) and Cluster 3 ($M = .42$, $SD = 1.49$). Based on these results, we find support for $H_{13a}$, indicating that good luck induces flow.

Respondents report experiencing a significant amount of *Frustration* ($M = 1.04$, $SD = 1.60$), $t(1373) = 24.19$, $p < .001$, when experiencing bad luck, supporting $H_{13b}$. Interestingly, respondents also experience significantly more *Determination to keep playing* and turn their fortunes around the more they experience bad luck ($M = .93$, $SD = 1.72$), $t(1373) = 20.06$, $p < .001$.

# 8 General discussion

With the use of the concepts of flow and stress, the present study aims to provide an understanding of the effects of gamification in marketing. We investigated the effects of four different game mechanics – *missions*, *contests*, *streaks*, and *luck* – that are frequently implemented in gamification. Through our studies, we uncovered their effects on addiction, usage intensity and user experience.

The implementation of gamified elements is shown to increase usage intensity among users, as well as enhance their user experience. These findings are consistent with the majority of research reviewed by Hamari et al. (2014), thus providing further support for the value of using gamification in marketing.

## 8.1 Flow and stress on usage intensity, user experience

The present study contributes to academia by establishing an understanding of how flow and stress mediate gamification's impact on usage intensity and user experience. Our studies show that gamified design should aim to induce flow and stress through appropriate game mechanics, as the experience of flow and stress both are shown to significantly increase the usage intensity of a gamified application. The experience of FOMO is the strongest driver of usage intensity, leading users to engage in the gamified application as a coping mechanism for their fear of being absent from rewarding experiences, consistent with past research (Przybylski et al., 2013). If it offers sufficient incentives, FOMO might even have the potential to re-engage non-active users.

Importantly, flow and stress also have a significant impact on how users experience the gamified application. The experience of flow strongly contributes to enhance the user experience, by providing users with intrinsic rewards and need

satisfaction that increase the perceived value of products or services. To improve user satisfaction and brand relationships, using game mechanics to induce flow might therefore be a powerful tool.

Contrarily, frustration has a strong negative effect on user experiences. Therefore, one should be careful about applying game mechanics that stimulate frustration, as it might have deteriorating long-term effects on brand relationships. In a time where a loyal and satisfied user base has a substantial influence on a company's value and stock price, this consideration is especially important.

Unexpectedly, FOMO has positive effects on user experience. This might be because users who experience FOMO have an increased usage intensity, and are more often exposed to elements that induce flow. Thus, although further research is needed to verify these results, FOMO has the potential to enhance user experience through flow while simultaneously increasing usage intensity. If coupled with flow-inducing elements, stimulating FOMO presents an interesting opportunity for managers to increase the impact of their gamification efforts.

## 8.2 Addiction to a gamified application

Should managers decide to implement gamification efforts, they are faced with an ethical dilemma. A significant number of users of a gamified application elicits symptoms of internet gaming addiction, and the present study finds that both the experience of flow and stress increase the likelihood of developing an addiction to a gamified application. Flow and stress as mediators might further academia's understanding of how internet gaming addiction and broader media addiction develops. With these findings, we also hope managers will be able to act more responsibly to an issue that is becoming increasingly common in society.

Stressors, in particular FOMO, is relieved through increased interaction with the gamified application. Thus, the present study connects the literature of Goeders (1997; 2002; 2003), Sinha (2008) and Lescop & Lescop (2014), showing that addictive behavior is self-reinforcing by in turn inducing and relieving stress.

While some previous studies found a negative relationship between flow and addiction (Wan & Chiou, 2006; Kuss & Griffiths, 2012; Yee, 2006a; Yee, 2006b; Khang et al., 2013), our study finds that users become addicted to the state of flow, supporting the conclusion of other extant research (Chou & Ting, 2003; Seah & Cairns, 2007; Kuss & Griffiths, 2012). Thus, the implementation of flow-inducing elements should not be exempt from ethical review by managers.

## 8.3 Game mechanics on flow and stress

The present study also contributes to academia by identifying how different game mechanics influence the impact of gamification. Although further research might be used to verify results in other contexts, our findings suggest the following regarding how game mechanics induce flow and stress.

### 8.3.1 Flow-inducing game mechanics

The strongest experiences of flow stem from the game mechanics *contests* and *good luck*, although also significantly induced by *missions*. The action of maintaining *streaks* interrupts flow, despite the received rewards having a weak positive effect.

Users who participate in *contests* experience a strong sense of flow due to their interaction with other BC participants, as it introduces social elements that increase their engagement. Therefore, *contests* should be most effective when social in nature, and in product categories where BC engagement already exist or can be stimulated. While *contests* are one way of achieving social interaction, these findings showcase a larger potential of facilitating brand engagement to induce flow and improve users' experiences.

Through helping users achieve their goals, *good luck* creates a strong intrinsically rewarding experience that leads to flow. *Good luck* also releases tension built from frustration, meaning that the more *bad luck* experienced previously, the stronger the induced flow should become (up to a threshold). This signifies the importance of finding the right balance between success and failure when implementing a *luck*-based mechanic. Guaranteeing *good luck* is not advisable, since it would diminish the perceived sense of achievement and intrinsic reward that comes from overcoming challenges (Csikszentmihalyi, 1993; Sherry, 2004). On the other hand, too many repetitions of *bad luck* could lead users to reach a threshold that discourages them from continued engagement.

*Missions* also significantly induce flow, although the effect is weaker than expected. However, we believe this to be an artifact of our operationalization in Study 2 where we only investigated one specific type of *mission*. Contrary, Study 1 found *missions* to have the strongest inherent flow-inducing potential among the four game mechanics. Our Study 1 results are consistent with extant research, which has found *missions*-characteristic game design to strongly induce flow (Sherry, 2004). Further research on *missions* in gamification should be done to verify these results.

### 8.3.2 Stress-inducing game mechanics

*Missions, contests, streaks* and *luck* all have a presence of stress-inducing elements, although with different effects. *Streaks* induce a strong experience of FOMO, suggesting that this game mechanic should be especially effective for increasing usage intensity. This supports past research on the use of *streaks* in social media (Laeder, 2018). Interestingly, the presence of FOMO is significantly stronger for the most involved users (Addicts). This might be due to them having invested more into their *streaks* and therefore stand to lose more by missing out, again indicating the self-reinforcing effect of addictive behavior in gamification.

Both *missions* and *contests* induce pressure among users. For *missions,* pressure stems from the sometimes challenging tasks. A middle ground is of essence here, as making *missions* so easy as to avoid creating pressure might also remove the skill-challenge balance that is characteristic of flow (Csikszentmihalyi, 1997). However, we recommend designing *missions* to be challenging, as the positive effects of flow are stronger than the negative effects of pressure in a *missions* context. For *contests*, competitiveness with other BC participants was important for users to preserve their BC identification, in turn creating normative pressure (Algesheimer et al., 2005, p. 30-31). However, this pressure can only be expected among users who are already active in the BC. A preponderance of study participants who had not previously participated in *contests* did not experience pressure. An understanding of the underlying factors for not participating in *contests* is required, since a higher rate of participation and engagement would increase the effectiveness of using *contests* in marketing.

Lastly, *bad luck* is a source of frustration due to users' inability to control outcomes. The frustration also becomes stronger when users observe others experiencing *good luck*, as they feel a sense of unfairness. Users become more determined to increase their usage intensity when frustrated by *bad luck*, as they seek to release tension. Moreover, *good luck* increases users' intrinsic motivation and reinforce their behavior. Hence, our findings suggest that both positive and negative outcomes of *luck*-based gamification stimulate increased usage intensity, pertaining to literature on gambling addiction (Parke & Griffiths, 2004).

# 9 Managerial implications

The present study outlines a new approach to gamified design based on business objectives. While we studied gamification in a game context, there is a clear

relevance for regular products, as the game mechanics investigated can and have been incorporated into non-game contexts.

Our findings resultantly provide several guidelines for managers looking to implement gamification in their marketing. However, we expect that achieving these effects require that the gamified application achieves a certain degree of involvement and engagement among users.

## 9.1 Linking gamification to business objectives

Using our findings, we connect gamification effects to business objectives. As a general recommendation, managers should first determine if their gamification efforts aim to improve the usage intensity or user experience of their product.

Usage intensity objectives should be used if aiming to increase micro-transactions, ad platform revenue or similar. When operating with usage intensity objectives, we recommend mainly utilizing *streaks* and *luck*, although *missions* and *contests* also increase usage intensity. As the main driver of FOMO, *streaks* offer an efficient way to increase usage intensity through increased usage frequency. *Luck* is found to strongly reinforce behavior both through *good* and *bad luck*, and should therefore increase usage duration.

As stress diminishes the user experience while flow improves it, usage intensity and user experience objectives are in some situations mutually exclusive. Managers operating with user satisfaction and customer-brand relationship objectives should implement flow-inducing game mechanics to improve the user experience. *Contests* induce flow and engage users by utilizing social elements, and *missions* stimulate intrinsically rewarding experiences to achieve the same effects. Simultaneously, pressure is the only stress variable induced by *contests* and *missions*, which does not diminish the user experience and thereby imposes little risk. Although *good luck* has the strongest effect on flow and therefore user experience, it is associated with a larger degree of risk, as *bad luck* induces frustration, which has a strongly negative effect on user experience.

***Table 9.1:*** *Recommended use of game mechanics related to business objectives*

| **Usage intensity** | **User experience** |
|---|---|
| Streaks | Contests |
| Luck | Missions |

## 9.2 Adapting gamification to different user groups

Our findings also suggest that the type of users might have a significant effect on which game mechanics are most impactful to implement. We divide different types of users into Addicts, Fun-seekers and Casuals.

Addicts experience a significantly stronger FOMO than other users, meaning that managers might find substantial benefits in using *streaks* to further increase their usage intensity. However, Addicts are also easily engaged by other game mechanics, meaning that they would most likely increase their usage intensity no matter which game mechanics are implemented.

Fun-seekers experience the same amount of pure enjoyment as Addicts, but significantly less stress. To engage Fun-seekers, managers should strive to make the gamified application intrinsically rewarding, which for Fun-seekers is best achieved through *missions* (Appendix C).

An important objective of gamification might be to increase engagement among those who are not as engaged in the gamified application, here referred to as Casuals. We find that Casuals' flow is most strongly induced by *good luck*. At the same time, they do not experience any significant frustration from *bad luck*, meaning that their user experience should be more positively influenced by *luck* than Addicts and Fun-seekers. *Missions* are also experienced as intrinsically rewarding, contributing to flow. *Streaks* do not induce FOMO among Casuals, meaning that the usage intensity will not increase by implementing this game mechanic. As Casuals do not experience significant amounts of stress from any game mechanic, we recommend using *luck* and *missions* to induce flow, with the potential of simultaneously increasing usage intensity and user experience.

These findings provide guidelines for which game mechanics to implement based on consumer insight, enabling managers to increase user engagement among important user groups.

## 9.3 Ethical issues regarding addiction

Lastly, it is important to be vary of how managers utilize gamification for business objectives. Our findings indicate that the flow and stress induced from gamification significantly increases the likelihood of users developing an addiction to the gamified application. When implementing gamification in their marketing efforts, managers should therefore design it in a way that discourages addictive behavior. Although the present study does not cover possible solutions to do so, this is an important avenue for future research.

# 10 Limitations and future research suggestions

Although our quantitative study finds significant results, some of the effects were weak. This was somewhat expected due to the self-reporting measures applied in the study design, providing some limitations despite triangulation with an ethnographic field study. Optimally, an experimental approach would have been used. However, this was not possible due to time and resource constraints, leaving us to conclude that an approach utilizing ethnography and survey was the most well-suited and ethical. Future research should attempt to replicate our findings through an experimental study design, manipulating and implementing game mechanics in different conditions. However, if such experiments are conducted, it is important to find an appropriate way of overcoming the ethical issues regarding addictive behavior connected to gamification.

Moreover, the present study looks at gamification through a game context. While the focal game mechanics are similarly present in multiple non-game contexts, we recognize that not all implementations of these game mechanics will have the same effect. More specifically, we believe that the degree of involvement inherent in the gamified application will moderate the amount of flow and stress induced by game mechanics. For example, *missions* are used both to incentivize Apple Watch users to reach their fitness goals, and to make LinkedIn members complete their profile information. It is reasonable to expect these two examples to induce substantially different degrees of flow. Future research should therefore investigate the effects of game mechanics in different product categories, based on degree of involvement both in the overall category and in the gamified design. We do also acknowledge that controls such as time limits and resource limitations (Ruhi, 2015; Dale, 2014) might moderate the effects of game mechanics. Based on the present study, future research might extend our findings and explore the moderating effect of controls on game mechanics.

Although not focal in the present study, our regression modeling finds that social elements significantly influence usage intensity and user experience. This finding might be extended in future research by investigating how the implementation of different social elements in marketing and product design stimulates user engagement, providing important managerial implications.

Our studies uncovered signs of addiction among users, despite the potential social desirability bias inherent in self-reporting measures. Hence, the risk of becoming addicted might in fact be higher than indicated by our findings,

if controlling for such biases. We therefore recommend extending our research by investigating the specific consequences of becoming addicted to a gamified application, such as losing jobs and friends or acquainting with new social groups.

The focal attention of the present study has been the psychological effects of gamification, and how these effects influence users' behavior and experience. We have not investigated the transactional side of gamification, which should be of substantial interest for academia and business alike. Our ethnographic findings indicated that transactions are a large part of the experience surrounding gamification and gaming, especially for highly involved users. Additionally, special equipment such as additional phones, wristbands and Nintendo Switch gaming consoles were discovered as accessories to Pokémon Go. Future research should aim to further investigate the transactional side of gamification.

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# Appendix A: Questionnaire (Study 2)

**How many hours do you play Pokémon Go in a typical 7-day week?**
Fill in the amount of hours below (only enter numbers). If you are unsure about your usage, some phones might show you the exact amount through an overview of your usage statistics.

_____

**Overall, how much do you enjoy playing Pokémon Go?**
Please provide your answer by placing the slider on a scale from 0 to 100, where 0 is "I do not enjoy it at all" and 100 is "I enjoy it a great deal".

| | 0 10 20 30 40 50 60 70 80 90 100 |
|---|---|
| Overall, how much do you enjoy playing Pokémon Go? |  |

**After the introduction of Pokémon Go, multiple features have been added, such as Raid Battles, Trainer Battles, shiny Pokémon, Research Objectives and Streaks.**

Please answer to what extent you agree with the following statements.

| | Strongly disagree (-3) | Disagree (-2) | Somewhat disagree (-1) | Neither agree nor disagree (0) | Somewhat agree (1) | Agree (2) | Strongly agree (3) |
|---|---|---|---|---|---|---|---|
| I spend more time playing Pokémon Go after the introduction of these game features | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I enjoy playing Pokémon Go more after the introduction of these game features | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

**How much money do you spend in Pokémon Go each month?**
Fill in the amount below, and please also provide the currency (e.g. USD, NOK).

_____

**When you play Pokémon Go, to what degree do you experience the following?**
Please answer to what extent you agree or disagree with these statements.

| | Strongly disagree (-3) | Disagree (-2) | Somewhat disagree (-1) | Neither agree nor disagree (0) | Somewhat agree (1) | Agree (2) | Strongly agree (3) |
|---|---|---|---|---|---|---|---|
| I do things spontaneously and automatically without having to think (1) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Time seems to speed up (2) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I find the experience to be rewarding (3) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| It bothers me when I miss an opportunity to take part in things that are happening in the game (4) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I become frustrated by things in the game (5) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I feel a sense of pressure to keep up with other players (6) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I have neglected other activities in my life to play Pokémon Go (7) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I often think about Pokémon Go even when I'm not playing the game (8) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| If I don't get to play Pokémon Go, I become stressed (9) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| I often play Pokémon Go for longer than intended (10) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

**In the next section, we are going to present you with different scenarios that players encounter when playing the game.**

We then ask how you would experience these different scenarios. When answering, we urge you to think about similar situations you have been in while playing the game, and how you experienced those situations.

Please read the scenario descriptions carefully before answering.

**You are out playing with your friends in a local park during a Community Day. After having played for a while, you <u>finally</u> find a shiny Pokémon.**
In this situation, to what degree do you experience the following? Please answer to what extent you agree with these statements.

| | Strongly disagree (-3) | Disagree (-2) | Somewhat disagree (-1) | Neither agree nor disagree (0) | Somewhat agree (1) | Agree (2) | Strongly agree (3) |
|---|---|---|---|---|---|---|---|
| I love the feeling and want to capture it again (1) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Time seems to speed up (2) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I find the experience to be rewarding (3) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I become more motivated to keep playing (4) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

**You are completing a number of Special Research tasks given to you by Professor Willow in order to catch a rare Mythical Pokémon.**
In this situation, to what degree do you experience the following? Please answer to what extent you agree with these statements.

| | Strongly disagree (-3) | Disagree (-2) | Somewhat disagree (-1) | Neither agree nor disagree (0) | Somewhat agree (1) | Agree (2) | Strongly agree (3) |
|---|---|---|---|---|---|---|---|
| I do things spontaneously and automatically without having to think (1) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Time seems to speed up (2) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I find the experience to be rewarding (3) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I become frustrated because the tasks are boring to complete (4) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I feel a pressure to complete the tasks quickly (5) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

**You are out playing with your friends in a local park during a Community Day. After having played for a while, you have <u>not</u> encountered any shiny Pokémon, despite having checked many.**

In this situation, to what degree do you experience the following? Please answer to what extent you agree with these statements.

| | Strongly disagree (-3) | Disagree (-2) | Somewhat disagree (-1) | Neither agree nor disagree (0) | Somewhat agree (1) | Agree (2) | Strongly agree (3) |
|---|---|---|---|---|---|---|---|
| I become frustrated by my bad luck (1) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I worry that Pokémon might despawn before I get to check if they're shiny (2) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The more time goes by, the more determined I become to keep playing until I find a shiny (3) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

**Have you competed in a Trainer Battle tournament with other members of your local Pokémon Go community?**

○ Yes (1)

○ No (2)

*Skip To: Q16 If Have you competed in a Trainer Battle tournament with other members of your local Pokémon Go comm... = Yes*

*Skip To: Q31 If Have you competed in a Trainer Battle tournament with other members of your local Pokémon Go comm... = No*

**When competing in a Trainer Battle tournament, to what degree do you experience the following?** Please answer to what extent you agree with these statements.

| | Strongly disagree (-3) | Disagree (-2) | Somewhat disagree (-1) | Neither agree nor disagree (0) | Somewhat agree (1) | Agree (2) | Strongly agree (3) |
|---|---|---|---|---|---|---|---|
| Before the tournament, I feel a sense of pressure to prepare in order to be competitive (1) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| My attention is focused entirely on what I am doing (2) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| The challenge and my skills are at an equally high level (3) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I find the experience to be rewarding (4) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

*Skip To: Q18 If When competing in a Trainer Battle tournament, to what degree do you experience the following? ... = Before the tournament, I feel a sense of pressure to prepare in order to be competitive*

*Skip To: Q18 If When competing in a Trainer Battle tournament, to what degree do you experience the following? ... = My attention is focused entirely on what I am doing*

*Skip To: Q18 If When competing in a Trainer Battle tournament, to what degree do you experience the following? ... = The challenge and my skills are at an equally high level*

*Skip To: Q18 If When competing in a Trainer Battle tournament, to what degree do you experience the following? ... = I find the experience to be rewarding*

*Skip To: Q18 If When competing in a Trainer Battle tournament, to what degree do you experience the following? ... =*

*Skip To: Q18 If When competing in a Trainer Battle tournament, to what degree do you experience the following? ... =*

*Skip To: Q18 If When competing in a Trainer Battle tournament, to what degree do you experience the following? ... =*

*Display This Question:*

*If Have you competed in a Trainer Battle tournament with other members of your local Pokémon Go comm... = No*

Have you heard about these tournaments being arranged in your local community?

- ○ Yes (1)
- ○ No (2)

*Skip To: Q18 If Have you heard about these tournaments being arranged in your local community? = No*

*Skip To: Q17 If Have you heard about these tournaments being arranged in your local community? = Yes*

Please answer to what extent you agree with the statement.

| | Strongly disagree (-3) | Disagree (-2) | Somewhat disagree (-1) | Neither agree nor disagree (0) | Somewhat agree (1) | Agree (2) | Strongly agree (3) |
|---|---|---|---|---|---|---|---|
| I did not compete in the tournament because I felt that I would not be competitive (1) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

**To maintain different streaks in the game (such as catch streak, PokéStop spin streak, and claiming research rewards), you have to complete various tasks before midnight.**

In this situation, to what degree do you experience the following? Please answer to what extent you agree with these statements.

| | Strongly disagree (-3) | Disagree (-2) | Somewhat disagree (-1) | Neither agree nor disagree (0) | Somewhat agree (1) | Agree (2) | Strongly agree (3) |
|---|---|---|---|---|---|---|---|
| My attention is focused entirely on what I am doing (1) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Time seems to speed up (2) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I find the experience to be rewarding (3) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I feel a sense of pressure to play the game (4) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| I worry about losing my progress (5) | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

**How much spare time do you approximately have in a 7-day week?**

A person working 8 hours and sleeping 8 hours a day have approximately 72 hours of spare time in a 7-day week, other commitments excluded.

Please fill in the amount of hours (only enter numbers).

_____

Do you play Pokémon Go mostly alone or with others? Please drag the marker to the right position.

| | Alone | | | | | | | | | With others |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| Do you play Pokémon Go mostly alone or with others? () |  | | | | | | | | | | |

**To what extent did you have prior knowledge about Pokémon before you started playing Pokémon Go?**

- ○ None at all (1)
- ○ A little (2)
- ○ A moderate amount (3)
- ○ A lot (4)
- ○ A great deal (5)

**What is your age?**

Please only fill in the number.

_____

**What is your gender?**

- ○ Male (1)
- ○ Female (2)

**Describe your professional life situation**

- ○ Student (1)
- ○ Part-time worker (2)
- ○ Full-time worker (3)
- ○ Out of work (4)
- ○ Retired (5)

# Appendix B: Scale development (Study 2)

| Construct | Items | Dimension |
|---|---|---|
| **Usage intensity** | How many hours do you play Pokémon Go in a typical 7-day week? | |
| **User experience** | Overall, how much do you enjoy playing Pokémon Go? | |
| **Addiction** | I have neglected other activities in my life to play Pokémon Go | Affecting other aspects of life |
| | I often think about Pokémon Go even when I'm not playing the game | Preoccupation with internet games |
| | If I don't get to play Pokémon Go, I become stressed | Withdrawal symptoms |
| | I often play Pokémon Go for longer than intended | Inability to control usage |
| **Flow** | I do things spontaneously and automatically without having to think | Action-awareness merging |
| | Time seems to speed up | Distortion of temporal experience |
| | I find the experience to be rewarding | Intrinsically rewarding experience |
| | I love the feeling and want to capture it again | Reinforcement of behavior |
| | I become more motivated to keep playing | Intrinsic motivation |
| | My attention is focused entirely on what I am doing | Intense and focused concentration |
| | The challenge and my skills are at an equally high level | Skill-challenge balance |
| **Stress** | It bothers me when I miss an opportunity to take part in things that are happening in the game | FOMO |
| | I become frustrated by things in the game | Frustration |
| | I feel a sense of pressure to keep up with other players | Pressure |
| | I become frustrated because the tasks are tedious | Frustration |
| | I feel a pressure to complete the tasks quickly | Pressure |
| | I become frustrated by my bad luck | Frustration |
| | I worry that Pokémon might despawn before I get to check if they're shiny | FOMO |
| | The more time goes by, the more determined I become to keep playing until I find a shiny | Determination |
| | Before the tournament, I feel a sense of pressure to prepare in order to be competitive | Pressure |
| | I feel a sense of pressure to play the game | Pressure |
| | I worry about losing my progress | FOMO |

*ANOVA*

| | | *SS* | *df* | *MS* | *F* | *sig.* |
|---|---|---|---|---|---|---|
| Missions: I do things spontaneously and automatically without having to think | Between Groups | 193.77 | 2 | 96.88 | 43.03 | .00 |
| | Within Groups | 3086.70 | 1371 | 2.25 | | |
| | Total | 3280.47 | 1373 | | | |
| Missions: Time seems to speed up | Between Groups | 276.67 | 2 | 138.34 | 68.95 | .00 |
| | Within Groups | 2750.52 | 1371 | 2.01 | | |
| | Total | 3027.19 | 1373 | | | |
| Missions: I find the experience to be rewarding | Between Groups | 27.97 | 2 | 13.99 | 10.48 | .00 |
| | Within Groups | 1829.54 | 1371 | 1.33 | | |
| | Total | 1857.52 | 1373 | | | |
| Missions: I become frustrated because the tasks are boring to complete | Between Groups | .59 | 2 | .29 | .11 | .90 |
| | Within Groups | 3665.09 | 1371 | 2.67 | | |
| | Total | 3665.68 | 1373 | | | |
| Missions: I feel a pressure to complete the tasks quickly | Between Groups | 262.83 | 2 | 131.42 | 42.14 | .00 |
| | Within Groups | 4276.08 | 1371 | 3.12 | | |
| | Total | 4538.91 | 1373 | | | |
| Contests: Before the tournament, I feel a sense of pressure to prepare in order to be competitive | Between Groups | 57.18 | 2 | 28.59 | 8.05 | .00 |
| | Within Groups | 941.25 | 265 | 3.55 | | |
| | Total | 998.43 | 267 | | | |
| Contests: My attention is focused entirely on what I am doing | Between Groups | 13.28 | 2 | 6.64 | 2.63 | .07 |
| | Within Groups | 669.60 | 265 | 2.53 | | |
| | Total | 682.88 | 267 | | | |
| Contests: The challenge and my skills are at an equally high level | Between Groups | 4.59 | 2 | 2.30 | 1.04 | .36 |
| | Within Groups | 586.41 | 265 | 2.21 | | |
| | Total | 591.00 | 267 | | | |
| Contests: I find the experience to be rewarding | Between Groups | 1.81 | 2 | .91 | .44 | .64 |
| | Within Groups | 544.98 | 265 | 2.06 | | |
| | Total | 546.79 | 267 | | | |
| Contests: I did not compete in the tournament because I felt that I would not be competitive | Between Groups | 5.52 | 2 | 2.76 | .69 | .50 |
| | Within Groups | 1888.87 | 473 | 3.99 | | |
| | Total | 1894.40 | 475 | | | |
| Streaks: My attention is focused entirely on what I am doing | Between Groups | 147.59 | 2 | 73.79 | 35.49 | .00 |
| | Within Groups | 2850.87 | 1371 | 2.08 | | |
| | Total | 2998.46 | 1373 | | | |
| Streaks: Time seems to speed up | Between Groups | 245.97 | 2 | 122.99 | 63.66 | .00 |
| | Within Groups | 2648.66 | 1371 | 1.93 | | |
| | Total | 2894.64 | 1373 | | | |
| Streaks: I find the experience to be rewarding | Between Groups | 16.71 | 2 | 8.36 | 4.81 | .01 |
| | Within Groups | 2382.02 | 1371 | 1.74 | | |
| | Total | 2398.73 | 1373 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Streaks: I feel a sense of pressure to play the game | Between Groups | 289.59 | 2 | 144.79 | 59.55 | .00 |
| | Within Groups | 3333.42 | 1371 | 2.43 | | |
| | Total | 3623.01 | 1373 | | | |
| Streaks: I worry about losing my progress | Between Groups | 270.45 | 2 | 135.23 | 47.84 | .00 |
| | Within Groups | 3875.07 | 1371 | 2.83 | | |
| | Total | 4145.52 | 1373 | | | |
| Good luck: I love the feeling and want to capture it again | Between Groups | 69.82 | 2 | 34.91 | 28.53 | .00 |
| | Within Groups | 1677.81 | 1371 | 1.22 | | |
| | Total | 1747.63 | 1373 | | | |
| Good luck: Time seems to speed up | Between Groups | 281.92 | 2 | 140.96 | 63.94 | .00 |
| | Within Groups | 3022.44 | 1371 | 2.21 | | |
| | Total | 3304.36 | 1373 | | | |
| Good luck: I find the experience to be rewarding | Between Groups | 11.44 | 2 | 5.72 | 6.91 | .00 |
| | Within Groups | 1135.56 | 1371 | .83 | | |
| | Total | 1147.00 | 1373 | | | |
| Good luck: I become more motivated to keep playing | Between Groups | 100.14 | 2 | 50.07 | 35.28 | .00 |
| | Within Groups | 1945.50 | 1371 | 1.42 | | |
| | Total | 2045.63 | 1373 | | | |
| Bad luck: I become frustrated by my bad luck | Between Groups | 145.32 | 2 | 72.66 | 29.59 | .00 |
| | Within Groups | 3366.06 | 1371 | 2.46 | | |
| | Total | 3511.38 | 1373 | | | |
| Bad luck: I worry that Pokémon might despawn before I get to check if they’re shiny | Between Groups | 181.85 | 2 | 90.93 | 27.34 | .00 |
| | Within Groups | 4559.81 | 1371 | 3.33 | | |
| | Total | 4741.66 | 1373 | | | |
| Bad luck: The more time goes by, the more determined I become to keep playing until I find a shiny | Between Groups | 283.53 | 2 | 141.77 | 51.27 | .00 |
| | Within Groups | 3791.18 | 1371 | 2.77 | | |
| | Total | 4074.71 | 1373 | | | |

**Tukey HSD**

| Dependent Variable | (I) Cluster # of Case | (J) Cluster # of Case | *MD* (I-J) | *SE* | *sig.* | 95% CI Lower Bound | 95% CI Upper Bound |
|---|---|---|---|---|---|---|---|
| Missions: I do things spontaneously and automatically without having to think | 1 | 2 | .91* | .10 | .00 | .68 | 1.14 |
| | | 3 | .41* | .10 | .00 | .17 | .65 |
| | 2 | 1 | -.91* | .10 | .00 | -1.14 | -.68 |
| | | 3 | -.50* | .10 | .00 | -.73 | -.27 |
| | 3 | 1 | -.41* | .10 | .00 | -.65 | -.17 |
| | | 2 | .50* | .10 | .00 | .27 | .73 |
| Missions: Time seems to speed up | 1 | 2 | 1.07* | .09 | .00 | .85 | 1.29 |
| | | 3 | .39* | .10 | .00 | .16 | .61 |
| | 2 | 1 | -1.07* | .09 | .00 | -1.29 | -.85 |
| | | 3 | -.68* | .09 | .00 | -.90 | -.47 |
| | 3 | 1 | -.39* | .10 | .00 | -.61 | -.16 |
| | | 2 | .68* | .09 | .00 | .47 | .90 |
| Missions: I find the experience to be rewarding | 1 | 2 | .32* | .08 | .00 | .14 | .50 |
| | | 3 | .05 | .08 | .80 | -.14 | .24 |
| | 2 | 1 | -.32* | .08 | .00 | -.50 | -.14 |
| | | 3 | -.27* | .08 | .00 | -.44 | -.09 |
| | 3 | 1 | -.05 | .08 | .80 | -.24 | .14 |
| | | 2 | .27* | .08 | .00 | .09 | .44 |
| Missions: I become frustrated because the tasks are boring to complete | 1 | 2 | -.05 | .11 | .90 | -.30 | .20 |
| | | 3 | -.04 | .11 | .94 | -.30 | .22 |
| | 2 | 1 | .05 | .11 | .90 | -.20 | .30 |
| | | 3 | .01 | .11 | 1.00 | -.24 | .26 |
| | 3 | 1 | .04 | .11 | .94 | -.22 | .30 |
| | | 2 | -.01 | .11 | 1.0 | -.26 | .24 |
| Missions: I feel a pressure to complete the tasks quickly | 1 | 2 | 1.06* | .12 | .00 | .79 | 1.34 |
| | | 3 | .50* | .12 | .00 | .22 | .79 |
| | 2 | 1 | -1.06* | .12 | .00 | -1.34 | -.79 |
| | | 3 | -.56* | .11 | .00 | -.83 | -.29 |
| | 3 | 1 | -.50* | .12 | .00 | -.79 | -.22 |
| | | 2 | .56* | .11 | .00 | .29 | .83 |
| Contests: Before the tournament, I feel a sense of pressure to prepare in order to be competitive | 1 | 2 | 1.12* | .29 | .00 | .44 | 1.79 |
| | | 3 | .66* | .27 | .04 | .02 | 1.30 |
| | 2 | 1 | -1.12* | .29 | .00 | -1.79 | -.44 |
| | | 3 | -.46 | .30 | .28 | -1.17 | .25 |
| | 3 | 1 | -.66* | .27 | .04 | -1.30 | -.02 |
| | | 2 | .46 | .30 | .28 | -.25 | 1.17 |
| | 1 | 2 | .53 | .24 | .07 | -.03 | 1.10 |
| | | 3 | .34 | .23 | .31 | -.20 | .88 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Contests: My attention is focused entirely on what I am doing | 2 | 1 | -.53 | .24 | .07 | -1.10 | .03 |
| | | 3 | -.20 | .25 | .72 | -.80 | .40 |
| | 3 | 1 | -.34 | .23 | .31 | -.88 | .20 |
| | | 2 | .20 | .25 | .72 | -.40 | .80 |
| Contests: The challenge and my skills are at an equally high level | 1 | 2 | .09 | .23 | .91 | -.44 | .62 |
| | | 3 | -.23 | .21 | .53 | -.74 | .27 |
| | 2 | 1 | -.09 | .23 | .91 | -.62 | .44 |
| | | 3 | -.33 | .24 | .36 | -.89 | .24 |
| | 3 | 1 | .23 | .21 | .53 | -.27 | .74 |
| | | 2 | .33 | .24 | .36 | -.24 | .89 |
| Contests: I find the experience to be rewarding | 1 | 2 | .20 | .22 | .62 | -.31 | .72 |
| | | 3 | .07 | .21 | .94 | -.42 | .55 |
| | 2 | 1 | -.20 | .22 | .62 | -.72 | .31 |
| | | 3 | -.14 | .23 | .82 | -.68 | .40 |
| | 3 | 1 | -.07 | .21 | .94 | -.55 | .42 |
| | | 2 | .14 | .23 | .82 | -.40 | .68 |
| Contests: I did not compete in the tournament because I felt that I would not be competitive | 1 | 2 | .25 | .22 | .49 | -.27 | .77 |
| | | 3 | .17 | .22 | .72 | -.35 | .70 |
| | 2 | 1 | -.25 | .22 | .49 | -.77 | .27 |
| | | 3 | -.08 | .24 | .94 | -.63 | .47 |
| | 3 | 1 | -.17 | .22 | .72 | -.70 | .35 |
| | | 2 | .08 | .24 | .94 | -.47 | .63 |
| Streaks: My attention is focused entirely on what I am doing | 1 | 2 | .79* | .10 | .00 | .57 | 1.02 |
| | | 3 | .36* | .10 | .00 | .12 | .59 |
| | 2 | 1 | -.79* | .10 | .00 | -1.02 | -.57 |
| | | 3 | -.44* | .09 | .00 | -.66 | -.22 |
| | 3 | 1 | -.36* | .10 | .00 | -.59 | -.12 |
| | | 2 | .44* | .09 | .00 | .22 | .66 |
| Streaks: Time seems to speed up | 1 | 2 | 1.02* | .09 | .00 | .80 | 1.23 |
| | | 3 | .40* | .10 | .00 | .18 | .62 |
| | 2 | 1 | -1.02* | .09 | .00 | -1.23 | -.80 |
| | | 3 | -.62* | .09 | .00 | -.83 | -.40 |
| | 3 | 1 | -.40* | .10 | .00 | -.62 | -.18 |
| | | 2 | .62* | .09 | .00 | .40 | .83 |
| Streaks: I find the experience to be rewarding | 1 | 2 | .22* | .09 | .04 | .01 | .42 |
| | | 3 | -.02 | .09 | .97 | -.23 | .19 |
| | 2 | 1 | -.22* | .09 | .04 | -.42 | -.01 |
| | | 3 | -.24* | .09 | .02 | -.44 | -.04 |
| | 3 | 1 | .02 | .09 | .97 | -.19 | .23 |
| | | 2 | .24* | .09 | .02 | .04 | .44 |
| | 1 | 2 | 1.09* | .10 | .00 | .85 | 1.33 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | 3 | .82* | .11 | .00 | .57 | 1.07 |
| Streaks: I feel a sense of pressure to play the game | 2 | 1 | -1.09* | .10 | .00 | -1.33 | -.85 |
| | | 3 | -.27* | .10 | .02 | -.51 | -.03 |
| | 3 | 1 | -.82* | .11 | .00 | -1.07 | -.57 |
| | | 2 | .27* | .10 | .02 | .03 | .51 |
| Streaks: I worry about losing my progress | 1 | 2 | 1.08* | .11 | .00 | .82 | 1.34 |
| | | 3 | .56* | .12 | .00 | .29 | .83 |
| | 2 | 1 | -1.08* | .11 | .00 | -1.34 | -.82 |
| | | 3 | -.53* | .11 | .00 | -.78 | -.27 |
| | 3 | 1 | -.56* | .12 | .00 | -.83 | -.29 |
| | | 2 | .53* | .11 | .00 | .27 | .78 |
| Good luck: I love the feeling and want to capture it again | 1 | 2 | .51* | .07 | .00 | .34 | .68 |
| | | 3 | .10 | .08 | .00 | -.08 | .28 |
| | 2 | 1 | -.51* | .07 | .00 | -.68 | -.34 |
| | | 3 | -.41* | .07 | .00 | -.58 | -.24 |
| | 3 | 1 | -.10 | .08 | .40 | -.28 | .08 |
| | | 2 | .41* | .07 | .00 | .24 | .58 |
| Good luck: Time seems to speed up | 1 | 2 | 1.08* | .10 | .00 | .85 | 1.30 |
| | | 3 | .37* | .10 | .00 | .13 | .61 |
| | 2 | 1 | -1.08* | .10 | .00 | -1.30 | -.85 |
| | | 3 | -.71* | .10 | .00 | -.93 | -.48 |
| | 3 | 1 | -.37* | .10 | .00 | -.61 | -.13 |
| | | 2 | .71* | .10 | .00 | .48 | .93 |
| Good luck: I find the experience to be rewarding | 1 | 2 | .21* | .06 | .00 | .07 | .35 |
| | | 3 | .05 | .06 | .69 | -.09 | .20 |
| | 2 | 1 | -.21* | .06 | .00 | -.35 | -.07 |
| | | 3 | -.16* | .06 | .02 | -.30 | -.02 |
| | 3 | 1 | -.05 | .06 | .69 | -.20 | .09 |
| | | 2 | .16* | .06 | .02 | .02 | .30 |
| Good luck: I become more motivated to keep playing | 1 | 2 | .65* | .08 | .00 | .46 | .83 |
| | | 3 | .26* | .08 | .01 | .07 | .45 |
| | 2 | 1 | -.65* | .08 | .00 | -.83 | -.46 |
| | | 3 | -.39* | .08 | .00 | -.57 | -.21 |
| | 3 | 1 | -.26* | .08 | .01 | -.45 | -.07 |
| | | 2 | .39* | .08 | .00 | .21 | .57 |
| Bad luck: I become frustrated by my bad luck | 1 | 2 | .79* | .10 | .00 | .55 | 1.03 |
| | | 3 | .48* | .11 | .00 | .23 | .73 |
| | 2 | 1 | -.79* | .10 | .00 | -1.03 | -.55 |
| | | 3 | -.32* | .10 | .01 | -.55 | -.08 |
| | 3 | 1 | -.48* | .11 | .00 | -.73 | -.23 |
| | | 2 | .32* | .10 | .01 | .08 | .55 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bad luck: I worry that Pokémon might despawn before I get to check if they're shiny | 1 | 2 | .89* | .12 | .00 | .61 | 1.17 |
| | | 3 | .48* | .13 | .00 | .18 | .77 |
| | 2 | 1 | -.89* | .12 | .00 | -1.17 | -.61 |
| | | 3 | -.41* | .12 | .00 | -.69 | -.13 |
| | 3 | 1 | -.48* | .13 | .00 | -.77 | -.18 |
| | | 2 | .41* | .12 | .00 | .13 | .69 |
| Bad luck: The more time goes by, the more determined I become to keep playing until I find a shiny | 1 | 2 | 1.10* | .11 | .00 | .85 | 1.36 |
| | | 3 | .51* | .11 | .00 | .25 | .78 |
| | 2 | 1 | -1.10* | .11 | .00 | -1.36 | -.85 |
| | | 3 | -.59* | .11 | .00 | -.84 | -.34 |
| | 3 | 1 | -.51* | .11 | .00 | -.78 | -.25 |
| | | 2 | .59* | .11 | .00 | .34 | .84 |

*. The mean difference is significant at the 0.05 level.