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Pokémon GO: Success Factors and Health Effects

Audun Skjervold

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Supervisor: Alf Inge Wang, IDI

Norwegian University of Science and Technology
Department of Computer Science

NORWEGIAN UNIVERSITY OF SCIENCE AND
TECHNOLOGY

MASTER OF SCIENCE

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Author:

Audun SKJERVOLD

Supervisor:

Alf Inge WANG

Department of Computer and Information Science

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Abstract

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Niantic launched Pokémon GO during the summer of 2016, and the game spread like wildfire, and streets and parks were filled by players of all ages. While there had been similar games before, none of them had ever been this popular, and inactive lifestyles were put aside in the pursuit of *catching 'em all*. This paper aimed to identify the reasons for the game's enormous success, and what effects its widespread use had on the physical and mental health of its players. A survey was created and distributed to collect data on the three focus areas: success factors, physical health effect and mental health effect. The survey asked about causes for initial interest, previous experience with similar games, the most important features and reasons to quit the game. It asked about hours of weekly physical activity, change in unhealthy habits, weight loss and risks players exposed themselves and others to, as well as the effect on new and existing relationships and any mental conditions the players suffered from. The survey found that the success was highly associated with the Pokémon franchise and the time of the release, and that effects on both physical and mental health were large for those who needed change the most. Unfortunately the game was lacking in content, and when most of the players stopped playing, their lifestyle changes also reverted.

Preface

This paper is the result of a Master's thesis in Computer Science, and was inspired by the changes observed in activity especially among young adults caused by the immense popularity of the augmented reality game Pokémon GO.

All work on the thesis was performed in parallel with a full-time employment away from campus, and has been a tiresome and challenging but rewarding task.

I want to thank my advisor for being accommodating, supporting and not to mention incredibly helpful to my work, despite my absence from the university campus; my employer for being understanding and supportive in the time leading up to and throughout the completion of the project; my fiancé for supporting me and giving me the time and space needed to focus on my work; all the players who took their time to respond to the much too long survey, and even share the survey with their friends and local community; and finally, the members of The Silph Road and Pokémon GO Snap communities at Reddit, for providing me with many great photos and screenshots I had been unable to take myself - in particular, chaoticgoblin, who provided photos from several different games, and Jim Arneson, who took the cover photo.

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Part I

Introduction and Method

This part gives an introduction to the purpose and motivation for the project. It also describes the research goals and questions for the project and how we aim to find the answers.

Chapter 1

Introduction

This thesis takes a look at the enormous success Pokémon GO found following its release and tries to answer why and how it happened. It also examines the personal effect the widespread play of the game had on its player base. This chapter gives a short introduction to the game and elaborates on the motivation for the project.

1.1 Pokémon GO

Pokémon GO is a location-aware game for Android and iOS devices developed by Niantic Labs, a former branch of Google, previously known primarily for Ingress, another game for Android and iOS. The game enjoyed massive success during the summer of 2016 with 500 million downloads just in the first two months after its release.

The game is played by moving around in the real world, where players encounter Pokémon, digital monsters from one of Nintendo's largest franchises. These *Pokémon* are then caught, using so-called *Pokéballs*, which can either be purchased for in-game currency (which again can either be earned or purchased with real money) or found at so-called *Pokéstops*, which are scattered across the world at notable landmarks and points of interest.

What the player does with the Pokémon they catch varies with the players' preferences. They can be powered up using resources gained through catching more

Pokémon, evolved into different, stronger breeds, and be used to battle other players' Pokémon at *gyms*, which are special places distributed more sparsely than Pokéstops also at points of interest in the real world.

1.2 Motivation

When Pokémon GO was released in Norway, it did not take long for streets and parks to be full of people of all ages playing Pokémon. The people who grew up with Pokémon were out, children were playing with their friends, parents were playing with their children, and even those who had no previous relationship with Pokémon were playing to see what the hype was about. During the day, everywhere you looked, someone was playing. Even during the night you were likely to encounter teenagers and young adults playing.

Strangers who just bumped into each other looking for the same Pokémon were talking to each other, cooperating to take down enemy gyms, sharing good locations for catching certain species and showing off their best Pokémon. People who would otherwise have been sitting at home playing games on their computers or watching TV were instead out walking around trying to find new Pokémon. In the weekends, students were going to parks to play instead of going to night clubs to drink. Power banks (portable chargers) were sold out everywhere, locals were flocking to tourist attractions, and every online news outlet was full of articles about the game.

It was clear that Pokémon GO was impacting the lives of a large number of people, on a much larger scale than previous games had done. This paper is the result of a project with the goal of making sense of not only why Pokémon GO was such a huge success, but also the extent to which the game has impacted the lives of its players.

Chapter 2

Research Method

In any evaluation of software, it is necessary to maintain metrics by which to evaluate strengths and weaknesses of the software. Following the Goal-Question-Metric method (Basili, 1992 [9]), to evaluate Pokémon GO, the following three research goals have been defined:

RG1 What are the main factors that made Pokémon GO successful?

RG2 What are the effects on physical health from playing Pokémon GO, and how much effort does it take to achieve this effect?

RG3 What are the effects on mental health from playing Pokémon GO?

To evaluate these goals, a set of research questions will be created for each of them.

2.1 Research Goal 1: Success Factors

The first research goal is **”What are the main factors that made Pokémon GO successful?”**. This goal has been decomposed into the following five research questions:

RQ1.1 **What factors influenced players to initially start playing Pokémon GO?** This question examines social, cultural, motivational and technological factors that made players initially become interested in the game.

- RQ1.2 **What features of Pokémon GO were used the most?** This question aims to identify the most important features of Pokémon GO, attempting to determine whether any particular features were innovative and/or responsible for the massive success.
- RQ1.3 **What features and aspects of Pokémon GO did players like compared to other similar games (pervasive games and mobile games)?** This question compares the game to its competition, attempting to identify what features make it more or less enjoyable than the alternatives.
- RQ1.4 **What features and aspects of Pokémon GO did players like compared to previous games in the Pokémon franchise?** This question evaluates the success of Pokémon GO as a Pokémon game, considering its potential as a new direction for the franchise.
- RQ1.5 **What factors cause players to stop playing Pokémon GO?** This question aims to identify the bad parts of Pokémon GO that drive players away, to prepare developers of similar games to make better choices.

The first research goal aims to identify the factors that made Pokémon GO into the enormous success that it became. By looking at what influenced players to start playing and what features they used and enjoyed, we might be able to identify choices that can be used in the development of new games and applications to achieve similar success. By examining what features were not used, what players disliked and what made players stop playing the game, we could avoid the same pitfalls in future development.

2.2 Research Goal 2: Physical Health Effects

The second research goal is "What are the effects on physical health from playing Pokémon GO, and how much effort does it take to achieve this effect?". The following six research questions have been created to answer this:

- RQ2.1 **How did playing Pokémon GO affect the amount of physical activity its players took part in?** This question looks at the intended and unintended effects on physical activity from playing a location-aware game such as Pokémon GO.

- RQ2.2 **How much were low-activity players affected compared high-activity players?** This question is concerned with the difference in effects experienced by players used to different amounts of physical activity.
- RQ2.3 **What game-related activities affect the amount of physical activity its players take part in?** This question aims to identify what kind of activities facilitated by the game lead to increased and/or decreased physical activity.
- RQ2.4 **What portion of players have experienced weight loss or other health benefits, perceived or measured, and what benefits do they experience?** This question examines potential health benefits of playing a location-aware game, and how common they are among players.
- RQ2.5 **What effect does playing Pokémon GO have on unhealthy habits, such as alcohol or junk food consumption?** This question investigates whether the widespread play of Pokémon GO has had any effect on the not-so-healthy habits of players, for better or worse.
- RQ2.6 **What physical risks do players expose themselves and others to due to playing?** This question looks at the potential for dangerous behavior resulting from playing Pokémon GO.

The second research goal looks at the physical health effects of playing Pokémon GO. We want to find how prolonged playing of the game has affected the physical health of players, what activities related to the game give this effect, and how players are motivated to participate in these activities. This can help us evaluate the effectiveness of this type of game as a tool to improve not only the health of single players, but of the population as a whole. We also want to identify potential ways in which playing the game can negatively affect the health of players or people who are exposed to players.

2.3 Research Goal 3: Mental Health Effects

The third research goal is ”**What are the effects on mental health from playing Pokémon GO?**”. It has been decomposed into the following four research questions:

- RQ3.1 How did playing Pokémon GO affect the amount of time its players spent socializing with others in their spare time?** This question examines whether playing Pokémon GO has had an effect on the amount of time players socialize with others outside of situations where social interaction is required.
- RQ3.2 What game-related activities affect the amount of time spent socializing?** This question seeks the activities facilitated by playing the game that affects relationships and time spent socializing.
- RQ3.3 What portion of players have made new friends or experienced improved existing relationships due to playing Pokémon GO?** This question looks at the concrete effects on new and existing relationships, investigating the potential of the game as a social catalyst.
- RQ3.4 Of players suffering from mental illnesses or other mental conditions, what effects has playing Pokémon GO had on these conditions?** This question investigates the effect on mental health by examining improvement of various mental conditions, and the reasons for any potential improvement.

The third research goal examines the effect participating in a popular trend such as the Pokémon GO phenomenon can have on the mental health of its players. We consider motivation, changes to social dynamics and physical activity, and seek to find the elements that positively affect the players, while identifying the aspects that increase mental health struggles.

The metrics used in the evaluation will be a pair of surveys distributed to players. The first survey will provide breadth by collecting cursory answers to all the questions from a large amount of players. The second survey will be conducted as interviews later to provide depth by following up on particularly interesting responses to the first survey. The follow-up survey will also gauge the effects long-term by retrieving updated responses to some questions when some more time has passed.

Part II

Literature Study

This part looks at previous literature to create a basis for the research done in the project. It also looks at existing similar games and provides a more in-depth look on Pokémon GO, and a cursory look at the Pokémon franchise in general.

Chapter 3

Video Game Theory

This chapter looks at some previous articles on subjects related to video game theory with the goal of establishing a terminology to be used throughout the project.

3.1 Pervasive Games

In today's multitude of game genres, *pervasive games* is the one that is most relevant to this project. The definition of pervasive gaming is somewhat fluid. According to Benford et al. [12], "*Pervasive games extend the gaming experience out into the real world*", further stating that "*The game player becomes unchained from the console and experiences a game that is interwoven with the real world and is potentially available at any place and any time*".

Montola [31] describes a pervasive game as "*a game that has one or more salient features that expand the contractual magic circle of play socially, spatially or temporally*". *Spatial expansion* describes the concept of expanding the play area beyond the play device itself, using a larger location such as a city or, in some cases, the whole world. *Temporal expansion* refers to the distribution of game play beyond traditional play sessions. Some games define every moment to be part of the game session, while others are inactive most of the time, being played only at certain times when the game itself decides. *Social expansion* means the players can go beyond those who deliberately chose to participate in the game, turning bystanders into participants through various means.

Magerkurth et al. [28] discuss the various sub-genres of pervasive gaming, including *Smart Toys*, *Affective Gaming* and *Augmented Tabletop Games*. The main focus of this project, however, are the *Location-Aware Games* and *Augmented Reality Games*.

Location-aware games determine the player's position based on technology such as GPS, WiFi, or GSM signals, or short-range proximity-sensors using RFID, Bluetooth or similar. The player can then be placed on a large-scale game board, ranging from a city block or smaller, to the entire world, and can interact with the game by physically moving.

According to Bederson [10], "*Augmented reality uses computers to enhance the richness of the real world. It differs from virtual reality in that it doesn't attempt to replace the real world*". Yuen et al. [53] said "*Augmented reality (AR) refers to a wide spectrum of technologies that project computer generated materials, such as text, images, and video, onto users' perceptions of the real world*". Examples of augmented reality are superimposing 3D images on a camera view or playing audio based on the user's location and movement.

Kiefer et al. [26] explored the design space of location-aware or location-based games, identifying three *game design dimensions*, positing that new games can be created by choosing values for each of the three dimensions, or by taking an existing game and changing one of the dimensions. The first of the three dimensions is the dimension of *game environmental embedding*, which "*deals with the way the game world is embedded in the player's environment*", distinguishing between *pure location-based games*, *mixed reality location-based games* and *augmented reality location-based games*.

They define a location-based game as "*a game which is supported by localization technology and integrates the position of (one or several) players as main game element into its rules*", focusing on the requirement that the game rules rely on the localization technology. Mixed reality location-based games refer to games where virtual objects affect the physical game space, but exist only in the virtual layer and cannot be perceived by the players in their physical location. Augmented reality location-based games on the other hand allow players to perceive the virtual game elements "*from a first-person perspective*".

The second dimension is the *game conceptual dimension*, which refers to the concept and goals of the game, on a more specific level than the established game

genres. They define four types game concepts for location-based games: *Chase game*, *Item hunt game*, *Puzzle game* and *Strategy game*. A chase game is a game where a player's physical speed is central in the pursuit of victory, and are typically technology-supported variants of the classic playground game of *Tag*. Item hunt games involves the search for items hidden throughout the game board, while puzzle games have you solve one or more puzzles toward some ultimate goal. Strategy games require the player to plan their moves to win.

The third and final dimension is the *spatial and temporal dimension*, where games can be either spatially continuous or discrete, and either temporally continuous or discrete. Spatially discrete (sd) games have game events take place only in specific locations, while spatially continuous (sc) games can progress the game anywhere. Similarly, temporally discrete (td) games allow movement in the game only at given moments, while temporally continuous (tc) games allow game progress and events at any time. They identified games with the *sddd*, *sdtc* and *sctc* combinations, but no *sctd* games.

3.2 Player Types

Player types are a way of categorizing players on various axes with the goal of creating an enjoyable game experience for the target audience. Identifying player types can also be important for developers of games whose business model is to sell in-game items rather than retail sale of the game itself, as Hamari & Tuunanen [21] discussed in their 2014 meta-synthesis on the subject. The design of such items is largely based on the potential customers, and what type of items will be sold will depend on who are going to play the game and what their motivations are.

There are countless studies on different player types, and Hamari & Tuunanen [21] compared the different ways previous researchers have segmented players to create their typologies, using primarily behavioral and psychographic segmentation, but sometimes also geographic or demographic segmentation.

They found that a common division was that of *hardcore* and *casual* players, but found this to be a too simplistic solution. Hardcore players were sometimes described to be more dedicated in all areas of the games, playing for longer sessions, more often and being more invested. However, they found that all these aspects

and more were better treated separately, creating multiple scales used to define more than just two types of players.

Kallio et al. [25] used a model consisting of the scales of *Intensity* and *Sociability*, along with a *Games* component to define three different groups of gamer mentalities. The components of the model can be seen in Figure 3.1, as presented in their paper, and the three groups of mentalities they define using this model are *Social mentality profiles*, *Casual mentality profiles* and *Committed mentality profiles*.

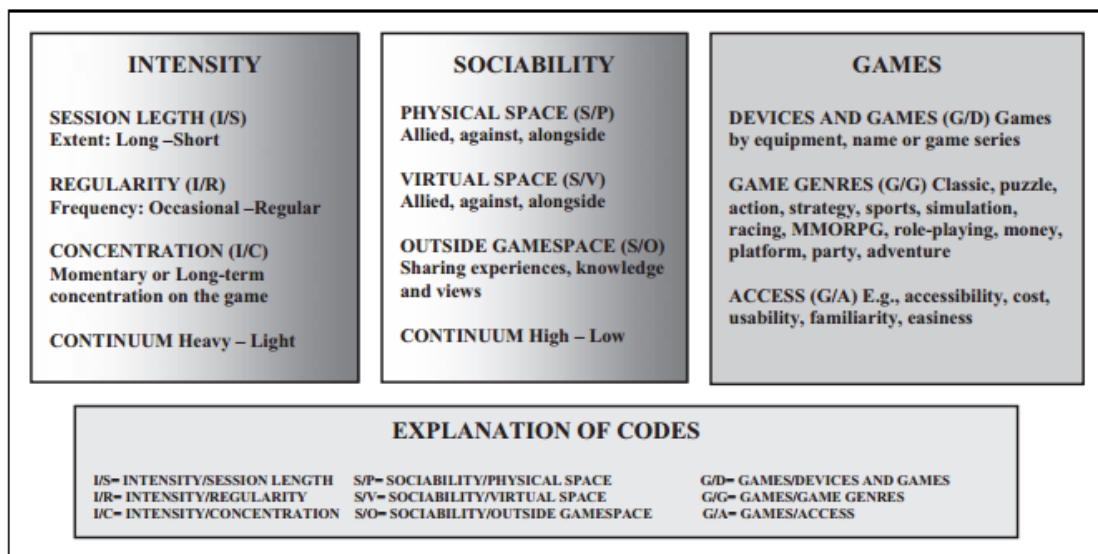


FIGURE 3.1: The three components of gaming mentalities, as seen in Kallio et al. [25]

The social mentality profiles identified by Kallio et al. are of “*quite light*” intensity, very high sociability and their choice in games focus on access to the games. The casual mentality profiles have variable intensity, low sociability and their choice in games focuses primarily on the device and access. The committed mentality profiles have “*heavy*” intensity, high sociability and their choice in games focuses primarily on the genre. Each of the groups of profiles consist of three profiles with different, although similar, values for the various metrics defined in the model.

Hamari & Tuunanen [21] used this and other papers to identify a total of five “*key dimensions pertaining to motivations of play/orientation of the player*”: *Achievement*, *Exploration*, *Sociability*, *Domination* and *Immersion*.

In this project, we will use the five archetypal player types *Achieving*, *Exploring*, *Socializing*, *Dominating* and *Immersing*, where each of them is *more concerned with* their respective dimension of the game than the four others, rather than

entirely focused on only that aspect. That is, for a *Socializing* player, the social aspect of the game is more important than any other aspect, but they may still have varying interest in the other four dimensions.

3.3 Motivation in Gaming

When considering motivation, we typically distinguish between *intrinsic* and *extrinsic* motivation. *Extrinsic motivation* is motivation from outside sources such as the promise of receiving rewards for successful completion of a task, or punishment should one fail to complete the task. *Intrinsic motivation* on the other hand refers to motivation coming from within, where performing a task is in itself personally rewarding, either because it is fun, exciting, enjoyably challenging or a variety of other positive emotions.

Malone [30] proposes challenge, fantasy and curiosity as the primary factors of intrinsic motivation in gaming. Looking back at the player types established in Section 3.2, the Achieving and Dominating players have challenge as their primary intrinsic motivator, while the Immersing player is motivated by fantasy and the Exploring player is motivated by curiosity. The Socializing player's main source of motivation is not related to the game itself.

While some studies suggest that extrinsic motivation can conflict with and undermine intrinsic motivation (see for example Benabou & Tirole [11], Lepper & Henderlong [27]), extrinsic rewards are common in video games. By progressing or performing difficult tasks in games, players unlock new types of items or characters, receive powerful items or abilities, in-game currency, cosmetic modifications to their avatar, recognition from other players from being placed in a hall of fame or leader board of some kind, or any number of other rewards. For some, these rewards do indeed remove the fun - the intrinsic motivation - from the game, turning it into a chase for the next reward. For others, however, these rewards help bring back the fun they were no longer able to find, enjoying the game more when being rewarded.

In a market with hundreds of thousands of games and players with short attention spans, however, extrinsic rewards for small feats has become common. To keep players active, they are awarded for doing a minimal amount of effort every day through daily reward systems, often of the form *First X of the day*. For some

developers, this is the final step for the game: a last resort to keep players playing their game. For others, it is a means to bridge the gap until they can introduce new features.

Chapter 4

Health and Gaming

This chapter looks at some previous research on the effect of gaming on physical and mental health.

4.1 Physical Activity

Obesity is becoming an increasing problem as the world is further urbanized, and increasing physical inactivity is an important factor in the trend (Anderson & Butcher [3], Malik et al. [29], Uauy et al. [45], Wang et al. [46]). The World Health Organization (WHO) [51] report that worldwide obesity has more than doubled since 1980, with 39 % of adults aged 18 years and older being overweight, and 13 % being obese. To combat this, they recommend adults do *"at least 150 minutes of moderate-intensity aerobic physical activity throughout the week"*, while children should do 60 minutes per day [52]. Janssen & LeBlanc [24] performed a review of previous studies on *"the relation between physical activity, fitness, and health in school-aged children and youth"*, and made similar recommendations based on these.

To motivate people to participate in physical activity, an emerging game trend in the last decade have been so-called *exergames*. Whitehead et al. [48] describe exergames as *"video games that provide encouragement to exercise, particularly for an audience that may be reluctant to engage in the more traditional forms of exercise"*, further stating that *"Exergames are a commonly accepted method of encouraging more physical activity to promote better health for those with high*

levels of sedentary screen time". Peng et al. [35] found that playing exergames were successful in increasing heart rate, oxygen consumption and energy expenditure to levels similar to those of traditional physical activities, and that they can "*facilitate light- to moderate-intensity physical activity promotion*".

Althoff et al. [2] performed a study on the effects of Pokémon GO on physical activity, using data collected from owners of Microsoft Wearables on search terms and change in number of daily steps. They found that Pokémon GO players did in fact increase their physical activity in the period in which they played, and players increased their activity by more if they were previously of low activity or were more than averagely engaged in the game.

4.2 Mental Health

The WHO [49] estimate 350 million people worldwide suffering from depression, and the Anxiety and Depression Association of America (ADAA) [5] reports 18 % of the US population suffering from anxiety disorders. These are serious disorders, and can in the worst case lead to suicide, yet less than half of those suffering, and in some countries fewer than 10 % [49], receive treatment for their condition.

Studies show that exercise can have a positive effect on depression, moderately to significantly reducing symptoms (Babyak et al. [8], Dunn et al. [19], Cooney et al. [15]), while Petruzzello et al. [36], Salmon [39], and Ströhle [43] also found potential for a positive effect on anxiety disorders.

Rosenberg et al. [38] found potential for exergames to significantly improve symptoms of depression among elderly, and Brox et al. [14] used exergames to a combined effect of increasing physical activity and decreasing loneliness among elderly.

Chapter 5

Similar Games

This chapter looks at some games that are relevant to compare with Pokémon GO, for the most part miscellaneous pervasive games. Some games are more similar than others, but all of them share some aspect with Pokémon GO, be it the play style, game concepts or the device used to play.

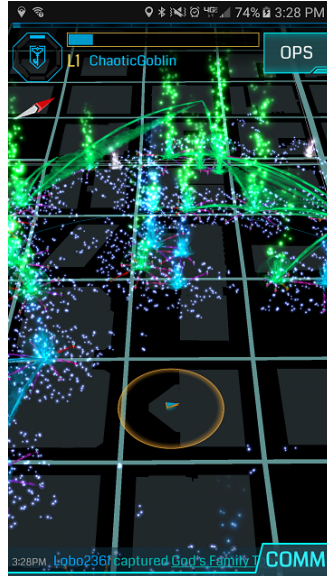
5.1 Ingress

Ingress is a location-aware, augmented reality game for Android and iOS phones. Like Pokémon GO, it was developed by Niantic Labs while it was a part of *Google*. It was first officially released on Android in December 2013, and is considered by many to be the precursor to Pokémon GO. In an interview in October 2013 [34], the product manager of Ingress stated that *"Our vision for this, from Niantic Labs, is really to build a platform and to help other game studios, other developers, build similar types of geo-games on top of this infrastructure"*. Not only was it one of the first augmented reality games for mobile devices to enjoy commercial success, but it also laid the groundwork for more games to come.

The game narrative explains that so-called *Exotic Matter (XM)* is spreading across the world from *Portals*, and have been linked to an unseen alien race called *the Shapers*. The players choose between two teams: the *Enlightened*, who embrace the alien influence, and the *Resistance*, who wish to save the human race from their *ingress* into our world. The portals and exotic matter are visible through the player's *scanner*, which is the mobile device the game is installed on.



(A) The Ingress logo



(B) A screenshot of an area with many portals and links, by Reddit user chaoticgoblin



(C) A screenshot of an area covered by a field

FIGURE 5.1: Ingress

The game revolves around these portals, which players can *hack* to retrieve items that help them claim these and other portals, while the XM they collect by moving around can be used to damage enemy portals. When a team is in complete control of multiple portals, players from that team can *link* these portals to create a *field*. Creating a field will claim the *mind units* under the field for that team.

Portals in the game can be found at landmarks or points of interest, such as statues or buildings of note. Initially, the portals were based on "*historical markers*", but players could submit locations with descriptions to Niantic, and many of these were added to the game as portals [13]. Portal locations were also added later in conjunction with partnerships with various commercial chains such as *Vodafone* [7] or *Jamba Juice*.

Progress in the game comes from performing actions, which yield *action points* (AP) or earning *badges* through achieving specific feats such as holding a friendly portal for a certain amount of time. The rewards for advancing in level is unlocking new, better items, and the only way to advance past level 9 (out of 16) is through earning badges.

Using Kiefer et al.'s [26] game dimensions, the game is a *strategy* more than anything else, requiring a solid plan if one wishes to have control over large areas.

Although the game is referred to as an augmented reality game, using Kiefer et al.'s definitions, it is closer to a mixed reality game. XM is not perceptible in the real world, nor are the links or fields created. The portals are visible in the real world, but only in the capacity that they are real life objects, and this capacity does not depend on the game. Thus we have to argue that this is a *mixed reality game*. If we ignore the XM, the game is spatially discrete, with game actions only taking place around portals. The collection of XM, however, is spatially continuous, as it can and will be collected mostly anywhere a player goes with the game open. The game is temporally continuous, with actions taking place at any time, although the game restricts the number of actions that can be taken on the same portal in a given time span. *Anomalies*, special events inside and outside the game, take place at specific times, being temporally discrete.

The game is free to play, and earns revenue through an in-game store selling items for use in the game, an online store selling game-related merchandise, and partnerships with businesses that gain benefits such as portals at all their retail locations.

5.2 Field Trip

Another application developed by Niantic is Field Trip. It is not really a game in the way that most people think about games. It does not have rules, goals or other players. It is simply a tool that assists you in exploring. The app encourages you to explore by walking off in any arbitrary direction. When you get close to somewhere interesting, it notifies you. You can set preferences for what type of locations you are interested in, such as *Architecture*, *Historic Places & Events* or *Cool & Unique*, and it will ignore other types of places while more frequently notifying you of these types of places.



FIGURE 5.2: The Field Trip logo

While the application is not a traditional game, it is worth mentioning not only because of its affiliation with Niantic, but because of its integration with Google's

augmented reality device *Google Glass*. With Field Trip, the Glasses show you *cards* of the locations you encounter overlaid over what you usually would see, right in front of your eyes without requiring you to look at your phone or a similarly carried device.

Field Trip is also relevant in the way it encourages physical activity by suggesting you walk off in a random direction to explore, rather than find specific places before going out and traveling directly to them, something that often involves less physically exerting modes of transportation. Given that you are exploring somewhere with locations within your field of interest registered in Google’s databases, Field Trip rewards you for your (potentially unintended) exercise with new, possibly exciting locations. These features resemble those of some exergames, motivating “players” to exercise through untraditional means.

5.3 Geocaching

Geocaching is a popular family activity game similar to the sport *orienteering*. It is a game played with real life objects, but uses a mobile application to register the location of the items. The application lets you see a map of caches in an area, register your findings and make lists for a planned session. The caches are containers placed at any location, and are typically hidden somewhere clever in this location. The containers contain a logbook which the finder signs with their codename and time they found the cache, while some larger caches also contain trinkets or items that players can trade for one of their own items. Some caches require that you solve puzzles in the app before its exact coordinates are revealed to you.

Going back to Kiefer et al.’s [26] dimensions for location-based games, Geocaching is primarily an item hunt game, and is in fact used as the most prominent example of one in their paper. Figure 5.3 shows three clever hiding spots for caches found by Reddit user *chaoticgoblin*, intended to make the player really have to search to find them. However, with the addition of caches that require you to solve puzzles to reveal their coordinates, Geocaching also gains aspects of a puzzle game. It is a pure location-based game, using localization technology solely to inform players of the location of the physical items, items that have no virtual equivalent. While caches technically can be placed anywhere, the actual locations of caches, where



(A) Cache covered in natural camouflage

(B) Cache hidden in birdhouse



(c) Cache in camouflage-taped container

FIGURE 5.3: Clever hiding spots for geocaches (by Reddit user chaoticgoblin)

game events take place, are discrete and fairly static. Creating and placing a new cache can be done anywhere, but once placed, the location is discrete. Thus we classify Geocaching as spatially discrete. The game can be played at any time, and is thus temporally continuous.

Geocaching is free to play, and earns its revenue through partnerships with businesses and the sale of access to premium features such as making lists in the application to plan play sessions.

5.4 Zombies, Run!

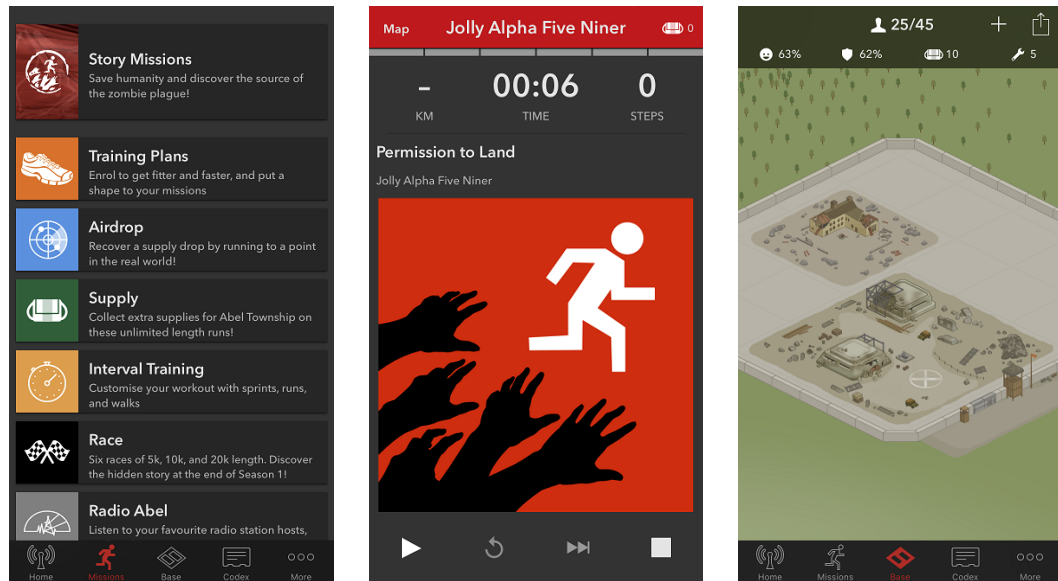
Zombies, Run! is an exergame for Android and iOS devices. First released in 2012, it has added a new *season* of content each year since, and now has 200 missions to play through. Within two weeks of its release, it was the highest grossing app in the Health & Fitness category in the iOS App Store, and now has a million players.



FIGURE 5.4: The *Zombies, Run!* logo

The game narrative places the player in a post-zombie-apocalyptic world, and you are one of few survivors. By going out to run, you'll collect supplies used to build up a base for you and fellow survivors. The game features 200 missions that are narrated mini-stories that drive the plot forward as you build up your base, playing audio clips in between your own music as you run. During your run, it is possible for zombies to appear and chase you, requiring an increased pace. Should you fail to increase your pace and outrun them, they will catch up to you and any supplies you have collected will be lost.

The game uses the device screen minimally to select missions and viewing and sharing your progress between runs, while the game experience is presented through audio. There are no visual augmentations of reality, but the game uses audio clips to perceptibly augment a run. When being chased by zombies, their groans can be heard closing in if you do not run quickly enough, and their distance to you can be felt through the volume and intensity of their sounds. The game also plays a heartbeat in your ears, intended to imitate your own as you run. Southerton [41] performed an *autoethnography* noting her experiences with the game, and found the heartbeat in particular to add high levels of immersion by adding a sense of urgency, but only during the other audio clips presented by the game.



(A) Activities available (B) The screen while in a mission (C) View of the player's base

FIGURE 5.5: Screenshots of *Zombies, Run!*

With basis in Kiefer et al.'s [26] paper, *Zombies, Run!* is a location-based game in that it uses GPS technology to track the player's movements in order to progress in the game by collecting supplies and to escape zombies. It also allows the player to choose a location on a map, and will generate a mission tailored to the distance to that location, called an *Airdrop*. We classify *Zombies, Run!* as an augmented reality game, with virtual elements (zombies) perceptible in the real world through audio. The game is closest to a chase game, as outrunning the zombies is vital to game progress. The game progresses continually as the player moves, as long as they are on a mission, and a mission can be started at any time. Thus we classify the game as spatially and temporally continuous.

While the game is an exergame in the true sense of being a game with the sole purpose of encouraging physical activity, or more specifically aerobic exercise, the actual impact of the exercise it encourages has been debated. Halushak, an experienced runner, noted in her experience with the game that because of the sparse zombie attacks and high requirement to escape them that the game is more about exercising the players' imagination than to push them to their limits. Halushak's reasoning for this is that the player must increase their pace by at least 20 % to escape, which is difficult when already running at a quick pace, encouraging an overall lower pace if one wants to be able to escape. Higgins [23] in a review of smartphone apps for increasing patients' health and fitness recommended the

game for *"healthy patients wanting to start basic aerobic exercise"*, but not any other groups of patients. Other studies (Cowdery et al. [16] and Direito et al. [18]) performed with the app showed that the physical impact was limited, but that players using these apps were more likely to be motivated to continue their exercise after the control periods. Since these reviews, the game has added more features. Among these features is the ability to adjust the pace increase required to escape zombies, allowing for a more even (and hopefully higher on average) pace, as well game modes such as interval training.

Zombies, Run! was previously a purchasable game, but has since become free to play. It now earns revenue through the sale of premium features (such as increasing the frequency of zombie attacks or additional game modes) and entry into special events.

5.5 The Walk

The Walk is another game from the same developer as *Zombies, Run!*, *Six to Start*. It is marketed as a *"fitness tracker and game"*, and is sold in the Google Play Store as well as Apple's iOS App Store. It is another story-driven audio-focused augmented reality game, but also features a sort of mini-games on the device screen while you are walking, where you can click objects that momentarily appear which unlock extra bits of the story. The game leads you down a set path in the virtual map of the game, unlocking more of the story as you reach certain points on the map. The game can be played at your own pace and simply continually tracks for how long you have been walking and the number of steps, but awards you badges for performing special actions such as completing an episode with less than 3 hours of breaks between start and finish.

The game's narrative places you in the northern parts of the United Kingdom, where a train station has just been blown up by terrorists. Somehow you mistakenly end up with a package that the terrorists are after, and it becomes your mission to walk across the United Kingdom and deliver it where it belongs. You are guided on your path by a remote secret agent, and have to be wary of dangerous enemy operatives and bystanders suspecting you of being a terrorist.

While the game uses localization technology to progress the virtual game, it is not a location-based game as per Kiefer et al.'s definition, as the virtual map does not

reflect the real world, and the GPS technology are only used to measure whether or not you are walking.

5.6 Munzee and Stolpejakten

Munzee (a stylized version of the German word for *coin*) is an scavenger hunt/item hunt game similar to Geocaching, using QR codes and GPS location to register captures as opposed to the physical hidden caches of Geocaching. As in Geocaching, *Munzees* are deployed by players by registering a QR code in the app and placing a waterproof sticker with the code on it in a location of their choosing, which they then register to a map. Munzees are found all over the world, with at least one Munzee present on every continent - including Antarctica [42]. Capturing a Munzee awards points to the player who made the capture as well as the player who deployed it.

Stolpejakten (meaning *The Pole Hunt* in Norwegian) is a Norwegian game with a similar concept to Munzee, but instead of stickers attached to poles and other objects, special poles with QR codes attached are placed as markers for the game. The game is marketed as an exergame, with the goal of getting people of all ages and physical conditions active and providing a means of exploration for those who wish to get to know their local community better. They are color coded according to four levels of difficulty, where the *green* poles are the easiest and are reachable by bicycle and wheelchair, and the *black* poles are difficult and require a serious effort in reaching. Capturing a pole gives the user a ticket in a raffle held in the county the pole is located, sponsored by local businesses. Capturing more poles awards more tickets, increasing their odds of winning good prizes such as concert tickets, festival passes or three-course meals at good restaurants.

Both of these games share the two of the same game dimensions as Geocaching, in that they are pure location-based games and are spatially discrete and temporally continuous. They are arguably also item hunt games, Munzee more so than Stolpejakten, as the *Munzees* are much smaller than the poles placed in Stolpejakten. Neither of the games share the puzzle game aspect of Geocaching.

Munzee's revenue comes from the sale of partnerships, as well as the sale of Munzee stickers that players can deploy. Stolpejakten earns their revenue through renting out infrastructure to local organizers and selling memberships to local clubs.

5.7 Run an Empire

Run an Empire is a social exergame where players compete to claim territory for their *empire* through running or jogging. The map is split into *hexes* (hexagonal tiles), and running across a hex stakes a claim to that hex. If your claim is stronger than all other players' claim to the hex, it will be added to your empire. You can strengthen your claim by running across the same hex on another run, and the stronger your claim, the more difficult it will be for intruders to take over your empire. Having more hexes in your empire grant a higher position on the leaderboards. There is both a global leaderboard and a social leaderboard, where the social leaderboard lists the players you are following in the game.

The game focuses on strategy rather than catering only to those of superior physical ability, making the game available and enjoyable for all players. They enable this by limiting each run to one hour, and only allowing one run per 24 hour period. New players are also accommodated by a limit to the strength of a player's claim to a hex, and *tile decay* ensuring that as time passes, a claim weakens if it is not strengthened through active play. The limit also acts as an incentive to expand your area with new routes when your claim to one area is near its limit, an incentive that is further strengthened by the generation of gems randomly on the map when you start a new run. These gems can be used to buy certain items in the game to upgrade your empire. Players also earn coins by running, which encourages play even if the surrounding area is strongly held by an opponent, as coins can be stolen from opponents. These coins, like the gems, can be used to purchase items, and act as secondary points to show a player's achievements over time.

Using Kiefer et al.' game dimensions [26], the game is a mixed reality location-based game, with virtual objects on the map that are not perceivable outside the virtual game environment. It is a strategy game rather than a chase game for the reasons described above, and requires good planning to most efficiently expand your empire. The game area is continuous, and while you can start your first run at any point, the restrictions to length and frequency of runs makes the game temporally discrete. Thus it would seem that Run an Empire is a spatially continuous and temporally discrete game, the class that Kiefer et al. at the time were unable to discover.

Run an Empire is still in a beta state, currently only being available in the United Kingdom and New Zealand, and its main income is from the original Kickstarter campaign that launched the game and other seed money from investors, but their business model includes sale of cosmetic items after the decision to turn the game free to play.

5.8 Mobile games

With hundreds of thousands of games available across iOS [37] and Android, there is a lot of competition for the players' attention. Popular games are often strategy or puzzle games that can be played in short sessions while waiting for something such as the train arriving, or while doing something else such as watching television. Games like Angry Birds and Candy Crush Saga, where you solve small, progressively harder puzzles, have been massively popular in the past and still are. Other social strategy games such as Wordfeud and Game of War are other massively successful games, while action games such as Clash of Clans and Mobile Strike are among the currently top-grossing games on iOS [6].

Most of these games are free to play, with revenue coming from in-game advertisements and stores, selling extra lives that allow players to play more levels or items that make certain levels easier to solve.

Chapter 6

Pokémon

This chapter gives a short introduction to the Pokémon franchise throughout the years, as well as an in-depth description of Pokémon GO and its features.

6.1 Pokémon Franchise

Pokémon is a multi-billion dollar (grossing nearly five trillion Japanese yen) media franchise owned by The Pokémon Company, a Japanese consortium consisting of Nintendo, Game Freak and Creatures. It began in 1996 with a pair of games for the handheld Nintendo gaming console Game Boy, internationally branded as *Pokémon Red* and *Pokémon Blue*. In 1997 an animated television series began airing, which helped popularize the franchise globally. In the twenty years since then, the franchise has released a multitude of games of various genres across all Nintendo gaming consoles, a Trading Card Game, nineteen feature films and several manga series (Japanese comic books). Additionally, Pokémon merchandise of all sorts is sold almost everywhere, ranging from plush toys to office equipment with Pokémon art, and the brand is licensed for all sorts of content.

The concept of Pokémon revolves around the namesake monsters which exist alongside humans in the fictional universe that is the setting of the franchise. In the Pokémon universe, all life forms besides humans are Pokémon, taking familiar forms such as dogs, rodents, insects, birds and fish, as well as traditionally less-than-sentient objects such as plants, magnets or piles of muck. The Pokémon have supernatural powers, such as generating electricity, controlling the weather

or breathing fire, which they use to attack and defend themselves. Humans catch and tame these Pokémon and use them as pets, companions and assistants, but the main focus of both the games and other media are the *Pokémon trainers*, who use Pokémon to battle other Pokémon trainers.

The slogan of the franchise is "*Gotta catch 'em all*", referring to the desire of the main protagonist of the series to become the world's best Pokémon trainer by capturing all the different species of Pokémon available, on his journey to become the champion of the Pokémon League. The two concepts of catching "*'em all*" and battling other trainers are present in almost all of the games, and throughout the *anime* (the animated television series), movies and manga.

6.2 Pokémon GO In-Depth

Pokémon GO is an augmented reality location-based game. It places the monsters of the franchise out into the real world, making them visible and catchable through Android and iOS smart phones. The game also features Pokémon battling in special locations known as *gyms*. The game shows a map of the surrounding area with the player's avatar placed onto it in the player's current physical location, determined using GPS localization. To move around in the game, the player has to physically move in the real world.

Various Pokémon will appear on the map around the player at certain times, and remain there for up to 30 minutes or until the player attempts to catch it and either succeeds or fails enough times for the Pokémon to flee. Pokémon that spawn naturally are visible for all players, and one player catching it does not affect its availability for other players, but players can only see Pokémon within a radius of roughly 30 meters.

To catch Pokémon, the player, or *trainer* as players are called, throws so-called Pokéballs at the Pokémon. A visual indicator, represented by a colored circle, shows at what time the throw has the greatest chance of successfully catching the Pokémon. Pokéballs exist in three different varieties found at *Pokéstops*, which we will cover shortly. Using a better ball will increase the odds of capturing the Pokémon, but they are also less commonly dropped by Pokéstops. *Razzberries*, another item gained at Pokéstops, are single-use items that increase the capture rate of the next Pokéball that hits the Pokémon.

In the capture view, the player can toggle *AR mode* on or off, switching between a view where the Pokémon is superimposed on the view of the device camera, or a standard background of an animated forest. The capture view also features a camera function that hides the UI and allows the player to take fun or interesting photos of the Pokémon, typically used in conjunction with AR mode, putting players in a situation resembling that of the Nintendo 64 game *Pokémon Snap*, where players were tasked to take interesting photos of Pokémon.

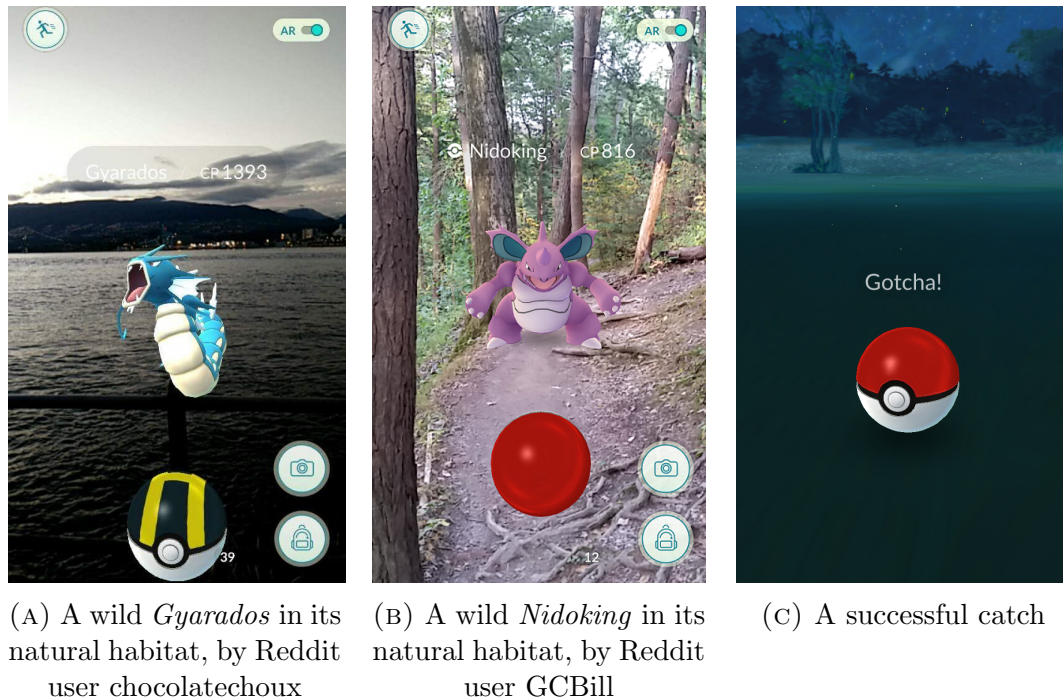
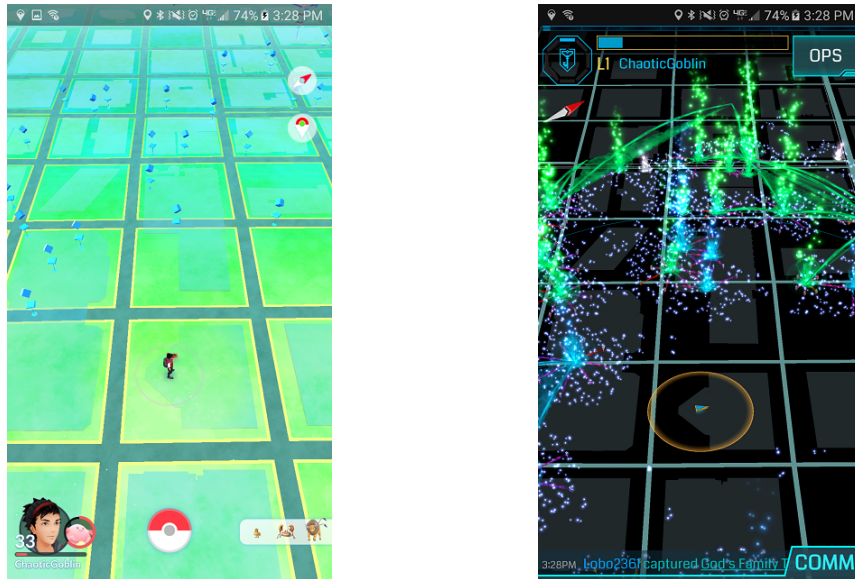


FIGURE 6.1: Capturing a Pokémon

Pokéstops are special locations, and are a subset of Ingress' portals, described in Section 5.1. The main feature of these Pokéstops is to dispense consumable items such as all varieties of the aforementioned Pokéballs (Pokéballs, Great Balls and Ultra Balls), as well as Razzberries, all types of *Potions* (regular, Super, Hyper and Max) and both types of *Revives* (regular and Max), with higher level items being less frequent drops. Pokéstops can also drop Pokémon eggs. Potions and Revives of all kinds are used to heal Pokémon that have been damaged in battle. The player can claim items from each Pokéstop once every five minutes, and does so by pressing the Pokéstop and spinning the *photo disc*.

A secondary feature of Pokéstops is that players can place *Lure Modules* on them, an item purchasable in the store that lures one semi-random Pokémon to the stop for two minutes every five minutes, over a span of 30 minutes. These Pokémon



(A) Pokémon GO, by Reddit user chaoticgoblin (B) Ingress, by Reddit user chaoticgoblin

FIGURE 6.2: The same location in Pokémon GO and Ingress

are visible to all nearby trainers, and can be any Pokémon of the species that are eligible to spawn in the area. Pokéstops are also featured in the player's *tracker*, a feature that allows players to see what Pokémon are currently in the area. It is split into two parts, *Nearby* and *Sightings*. Pokémon in the *Nearby* category are listed together with the Pokéstop closest to their location, while Pokémon in the *Sightings* category are in your immediate vicinity and not within range of a Pokéstop.

Basic Pokéballs can also be purchased in the in-game shop, using *coins*. These coins can be purchased in the same shop using real money, or earned through gym battling, which we will cover in the next paragraph. The shop also sells *Incense*, *Lucky Eggs*, lure modules and *Egg Incubators*, as well as upgrades to Pokémon or item storage.

Incense resemble lure modules in that they attract semi-random Pokémon, but are deployed on the player rather than a Pokéstop. The incense lasts for 30 minutes, and remains on the player as they move around, but any Pokémon it spawns are visible only to the player who used the incense. These Pokémon are shown with a purple cloud circling around them on the map. Incense will spawn Pokémon at a rate depending on the player's activity: a Pokémon will spawn every five minutes while the player is standing still, or every minute while the player is moving, if they have moved at least 200 meters since the last check.



(A) Lured Pokéstops at Santa Monica Pier, by Reddit user Bobby1211



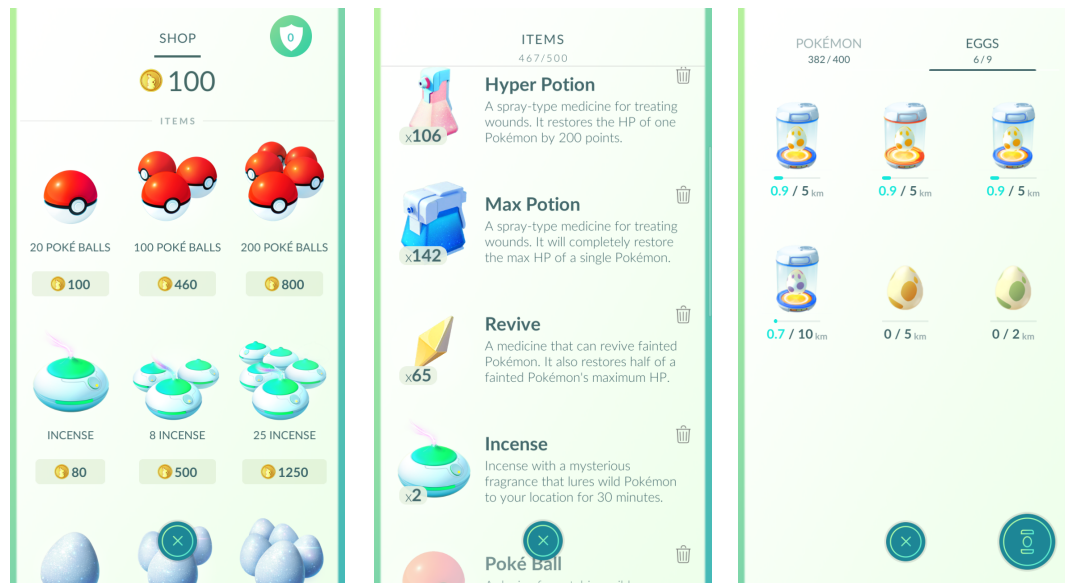
(B) The in-game Pokémon tracker

FIGURE 6.3: Secondary features of Pokéstops

Lucky eggs double the amount of experience points gained by the player for the next 30 minutes. Experience points can be gained by catching a Pokémon, hatching an egg, evolving a Pokémon or battling in a gym. Additional experience is awarded for adding a new *Pokédex entry*, making a particularly good throw at an opportune time while catching a Pokémon, defeating an entire gym, or if you are making your first catch of the day, as well as for every 100 Pokémon you catch of a species. Earning a new Pokédex entry is done by capturing, hatching or evolving a Pokémon you did not previously have, playing into the "gotta catch 'em all" slogan.

Egg incubators are used to incubate Pokémon eggs. Incubating an egg allows it to be hatched, and each egg requires either 2, 5 or 10 kilometers of walking while incubated to hatch. Each type of egg, with types determined by the distance required to hatch it, can hatch into a different set of Pokémon, with 10 km eggs containing some of the rarest and strongest Pokémon in the game, such as *Snorlax* and *Lapras*. In addition to a new Pokémon and some experience points, hatching an egg awards an amount of *Stardust* and *Candy* proportional to the effort required to hatch the egg.

Stardust, which is also gained by catching Pokémon, is used to *Power up* Pokémon. The amount of stardust required to power up a Pokémon increases the stronger the Pokémon gets, ranging from 200 stardust at its weakest to 10 000 near its



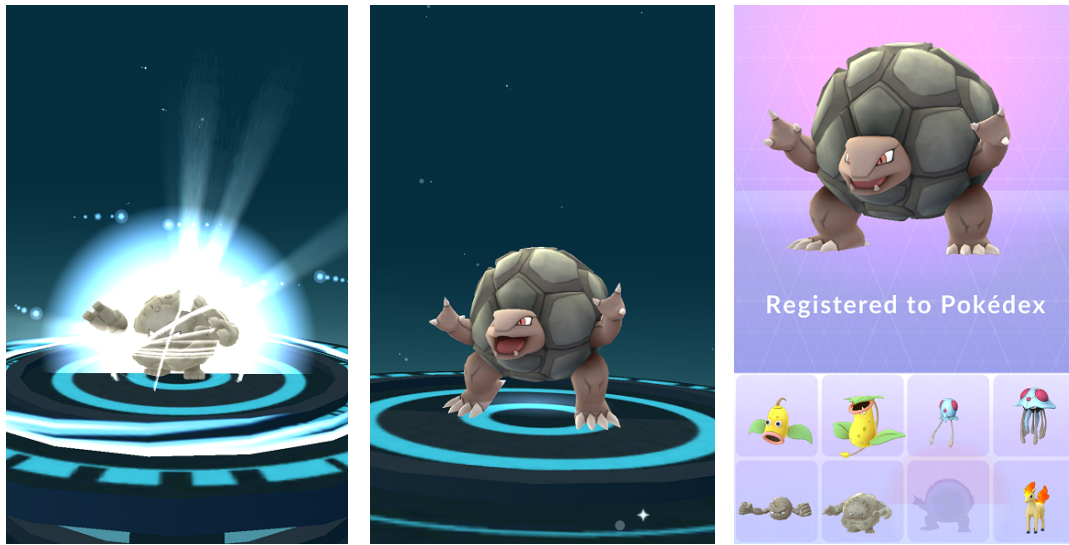
(A) A view of the in-game store (B) A view of the player inventory (C) The currently carried eggs with some incubated

FIGURE 6.4: Items and eggs

strongest. Catching a Pokémon always yields 1000 stardust, and the extent to which a Pokémon can be powered up depends on the player's level. Powering up a Pokémon increases its combat potential by making it deal more damage (increased *Combat Power (CP)*) and able to take more damage (*increased health/hit points (HP)*).

Candy is the second resource related to the Pokémon themselves. Each evolution line of Pokémon has their own type of candy, named after the base form of the species - for example, Pidgey candy is used for Pidgey as well as its evolutions Pidgeotto and Pidgeot. Candy is earned through capturing a Pokémon (yielding three candy of the appropriate type), hatching a Pokémon (yielding from 5 to 32 candy depending on the type of the egg), *transferring* or evolving a Pokémon (each yielding one candy). Transferring a Pokémon donates it to Professor Willow, the Pokémon expert guiding you through the game, and is the game's way of making the act of deleting a Pokémon immersive. Candy is used alongside stardust to power up a Pokémon, the required amount ranging from 1 to 15 depending on the current power level of the Pokémon. It is also used to evolve a Pokémon to a new species at a later stage in the evolution chain. Evolution is not a new concept for Pokémon GO, and evolution chains has been a part of the franchise since the beginning, with most Pokémon having between one and three stages. A single Pokémon (at a time) can be chosen as the player's *buddy*, earning the player

an additional candy every few kilometers they walk, the exact distance required varying from one to five kilometers depending on the species of the buddy.



(A) Evolving a *Graveler* (B) Evolved into a *Golem* (C) New Pokédex entry

FIGURE 6.5: Evolving a Pokémon

When a player reaches level 5, they can approach a gym and choose to join one of the three teams in the game: *Valor* (the red team), *Mystic* (the blue team) or *Instinct* (the yellow team). The player can then claim gyms for their own team by placing one of their Pokémon in an empty gym to defend it against attackers from other teams. A gym can be leveled up to a max of level 10, and each gym level opens up an additional spot for a Pokémon from the controlling team, with a limit of one Pokémon per player at each gym. Leveling up a gym is done by *training* it through friendly battle. To take down an enemy gym, players can battle it with their own Pokémon, choosing a team of up to six of their Pokémon.

A Pokémon battle is a last-Pokémon-standing fight, where attackers fight one defender at a time. When attacking an opposing gym, multiple players from any of the teams not currently controlling the gym can fight together to take down the defenders, while training a friendly gym limits the battle to a one-on-one fight. Pokémon have two *attacks* or *moves*, each randomly selected from a pool of eligible moves upon acquiring the specific Pokémon. The Pokémon use a *typing* system where each Pokémon has one or two "elemental" types, and each move having one type. There are 18 different types, using a rock-paper-scissors scheme where some types are strong against certain types and weak against others, and neutral against the rest. As an example, fire moves are strong against grass Pokémon, neutral against flying Pokémon and weak against water Pokémon. Strong moves

deal 25 % increased damage, while weak moves deal 25 % reduced damage. Having double *type advantage*, such as a water move against a Pokémon with both rock and ground types, leads to an even stronger attack. The strength can be further increased by using a move with the same type as the Pokémon using it, such as a water Pokémon using a water move. Figure 6.6c shows the fact sheet for a single captured Pokémon, a *Slowpoke* with a psychic attack (*Confusion*) and a water attack (*Water Pulse*).



(A) A gym as seen on the map, with the strongest Pokémon in the gym displayed on top (B) The lobby of a gym, showing one of its trainers with the Pokémon stationed there (C) A single captured Pokémon's fact sheet

FIGURE 6.6: Gyms and Pokémon

Most actions in the game earn progress towards a badge, shown in Figure 6.7c. Some of these badges increase the odds of catching specific types of Pokémon based on the level of the badge.

Using Kiefer et al.'s [26] game dimensions, Pokémon GO is an augmented reality location-based game, with Pokémon being perceivable in the real world through the AR mode in the application. It can be played anywhere and at any time, making it spatially and temporally continuous. Even if there are no Pokéstops or spawns nearby, the player can still earn distance for their incubated eggs and their buddy. The game is arguably primarily an item hunt game, with the capture of Pokémon being the main goal, although the area which the user has to search is scaled up to be the area within range of the tracker rather than an area defined by coordinates where the player has to search in bushes, under benches or similar in



(A) An overview of the various badges collected

(B) The *Jogger* badge, showing current progress

(C) The *Collector* badge, showing current progress

FIGURE 6.7: Badges

the very specific area. However, the game is also a strategy game, with multiple areas of the game requiring some form of strategy to play efficiently. Battles require a good portion of planning to win reliably and effectively, and resource management is important to not run out of consumables. Resource management is also important with stardust and candy, as a player will gain much less of these resources than what is needed should they wish to power up and evolve everything. To evolve a single Pidgey, a player will have to catch at least two others, and stronger evolutions cost even more candy.

Part III

Player Study

This part presents the player study that was performed and the data it resulted in, with an analysis of the collected results.

Chapter 7

Introduction to the Player Study

To find answers to the research questions defined in Chapter 2, a survey was constructed to be distributed among Pokémon GO players. The final version of the survey can be found in Appendix A. The data from the survey have been analyzed in this and the three following chapters, with interviews conducted in conjunction with a follow-up survey providing additional depth in some areas. It should be noted that most percentages have been rounded to the nearest integer, causing the sum of all percentages in some tables to exceed or fall short of 100 %.

7.1 Survey Construction

This section will provide a mapping between the questions of the survey and the research questions each of them aim to answer. It should be noted that in addition to the listed questions, the survey included other questions intending to get further information that could either be used to provide background on the respondents or possibly reveal perspectives not previously considered. It also included a comment section at the end where respondents could provide any additional info they did not find a proper place for, and these comments have also been used to evaluate the research questions.

The first research goal, examining the success factors of Pokémon GO as seen in Section 2.1, was decomposed into five research questions, RQ1.1 through RQ1.5. Table 7.1 shows the survey questions relevant for this research goal and the research questions each of them help answering.

TABLE 7.1: *What are the main factors that made Pokémon GO successful?*
Survey Questions

Survey question	Research questions
Which of the following factors influenced your decision to start playing Pokémon Go?	RQ1.1
Which of the following game features do you use?	RQ1.2
If you have previously played any location-based or augmented reality games, what did you like about them and what did you not like about them? How does Pokémon Go compare on these points?	RQ1.3
If you have previously played any other casual mobile games, what did you like about them and what did you not like about them? How does Pokémon Go compare on these points?	RQ1.3
If you have previously played any other Pokémon games, what did you like about them and what did you not like about them? How does Pokémon Go compare on these points?	RQ1.4
If you are no longer playing, when and why did you stop? If you are still playing, but have greatly reduced the amount you play, when and why did this happen?	RQ1.5

The second research goal, evaluating the physical health effect of playing Pokémon GO as seen in section 2.2 was decomposed into six research questions, RQ2.1 through RQ2.6. Table 7.2 shows the survey questions relevant for this research goal and the research questions each of them help answering.

The third research goal, evaluating the mental health effect of playing Pokémon GO as seen in section 2.2 was decomposed into four research questions, RQ3.1 through RQ3.4. Table 7.3 shows the survey questions relevant for this research goal and the research questions each of them help answering.

TABLE 7.2: *What are the effects on physical health from playing Pokémon GO, and how much effort does it take to achieve this effect?* Survey Questions

Survey question	Research questions
In an average week, how much time did you spend on physical activities (e.g. walking, running or biking) before you started playing Pokémon Go?	RQ2.1, RQ2.2
In an average week, how much time do you spend on physical activities since you started playing Pokémon Go?	RQ2.1, RQ2.2
If you spend more time on physical activities after you started playing Pokémon Go than before, what are the sources of this activity?	RQ2.3
Have you lost weight or in other ways feel more healthy than before you started playing Pokémon Go?	RQ2.4
Have you skipped out on less healthy activities (e.g. going out to drink) that you otherwise would have engaged in due to playing Pokémon Go instead? If so, please specify.	RQ2.5
Have you trespassed or otherwise gone into areas you shouldn't be because you were playing Pokémon Go?	RQ2.6
Have you put yourself or others in dangerous situations because you were playing Pokémon Go?	RQ2.6
Have you gotten into any accidents because either you or another involved party was playing Pokémon Go?	RQ2.6
If you have put yourself or others in dangerous situations, or gotten into accidents, because of Pokémon Go, could you elaborate?	RQ2.6
Have you neglected other areas of your life because you were playing Pokémon Go?	RQ2.6

TABLE 7.3: *What are the effects on mental health from playing Pokémon GO?*
Survey Questions

Survey question	Research questions
In an average week, during your spare time, how much time did you spend socializing with other people (in person, outside your home) before you started playing Pokémon Go?	RQ3.1
In an average week, during your spare time, how much time do you spend socializing with other people (in person, outside your home) since you started playing Pokémon Go?	RQ3.1
If you have increased the amount of time you spend socializing with people since you started playing Pokémon Go than before, what are the causes of this increase?	RQ3.2
Have you talked to someone in person because of Pokémon Go that you otherwise would not have talked to?	RQ3.3, RQ3.4
Have you made new friends through playing the game?	RQ3.3
Has playing Pokémon Go improved any of your existing relationships?	RQ3.3
Do you suffer from any mental illnesses?	RQ3.4
If you suffer from a mental illness, do you feel that playing Pokémon Go has had a positive effect on your mental health? If yes, feel free to elaborate on how it has helped you	RQ3.4

7.2 Survey Distribution

The survey was distributed in a Norwegian and an English version, and in multiple phases. After the first phase, some questions were adjusted, and a missing question regarding weight loss and perceived improvement on physical health was added.

The first phase of distribution took place at a large Pokémon Go event in *Frognerparken* in Oslo, Norway, a large sculpture park and popular destination for Pokémon Go players due to the high density of Pokéstops and spawns. The survey was available online via an easily accessible custom URL from a known link shortener, leading to the Norwegian version. Single players and groups of players were approached over the span of about two hours, given a short introduction to the project and asked whether they would be willing to respond to the survey. Given a positive response, they were handed a note with the URL. Extra effort was made to reach out to players in the following categories: Young children (15 or below), parents playing with children, and players above 40. This was done in an attempt to reach the broad spectrum of ages participating, even though the bulk of players are between the ages of 20 and 35. Unfortunately, this only resulted in a very small portion of the responses collected, with 74 people following the link, and not all of them filling out the survey.

In the second phase, the survey was distributed on *Facebook*. A post explaining the project and an encouragement to respond despite the length of the survey, along with links to both versions, was shared in each of the four largest Norwegian Pokémon Go groups (*Pokémon GO: Norway*, *Pokemon Go Norge*, *Pokémon GO - Oslo & Akershus* and *Pokémon GO Trondheim*), as well as personally. It was then re-shared by several people to their local Pokémon GO groups or their personal friends and followers. These groups consisted of between 4 000 and 16 000 members, and despite overlap between groups it is not unlikely that more than 20 000 people were able to see the posts in these groups. This is where the majority of the responses originated from, with roughly 1900 clicks on the links from Facebook, yielding between 1050 and 1200 responses.

The third phase involved sharing the survey on the popular internet forum *Reddit*. Here it was shared in two *subreddits*, sub-forums on the larger site with their own dedicated communities. The first subreddit was */r/PokemonGo*, the main community for people interested in the game in general. The second, */r/TheSilphRoad*, is a community devoted to research on all things related to Pokémon GO.

In addition to the three main phases of distribution, people encountered playing or talking about the game at any time were approached and asked to participate throughout all of September.

In early December, the respondents who had left contact information were contacted with a short follow-up survey, seen in Appendix B. Those who had left comments of note separating them from the other respondents were additionally asked about these points of interest. This round of follow-ups was an attempt to gather information on the longevity of the game, some clarifications of questions and comments from the original survey, and answers to some new questions. All responses to the follow-up survey were carefully read and any new points of interest were further followed up on, resulting in a few interviews.

7.3 Demographics

The survey collected data on the demographics of its respondents, including the age, gender and the country in which most of their playing occurred. The recorded nation is assumed to be their country of residence in most cases. A total of 2190 responses were recorded with demographic data.

Out of everyone who responded, 1244 (slightly below 57 %) were male and 946 were female. Figure 7.1 shows a histogram of the ages of all respondents, ranging from 5 to 67 years old, with the largest number of respondents (176) being aged 25. Respondents have also been divided into seven different age groups, show in Table 7.4. Note that the total percentages are rounded, and rounding errors cause the total to sum up to 101 %.

TABLE 7.4: Age distribution of survey respondents

	18-	18-21	22-26	27-32	33-40	41-50	50+
Male	120	247	434	284	108	37	14
Female	48	154	355	231	81	64	14
Total	168	401	789	515	189	101	28
	8%	18%	36%	24%	9%	5%	1%

If we normalize the results for gender, we get the numbers in Table 7.5. From this we can see that the game seemed to be more popular among males in the younger categories, while the older categories showed a preference towards female

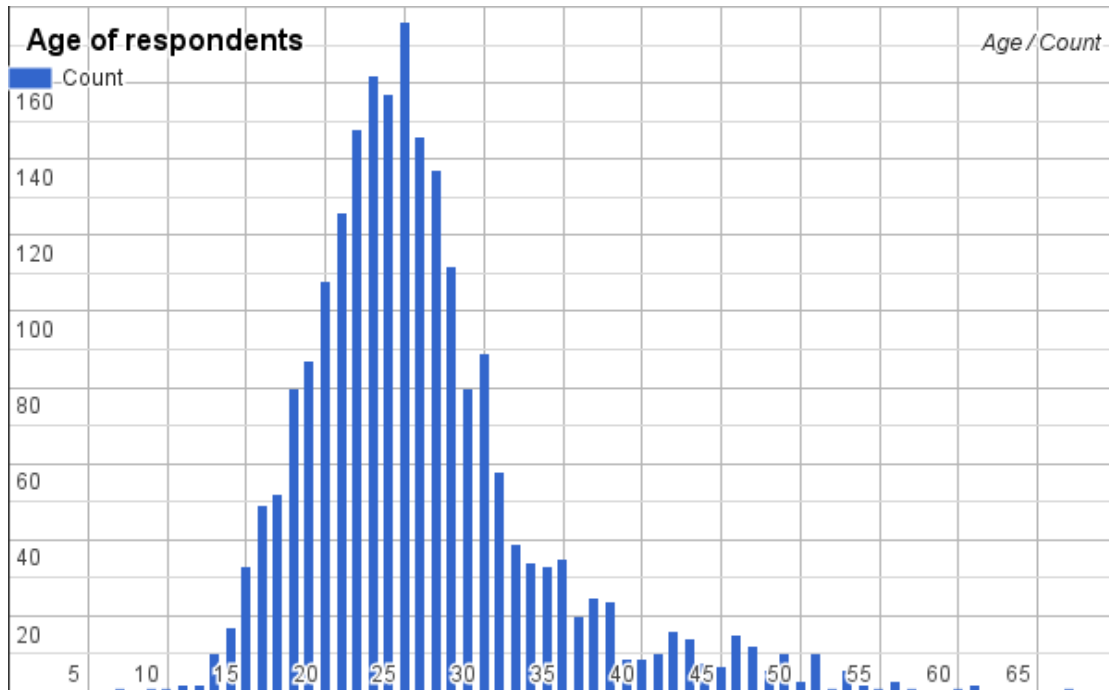


FIGURE 7.1: A histogram of the ages of the respondents

players. The middle categories were more even. This fits observations of players *in the wild*. Groups of young boys were a common sight, but young girls were much more rare. Mothers aged 40 and above playing with children also seemed more common than fathers around that age doing the same, and walking groups consisting of women also seemed more common than male equivalents.

TABLE 7.5: Age distribution of respondents normalized for gender

	18-	18-21	22-26	27-32	33-40	41-50	50+
Male	66%	55%	48%	48%	50%	31%	43%
Female	34%	45%	52%	52%	50%	69%	57%

The results contained 1189 responses stating Norway as their main location for playing, which is more than 50 % of all responses. Because the survey was distributed in Norwegian Facebook groups, but not in local communities for other countries, Norway has been excluded from Table 7.6, which shows the distribution of players per continent for the remaining respondents.

TABLE 7.6: Distribution of respondents per continent

North America	South America	Europe	Asia	Oceania	Africa
649	25	230	36	51	1
65%	3%	23%	4%	5%	0%

Of the remaining responses, The United States of America has a clear overweight with 575 responses, almost half the amount of Norwegian responses. If we also exclude these respondents, more than half of the remaining responses come from Europe, with the rest being relatively evenly divided between Oceania, Asia and South America. Countries with many responses include Canada, the British Isles (the United Kingdom and Ireland), Germany, Australia and the Netherlands. The game had just been rolled out in the first parts of Africa at the time the survey concluded, and thus we only have one respondent residing in South Africa.

The survey also asked for the main occupation of each respondent, with four categories available: employed, unemployed, higher education (e.g. university or college) and lower education (e.g. high school or middle school). The following table again shows the distribution between these categories.

TABLE 7.7: Distribution of survey respondents across occupations

Lower education	Higher education	Employed	Unemployed
219	747	1056	169
10%	34%	48%	8%

The average player level of the respondents was slightly above 23, with the vast majority being in the 21-30 range. Table 7.8 shows the number of respondents in each range of levels from 1-10 through 31-40. It also shows the average number of different Pokémon caught for each level range.

TABLE 7.8: Respondents and average Pokédex count per level range

	1-10	11-20	21-30	31-40
Respondents	21	386	1743	38
	1%	18%	80%	2%
Avg. Pokédex count	37	71	108	139

Chapter 8

Success Factors

This chapter examines the survey results in the context of determining the success factors of the game. The questions in Table 7.1 and their answers are the main focus of this chapter, but relevant answers to other questions are also included.

8.1 Results about Initial Interest

To answer research question RQ1.1, subjects were asked "Which of the following factors influenced your decision to start playing Pokémon GO?". Table 8.1 shows the options that were supplied, as well as the number of respondents for each alternative. Subjects could choose more than one option, and the *Other* choice allowed the respondent to describe other reasons.

TABLE 8.1: Which of the following factors influenced your decision to start playing Pokémon GO? options and responses

Option	Respondents	% of total
Nostalgia or previous experience	1507	70
Social media or internet forums	764	35
Recommendations from friends/family	738	34
Media coverage	315	15
Official trailers/promotion	308	14
The opportunity to get discounts or benefits because of Pokémon Go-related promotions	9	0.5
Other	165	8

The answers given for the *Other* option were categorized, and Table 8.2 shows the categories with multiple answers, with the remaining responses grouped together as *Miscellaneous*.

TABLE 8.2: Which of the following factors influenced your decision to start playing Pokémon GO? Other categories

Category	Respondents	% of Other
Pokémon	43	26 %
Exercise	29	18 %
Children/family	26	16 %
Ingress	18	11 %
Social	7	4 %
Technology	6	4 %
Fill outside time	6	4 %
Something to do	5	3 %
Real world	5	3 %
Trends	4	2 %
Gamer	3	2 %
Miscellaneous	10	6 %

The *Pokémon* category are respondents who said they started playing simply because it was Pokémon. They consume any product related to the franchise, and would not let a Pokémon game go unplayed. These respondents are primarily around their twenties, and have to an extent grown up with Pokémon.

The *Ingress* category are respondents who had previously played Ingress. Some active Ingress players were part of the Pokémon GO beta because of their participation, while others simply wanted to try another similar game. The *Gamer* category are respondents who identify as gamers and picked up Pokémon GO because it was a new game, despite not having previous experience with either Pokémon or Ingress.

The *Exercise* category are respondents who picked up the game as an exercise app, and wanted to use it as an excuse to walk more or a final push to get out and exercise, while the *Fill outside time* are respondents who were already exercising or walking and wanted something to do during these activities.

The *Children/family* category are respondents who either started playing because they wanted to spend time with their children or other family members who were already playing, or decided together with family members (significant others included) to start playing as a common activity. The *Social* category are those who

had similar goals with friends or who merely mentioned they started for the social aspect without specifying who they wished to be social with.

The *Technology* category are respondents who were drawn to the game because of the technology used, be it augmented reality, GPS tracking or otherwise. The *Real world* category are respondents who started playing because of the real world integration. They either wanted to find out what familiar locations had been turned into Pokéstops, or use the game to explore and find new and interesting locations. One subject in this category reported that they started playing because a sculpture they had made had been turned into a Pokéstop.

The *Something to do* category are respondents who picked up the game just as something to do, either because they were bored at vacation or similar, or because they needed a distraction.

The *Trends* category are respondents who started playing to take part in the cultural phenomenon and keep up with current trends.

8.2 Analysis of Results about Initial Interest

As expected, the Pokémon brand played a major role in spreading the game to such a vast number of players. 2164 respondents supplied a reason for downloading the game, and 1507 of them - almost 70 % - listed *Nostalgia or previous experience* as one of or the only reason they started playing. This reflects the large amount of respondents in their mid-to-late twenties as seen in Section 7.3, as this is the age group who were children the last time Pokémon was a big deal, and people outside that age group are unlikely to feel nostalgia towards the phenomenon.

Releasing a Pokémon game that did not require any additional console (e.g. Nintendo DS), but could be played on the smartphone everyone was already carrying, was all but guaranteed to be a success. However, not all games can be Pokémon games, so what other things did Pokémon GO do right that we can use to create other successful games? A little over 30 % of the respondents did not list nostalgia as a reason, and while some of them may have had memories of watching or playing Pokémon but for some reason or other did not pick this choice, there were certainly players who had no previous experience or connection with Pokémon.

The opportunity to get discounts or benefits because of Pokémon GO-related promotions did draw a few players, but with less than 0.5 % of the respondents listing this as a reason, it seems negligible. Those who responded within the *Pokémon* category can be grouped together with the nostalgia responders and should thus be ignored as well.

308 respondents, or just over 14 %, said they were affected by official trailers or promotional material. This shows that the advertisements shown at Super Bowl 50 and available on Youtube were helpful in creating interest in the game. While 14 % is a relatively small portion compared to the numbers for the other responses, the more casual players who were not reached by the survey (see more in Section 11.1) may have had a larger portion of players who were intrigued by the Super Bowl ad but who did not have much previous experience with Pokémon.



FIGURE 8.1: A screen from the advertisement teasing Pokémon GO shown at the Super Bowl

During the first few weeks following the release of the game, there was quite extensive coverage of the game in media all over the world. A little under 15 % of respondents said that this media coverage affected their decision to start playing Pokémon GO, meaning it was slightly more effective than the official promotional material at building the player base, despite many of the articles highlighting the bad parts of the game, such as trespassing, carelessness around traffic and criminals using it to lure victims. However, the media would not have covered the phenomenon to such a degree had there not already been a huge player base. But

if one can succeed in spreading the game to a large enough number of players such that the media starts covering the game, it is not unlikely that one can achieve a similar growth of an additional 15 % players. Those who responded within the *Trends* category can also be included in this group.

A combined 69 % of respondents said they started playing because of either recommendations from friends or family or from reading about the game on social media or internet forums. Similar to the *Media coverage* group, these groups required someone else to pick up the game before them, but a huge following is not required for this to have an effect, unlike what is necessary for media coverage to kick in. Thus it could seem that if one can successfully spread ones game to an initial group of players and the game is appealing enough, it can easily spread naturally via them.

Veteran Ingress players were part of this initial group for Pokémon GO, and almost 11 % of those who listed other reasons were previous Ingress players who either had been granted beta access to Pokémon GO or started playing it because they were previously familiar with the games from the developer. This also indicates that if a developer already has a successful game (even if somewhat niche, like Ingress), it is possible to adjust some parts of the game and release a new one and gain an initial player base from those familiar with your previous games. This is what game developers have been doing for years, and is also in line with Kiefer et al.[26]

The *Children/family* and *Social* categories are partly related to the idea of creating an initial player base and letting it grow through sharing, but they also highlight the importance of the social aspect of the game. One area where Pokémon GO succeeded is making the game very social, and it becomes more fun to play together with others, as shown by 20 % of the *Other* responses placing in these categories. Players enjoyed going out to play with their friends and family, having a purpose and something to do while socializing. More on this in Chapter 10.

The use of augmented reality technology and anchoring to the real world using GPS positioning also succeeded in attracting some number of players. About 7 % of responses for the *Other* option gave these areas as one of or the sole reason for playing. There still are not a large number of games using these technologies, and being one of the few that do allowed Pokémon GO to grab a market share by filling a hole. Some examples of other games with relative success in these

areas were mentioned in Chapter 5, but there should still be room for more games in this category, and new, successful games could be created by changing some parameters of the Pokémon GO formula, as described in Kiefer et al.[26]

Another category related to real world integration is *Fill outside time*. The respondents in this category take advantage of the location-based aspect of the game, where the game progresses simply by moving around. They were looking for an activity to fill the time they were already spending outside, either walking somewhere (e.g. to work, public transit etc.) or exercising, and a game that does not require their constant attention and actually progresses based on the activity they were already performing is a better fit than most other mobile games.

Even though Pokémon GO is not marketed as an exercise app, over 17 % of respondents who chose the *Other* option said they started playing the game with that exact purpose. The location-based gameplay serves as motivation to get up and out and to move around. With overweight being an increasing problem and sedentary lifestyles becoming increasingly common, we are frequently reminded by health institutions of the importance of physical activity. While most are aware that it is important to be physically active, many struggle with motivation. Not only being able to combine exercise with something fun, but the game actually requiring players to move around to progress makes Pokémon GO the perfect motivation for many players. Other games have also used a similar recipe to success before, as discussed in Section 5.

The *Something to do* and *Gamer* categories can also be more or less ignored, because it is difficult to say what will attract these players to your game over another one. The *Gamers* are likely to pick up any game they stumble upon, and the quality of the game will determine whether or not they will stick with the game. The respondents in the *Something to do* category will similarly start any activity in an attempt to find something that can keep their attention. The best one can do to capture these players is to simply get the game as much exposure as possible to increase the odds of being the first activity or game they happen upon, and make sure the game is good enough to keep their attention. In the *Miscellaneous* category are respondents whose reasons have too small of a sample size to draw any conclusions from.

8.3 Results for Most Used Features

To answer Research Question [RQ1.2](#), players were asked which of a selection of game features they used. The 2193 answers to this question are given in [Table 8.3](#).

TABLE 8.3: *Which of the following game features do you use?* responses

Incubators	Gym battles	Lures	Incense	Shop	AR mode
2126	1729	1597	1427	1087	343
97%	79%	73%	65%	50%	16%

8.4 Analysis of Results for Most Used Features

From [Table 8.3](#), we see that incubators were the most used feature of Pokémon GO (besides the obvious catching of Pokémon), with a massive 97 % of respondents using this feature. With basis in the comments and answers across multiple questions, it seems likely that there are two major reasons for this popularity. The first half of it is the excitement and expectations the players experience because they don't know the contents of the egg. You never know exactly what you're going to get, and some eggs are known to contain rare and powerful Pokémon such as *Snorlax* and *Lapras*, which makes hatching eggs very desirable. The second half is that incubating eggs gives players something to do even if there is nothing else interesting in the immediate vicinity, or if the players are unable to pay attention to the game, for example while running.

Gym battles are the second most used feature. This seems natural, as they are currently the only points of interaction with other players within the game, and the only area of the game where players are able to deploy any sort of strategy, which for many is an important factor of playing games. As discussed in [Section 8.6.6](#), gyms also provide the only goals in the game besides catching all the different Pokémon. Conquering gyms also provides rewards in the form of coins, which can be used to purchase things in the shop such as additional Pokéballs or incubators.

The third most popular feature were lures, used by 73 % of the respondents. Lures, as discussed in [Section 6.2](#), are items used to attract Pokémon to specific Pokéstops. The Pokémon they attract can sometimes be rare Pokémon that do not

frequently spawn in the area, making them attractive for players who are looking to catch more and rarer Pokémon. The lures also attract nearby players with the same goals. It was therefore not uncommon to see clusters of Pokéstops have lures on all Pokéstops, as groups of players would gather in these places to fill their Pokédexes and just hang out with old and new friends, making lures a very social item.

Incense was slightly less popular than lures, with 65 % usage. Where the Pokémon attracted by lures are visible for all players, Pokémon attracted by incense are personal to the incense user. This makes it less attractive for use in groups, as players cannot split the costs of incense the same way they can with lures by rotating who places a lure. Incense does however allow players without access to Pokéstops to attract additional and rarer Pokémon, and in areas that do not naturally spawn Pokémon at all, lures are able to attract any Pokémon, making it popular in these areas.

The shop is especially important for players who do not have access to many Pokéstops, as they can often run out of Pokéballs. It is also the only way to get additional lures, incense, incubators and lucky eggs besides those awarded every ten levels. Therefore it is natural that it is relatively popular, considering the popularity of the features mentioned above. While it is used by 50 % of the respondents, however, it is important to note that the coins required to purchase items in the shop can also be earned by capturing gyms, so it is likely that less than 50 % actually spent money on the game. In the follow-up survey, 82 % said they had spent real money in the store, with a median expenditure of roughly 770 NOK (or 90 USD), ranging from 55 NOK (around 6 USD) to 12000 NOK (around 1400 USD). There were only 11 respondents for these questions in the follow-up survey, however, so the significance of these numbers is unfortunately very low. These players spent coins primarily on incubators, secondarily on lucky eggs and storage space, and the rest on lures, incense and Pokéballs. Two of the low spenders spent coins only on Pokéballs.

Perhaps the most important number to note is the low usage of the *AR Mode* feature. Only 16 % of respondents used the AR mode, despite augmented reality being one of the important features in the promotional material and one several users listed as a reason to start playing in the first place. It is however not so surprising that players were reluctant to use it, as it sometimes made it more difficult to catch Pokémon because one would have to remain more or less stationary and

point the phone towards the same location for the entirety of the catch while it was on. It also caused additional battery drain by using the camera, which was already a problem without AR mode, as discussed further in Section 8.6.9. One would think that these problems and the low usage indicated that it was mostly only used by low level, new players, but the usage was in reality distributed evenly with player levels ranging from 7 to 38.

We see that the items that increased the amount of Pokémon the players get access to, that is the incubators, lures and incense, were all very popular. By purchasing these items in the store, the player can increase their pace of play by encountering more Pokémon and more quickly gaining access to stronger Pokémon, and are not unlike the items that can be purchased in other mobile games. They provide an advantage to those players who purchase them, but one that can also be gained by spending an appropriately higher amount of time in the game. That there are no items available for purchase that give advantages that cannot be otherwise be gained by putting extra effort into playing is an important trait of the game that multiple players mentioned in comments and the follow-up survey as reasons that would make them quit the game.

That the augmented reality part of the game was so little used means that there is some room for improvement here. It adds a little bit of immersion to the game, and allows for funny or interesting photos to be taken, but beyond that there is little reason to use it at all. John Hanke, the CEO of Niantic, mentioned in an interview with Business Insider [47] that they were planning on extending the feature in the future. Nothing has come of it yet, but it seems important if they want to be able to compete in this section of the market.

8.5 Results for Dwindling Interest

Despite launching as a soaring success, the Pokémon GO bubble also burst relatively quickly. Player numbers started dwindling near the end of July, and by mid-August it had lost around 80 % of its paying player base [17][44]. This section and the following attempts to answer research question RQ1.5 and determine why Pokémon GO all but faded away so quickly.

Table 8.4 shows the distribution of responses for the question *“Are you still playing?”*. Not surprisingly, less than 3 % of the responses said they had already quit

playing, as those who have quit are for the most part no longer following Pokémon GO groups or forums even if they previously were. What is more interesting is that over 40 % of respondents said they had reduced the amount of time they play compared to their peak. While we do not know how much they reduced their play time, we do know that they were playing less, and there had to be some reason for it.

TABLE 8.4: *Are you still playing?* survey question responses

No	Yes	Yes, but less frequently than during my peak
65	1245	884
3%	57%	40%

A total of 610 respondents gave one or more reasons for either quitting the game or reducing the amount of time they spend in the game compared to their peak. These answers were categorized into one or more categories depending on the given reason. Table 8.5 shows these categories, along with the number of respondents who gave a reason that was placed in that category, and the portion of the total number of respondents who gave reasons. It should be noted that the input for this question was free text. Because some of the categories are closely related, and because the interpretation of some answers may have been slightly wrong, some respondents may have been placed in one category when they should have been in another similar one instead.

The largest category by far was *Reduced free time*. This category consists of respondents who had either quit playing or reduced the amount of time they play because of reduced free time. The cause of the reduced free time was in most cases related to returning to work or school/studies. The *Climate/weather* category is related, being additional players who decided to play less as summer faded away, but for climate and weather reasons rather than (or in addition to) having less time available.

The *Non-urban* category are respondents who live outside urban centers, either in suburban or rural areas. These areas are not as suited for Pokémon GO playing as urban areas, and is sometimes referred to as *the rural problem*. More on this issue in Section 8.6.4.

The *Social aspect* category are those who quit or reduced play time because the game fell in popularity with others and they did not have as many other people to play with. Somewhat related is the *Hype died down* category, which consists of

TABLE 8.5: Reasons for quitting or reducing play time of Pokémon GO

Category	Respondents	% of total
Reduced free time	253	41 %
Non-urban	77	13 %
Social aspect	51	8 %
Too repetitive	45	7 %
Lack of features/content	43	7 %
Difficulty of progression	41	7 %
Goal completion	40	7 %
Lack of variation	40	7 %
Hype died down	39	6 %
Removal of tracker	38	6 %
Climate/weather	28	5 %
Community management	26	4 %
Technical requirements	21	3 %
Technical issues	13	2 %
Cheaters/catching up	13	2 %
Burnout	9	1 %
Lack of purpose/endgame	9	1 %
Lack of incentives	8	1 %
Too all-encompassing	7	1 %

respondents who got bored with the game after the novelty wore off and the game was no longer *"hyped"* as much.

The *Too repetitive* category focuses on the repetitiveness of the game. These respondents felt like they were doing the same thing over and over and felt their enjoyment of the game (e.g. catching the same Pokémon, evolving them and then transferring them) lessen because of this. The *Lack of variation* category is closely related, consisting of players who were tired of mostly only running into the same Pokémon everywhere. This is also somewhat related to *the rural problem*, as the variety of Pokémon becomes much smaller once you leave the urban areas.

The *Lack of features/content* category is again closely related to the previously mentioned *Too repetitive* category. These players got bored of the game because of the limited number of things one can do within the game itself. You are limited to relatively few activities, as described in Section 6.2, and this was simply not enough to keep the interest of these players in the long run. The *Lack of purpose/endgame* category is relevant here, consisting of players who struggled to find a purpose with the game. There was no clear goal or endgame, and thus nothing for these players to work towards.

The *Difficulty of progression* category respondents were frustrated with how long it takes to make any progress after having played for a while. The related *Lack of incentives* category focuses on the lack of incentives to progress or even play the game.

The *Goal completion* category are players who had certain goals when they started playing. As they reached these goals, they no longer felt any reason to play, or at least no longer played as actively. For most of these players, the goal was to catch one of each Pokémon (or at least those available to them in their region). For others, additional goals were to reach certain player levels in the game.

The *Removal of tracker* category consists of players who were unhappy about the removal of the in-game tool for tracking Pokémon. For the first few weeks after the initial release of the game, players could track Pokémon in the area by using a tool that was available within the game itself. The *tracker* showed from one to three footprints next to an image of the Pokémon, indicating its distance from your current location. As the player got closer, the number of footsteps would decrease. However, around July 18th, this tracker stopped working, never showing less than three footsteps. For some time it was believed that this was caused by a bug, but within two weeks, the footsteps feature was removed entirely. The players in this category were not happy about this, and either reduced play time because of it, or quit playing entirely.

Many players were not happy about the way this issue was handled. The feature was "broken" for a long time without any news from the developers about it, leaving players not knowing whether it was a bug that would be fixed or if it was intentional. For a long time there was a general lack of communication from Niantic regarding the game at all, and the *Community management* category consists of players who were frustrated about this to the point where they no longer wished to play as actively, or in some cases at all.

The *Technical requirements* category are respondents who decided that the technical requirements of the application were too much for them to be willing to play, or who actually were unable to play because of them. One of the requirements that many struggled with was the huge battery drain playing the game caused. The game required the screen to be on, and was constantly using GPS and mobile data, resulting in a battery drain that caused most users to have to charge their phone several times a day. This led to a massive spike in power bank sales, but

for some it was simply not feasible or acceptable to charge multiple times during the day. For others, the issue was with the use of mobile data, having too a too limited amount of data available to let the game use it all. A third, major technical requirement that completely lost a portion of players was the requirement for the device to not be rooted. This was a change made in early September in an attempt to stop cheaters, that also ended up rendering many legitimate users who had rooted their Android devices for one reason or other unable to play the game. Many of these users were infuriated with Niantic, also responding within the *Community management* category.

The respondents in the *Cheaters/catching up* category are players who wished to compete in gyms, but were unable to because they were too far behind. While some of these respondents were players who had been forced to take a break or were late to the party and fell behind because of that, the majority of this category are people frustrated with cheaters. Pokémon GO has struggled with players cheating through various means, such as creating bots that can play constantly, and *spoofing* their GPS-location so they can be anywhere in the world at any moment. This resulted in very high level rare Pokémon filling gyms around the world, making it difficult for legitimate players to compete.

In the first few weeks after release the game was suffering from technical issues of varying degree of severity. The game was full of bugs, some worse than others, but the major problem was the servers. They were not proportioned for the incredible amount of players, and during peak hours (the middle of the day in America) you were lucky if you were able to log into the game. If you were unlucky enough to encounter one of the bugs that required you to restart the game, you were all but forced to stop playing for the rest of the day. This annoyed quite a few players, and for some of them trying to play was not worth the trouble and disappointment. In addition to bugs and server issues, the game struggled with poor GPS tracking, causing worries and problems for some players. All of these players are represented in the *Technical issues* category.

The last categories are the *Too all-encompassing* and *Burnout* categories. The *Burnout* category are players who went all-out and played too much and got burnt out and tired of the game, while the *Too all-encompassing* players could no longer deal with everything around them being about Pokémon. They were either unable to focus on anything other than Pokémon themselves, or everyone around them talked about nothing else, and it became too much for them.

Other answers that had less than 1 % representation were not included in the table. Some examples are players who were unsatisfied with the combat system and the difference from the Nintendo device based games, players who disliked the lack of variety in the Pokémon you would encounter in gyms, or were unhappy that they were unable to hold a gym even if they placed their strongest Pokémon in it. Some did not approve of the decision to make some Pokémon region-specific, while others found the game unrealistic because even the weakest of Pokémon were sometimes quite difficult to catch, and some did not like that the Pokémon they could catch in the wild almost always were much weaker than those they would hatch from eggs. Some did not want to use the app because of security concerns, some gave up saying they were too lazy to play it, and some simply found the game to be boring.

8.6 Analysis of Results for Dwindling Interest

This section takes a closer look at the various reasons players gave as discussed in the previous section, attempting to identify the core issues. We want to find decisions that could have been made to avoid the player exodus that took place, changes they could make to avoid losing the remaining player base, and things that could or should be done differently in creating a new game seeking to achieve a similar success.

8.6.1 Reduced free time

We saw that the vast majority of players who had quit or reduced their play time had done so because they simply did not have enough spare time to play anymore. Releasing the game during summer when schools were out and adults were taking out their vacation allowed the game to build a much larger player base than if it had released during a busier time. While a lot of the players are not sticking around in the long run, it was still a successful strategy. As we saw from the number of players who were drawn to the game because of friends, family, social media and media coverage in Section 8.1, the important part was to get a large initial player base that would expand naturally. Even if some (or even most) of the players who started because they had time during summer stopped playing entirely after their vacation ended, many of the people they brought to the game

may have stayed. At its peak, Pokémon GO was earning more money than all other mobile games combined [44], and even after losing most of its player base it remains one of the most profitable mobile games available.

8.6.2 Removal of tracker

While less than 7 % of respondents mentioned the removal of the tracker as a reason for quitting or playing less, it has been one of the most discussed topics in the Pokémon GO community since it happened. The tracker was not only very important to the playability of the game, but core to the concept and idea of being a Pokémon trainer. The players want to go out and be able to hunt for specific Pokémon to "*catch 'em all*" and complete their *Pokédex*, or to get certain strong Pokémon for battling with. With the removal of the tracker, the players were forced to walk around aimlessly, hoping to be fortunate enough to run into the Pokémon they wanted to find.

Shortly after the removal of the tracker, third-party map services started popping up online. These services let players choose an area they wished to search in, and the service would run API calls to the same API as the game itself to find what Pokémon were currently available in the area, and placed them on a map. For a large number of players these services became the new tracker, and they became more focused in their playing, going to specific locations because of the Pokémon they knew were present rather than because of the density of Pokéstops.

Some players viewed these maps as blatantly cheating, while others viewed them as a necessary evil. Others argued that they made the game more realistic, as if the Pokémon were real, there would indeed be data mapping where the different species could be found. Niantic were clear on their stance, however: the maps were cheating, and their creators were sent cease and desist letters [22]. The sites were taken down, and users were once more stuck without a functioning way of tracking Pokémon. This caused further outrage among players, and the player base was largely unhappy with the way Niantic were handling the community. The in-game tracker was still broken, without much word from the developers on their progress in getting it back.

The tracker has since been re-introduced in a new version: it still lists Pokémon that are nearby with no indicator of distance, but Pokémon that are near Pokéstops

now list the closest stop and can even be shown on the in-game map. However, the whole tracker situation shows two major things that should be important to keep in mind when creating a popular game:

1. Do not remove core functionality from the game after it has been released. If absolutely necessary:
2. Make sure you have a handle on community management. If the game becomes popular, you will get support requests, and if they do not get answers, your players will be unhappy and eventually leave.

8.6.3 Social aspect

The 8 % of players who leave because the social aspect became worse are difficult to avoid, but they show the importance of the strong community and maintaining a good player base. One player went as far as saying "*A vibrant competitive community is more important than the actual content of the game*". The fact that players were able to compete but still play together and cooperate despite being on different teams was a nice feature appreciated by many players, and is discussed further in Section [10.4](#).

8.6.4 Non-urban

Almost 13 % of players ended up losing their enthusiasm for the game, and in some cases leaving entirely because the game for a long time was all but unplayable in rural areas, and strongly imbalanced towards urban areas. There are multiple sides to this issue, but it is clear that something should have been done differently, as we can see not only from it driving players away, but from the fact that Niantic later increased the spawns for rural areas.

The core of *the rural issue* is that urban centers had a much higher density of Pokéstops, gyms and Pokémon spawns - everything needed to participate in the game - than non-urban areas such as suburbs or rural areas. As explained in Section [6.2](#), this is because Pokéstops and gyms were based on points of interest reported by players, while Pokémon spawns (initially) were based on cell phone usage.

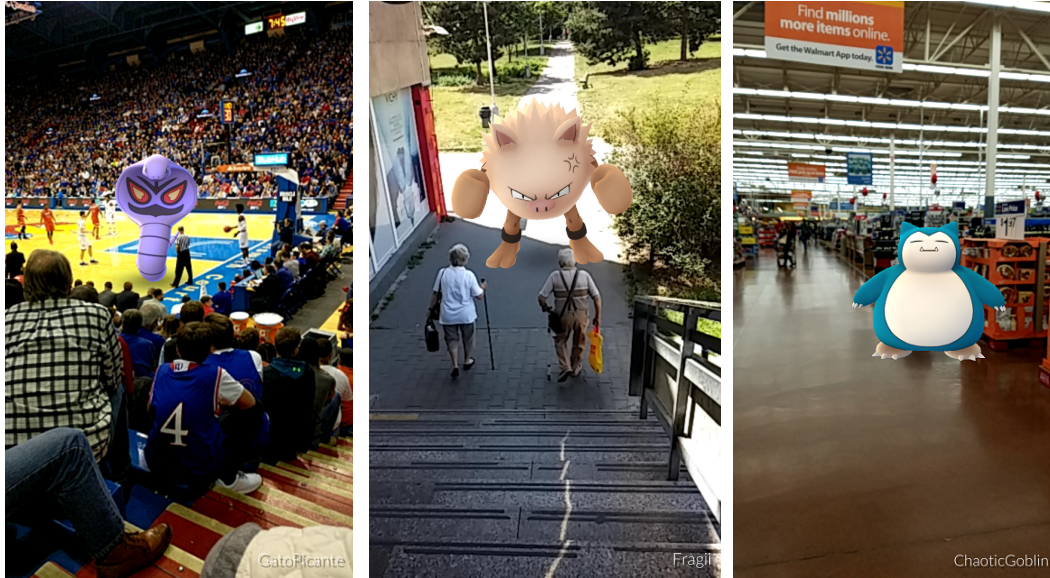
It makes sense that cities and urban centers have more Pokéstops and gyms, for multiple reasons. From a technical perspective, there are typically more points of interest in a more densely populated area, and these areas were more likely to have Ingress players who would report these *POIs* to be registered. From an immersion perspective, it's also not hard to believe that more people would set up gyms or hotspots to help nearby trainers in cities where more trainers are likely to come by.

The immersion perspective is where distribution of Pokémon spawns fails, however. While it makes sense from a technical perspective to use mobile usage to place spawns because it avoids having many spawns that no one will ever see because they are in areas where no one travel, from an immersion perspective it does not make sense that wild Pokémon are more likely to converge in areas filled with humans as opposed to being out in nature. Rural areas had close to no spawns, and the few they had were mostly just of the common species *Pidgey* (a pigeon-like bird Pokémon) and *Rattata* (a purple rat Pokémon). These are Pokémon you would expect to find in a city, while rare Pokémon such as *Charizard* and *Dragonite* (large dragon Pokémon), *Aerodactyl* and *Kabutops* (living fossil Pokémon) and *Onix* (an enormous stone snake Pokémon) are examples of Pokémon you would not expect to find on a busy pier or shopping street. There are plenty of the common Pidgey and Rattata in cities as well, but where almost every single spawn in rural areas are these Pokémon, the cities have plenty of other spawns as well, including rare and dangerous (from an in-universe perspective) Pokémon. Players in suburban areas are to a degree better off than the rural players, with slightly more spawns and a little higher variation in the species they encounter, but they too have nothing compared to the truly urban players.

TABLE 8.6: *What type of area do you primarily play in?* answer distribution

Urban	Suburban	Rural
1048	919	227
48%	42%	10

Because a large part of the player base naturally would be located in cities, it was important from a community perspective to enable them to play the game, and removing all exciting spawns from cities therefore seems like an equally bad or worse alternative. However, since much of the player base also lives and plays outside of cities, they too should be able to play. Table 8.6 shows the distribution of survey respondents between the three environments. With the described system,



(A) An *Arbok* in the middle of a basketball court during a game, by Reddit user Jack_Attak

(B) A *Primape* blocking the path of an elderly couple, by Reddit user Fragii

(C) A *Snorlax* inside a Walmart, by Reddit user chaoticgoblin

FIGURE 8.2: "Dangerous" Pokémon in high traffic areas

urban players gained an unfair advantage, not only having better and frequent access to rare Pokémon, but also being able to stock up on consumables from Pokéstops where suburban and especially rural players were lucky to have more than one Pokéstop around from which they could gather Pokéballs. The result of these differences was that urban and suburban/rural players were essentially playing different games. Urban players who visited suburban or rural areas and players from the suburbs or rural areas who worked in and commuted to more urban areas brought this unfair advantage with them and were able to place strong Pokémon acquired in the city in the few gyms available in the outskirts. In December, Niantic added additional spawns to rural areas (as well as to parks), but it may have been too late.

8.6.5 Cheaters and catching up

Only a little over 2 % of respondents listed cheaters and the difficulty of catching up and competing as a reason to quit. This is likely because most of the game can still be played in spite of cheaters and people who have been playing more than you. The only affected aspect of the game are gyms, as that is currently the only place where players interact with each other inside the game itself. However, in the



FIGURE 8.3: Tweet from Niantic about increased spawns in rural areas

area where it does matter, it is clear that cheaters are significant problem. While not all gyms are being targeted by these cheaters, in some popular areas players are finding it impossible to hold a gym for more than a few minutes, even in the middle of the night, as high level trainers suddenly show up in the game to claim the gym and fill it with powerful Pokémon, despite there being no one else around. Perhaps the best example of this problem is that within a few hours of the game's release in Brazil, many gyms were already filled with level 30 trainers and their nigh unbeatable Pokémon. For reference, the total amount of experience points needed to reach level 30 is 2 000 000 (two million), while catching a Pokémon nets 100 experience points, making the feat of one player reaching level 30 within less than a day of release impossible. With all nearby gyms full of these trainers, Brazilian players were not thrilled.

Niantic made multiple changes throughout the year in an attempt to make it more difficult for cheaters, in addition to banning known and suspected cheaters' accounts, but because letting a bot play for you requires minimal effort, they keep creating new accounts. For those who want to play the game competitively but are unwilling to cheat, better solutions are needed. One change that could help catch cheaters, or at the very least limit the amount of damage that they can do, would be to show the time at which a Pokémon was added to a gym. This would allow cheaters who spoof their GPS location to place Pokémon in multiple gyms in a short time to be caught, as one could estimate the required time to transport from one gym to the next, and if the time between placing Pokémon in distant gyms is too large, the spoofing could be uncovered. Combining a screenshot of the time a Pokémon was placed in a gym with a timestamped photo of the area could also help prove that there was no one physically around to place the Pokémon, allowing

people to report players who steal gyms in front of them while not physically present.

8.6.6 The grind

Over 7 % of players who quit the game found the game to be too repetitive, while almost 7 % were less motivated to play because of the difficulty of progression. These two categories combined make up the more than 14 % who complained about the *grind* - the feeling and boredom of repeating the same menial tasks over and over - that the game turned into. Starting at level 20, the number of experience points (*XP*) needed to progress to the next level increases rapidly. Figure 8.4 shows the required experience to reach each level along with the total accumulated experience so far for levels 18 and up.

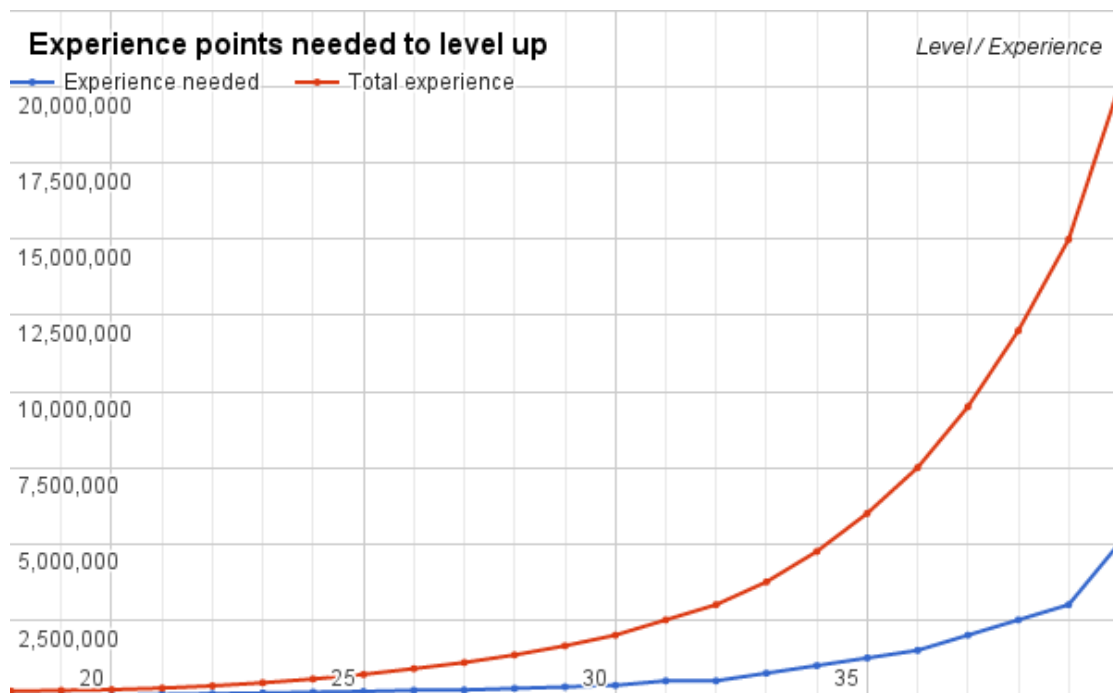


FIGURE 8.4: Experience points needed to level up from level 18 to 40

As we can see, the required experience to level up past 20 starts increasing much more rapidly than for the first 20 levels, where the total amount of experience needed to reach level 20 is 210 000, while level 30 requires a total of 2 000 000 (two million), and 40 requires 20 000 000 (twenty million). After level 30 the experience required to level up becomes too much for most players, and when the player reaches level 37 they are still not halfway to level 40.

Every caught Pokémon only yields 100 XP with no regard towards the difficulty of the catch or the strength of the Pokémon, while evolutions yield 500 XP, again disregarding the strength of the Pokémon or the amount of resources needed to perform the evolution. While bonuses for *nice*, *great* or *excellent* throws, as well as a bonus for throwing a curved ball, can grant up to 110 additional XP per catch, the strategy that is widely regarded as the most efficient way to level up is mass evolution of common Pokémon such as Pidgey and Rattata. By activating a *lucky egg*, a purchasable item that doubles XP earned for 30 minutes, and then performing around 90 evolutions, players are able to earn up to 90 000 XP in one "session". Unfortunately, at higher levels, this is more or less the only time any significant progress is made, which makes players less motivated to play more after reaching level 30. At this point, most have "completed" their Pokédex (more in Section 8.6.8), and their entire play experience revolves around catching the same marginal selection of Pokémon (for most this is Pidgey, Weedle and Rattata), then evolving and transferring them once they have enough candy to perform around 90 evolutions.

Combine this monotonous experience with the lack of incentives (which around 1.31 % reported as a reason to stop playing) and the game does not sound very appealing. At level 20, Pokémon hatched from eggs stop scaling with the player level (all Pokémon caught after level 20 are hatched as level 20). At level 30, wild Pokémon stop scaling further (you can never encounter wild Pokémon higher than trainer level 30). While every level awards some number of consumables (different types of Pokéballs, potions etc.), and every few levels unlocks a new type of item, the last type of item is unlocked at level 30. Every additional level the trainer gains allows powering up their Pokémon a little further, but beyond this there are no real incentives to level past 30.

There also seems to be no real purpose or endgame, which around 1.5 % listed as a reason for quitting. As players catch new Pokémon and continually improve the ones they catch, there is no in-game goal to work towards. Currently, the only actual use for Pokémon is to battle at gyms. Capturing gyms lets you claim up to 100 in-game coins (10 per held gym at the time of the claim) once per 21 hours. These coins lets you upgrade your storage space or purchase consumables that either let you get more Pokémon or level up so you can have stronger Pokémon. If you are able to capture many gyms, people in your local community may start

to recognize your name, but beyond that there is no recognition to be had, and there are no real life rewards.

Gym battles favor the attacker (see more on how gyms work in Section 6.2), which makes it very difficult to hold gyms for any significant amount of time, and in popular areas the gyms often switch controllers multiple times per hour. Because of this there is little incentive to level up and improve your Pokémon.

In the original games and the animated TV series, gyms were locations held by certain esteemed trainers and the player had to defeat eight of these to collect *badges*. Collecting all eight badges allowed the player entry into the *Pokémon League*, a very difficult tournament where the winner was crowned Champion. Subsequent entrants into the league would have to battle the previous Champion at the end to try to become the next Champion. The League was very tough, and required very strong Pokémon to be able to defeat. Implementing something like this into the game would provide a goal for players to work towards, and a reason to keep progressing to higher levels. Other multiplayer games often have online leader boards where strong players are showcased. This is another way of giving players motivation to keep playing and become stronger trainers, and is something the Niantic CEO mentioned in an interview shortly after the release [47] that they were planning on implementing, but has yet to be seen at the time of writing this.

It makes some sense to make it difficult to reach the highest level, not only to keep some difference between the dedicated players and the casual players, but also to make it prestigious and desirable to reach the goal - given that there are incentives to do so, as discussed above. However, the current solution of almost exponential growth in required XP seems somewhat absurd given the flat rates of XP rewards. While it is true that a large part of the game's business model is based on sales in the in-game shop, and requiring large amounts of experience to level promotes sale of the *Lucky Egg* item which doubles experience gained for 30 minutes, a player could level ten times to level 30 in the time it takes to reach level 40. Leveling to level 30 in a reasonable amount of time still requires active usage of Lucky Eggs, and if the higher levels were slightly less out of reach, more players might be inclined to purchase these Lucky Eggs and go all the way to the top. If the amount of experience needed to reach level 40 was halved to ten million, it would still be a considerable feat, but many more players would likely attempt to reach the goal.

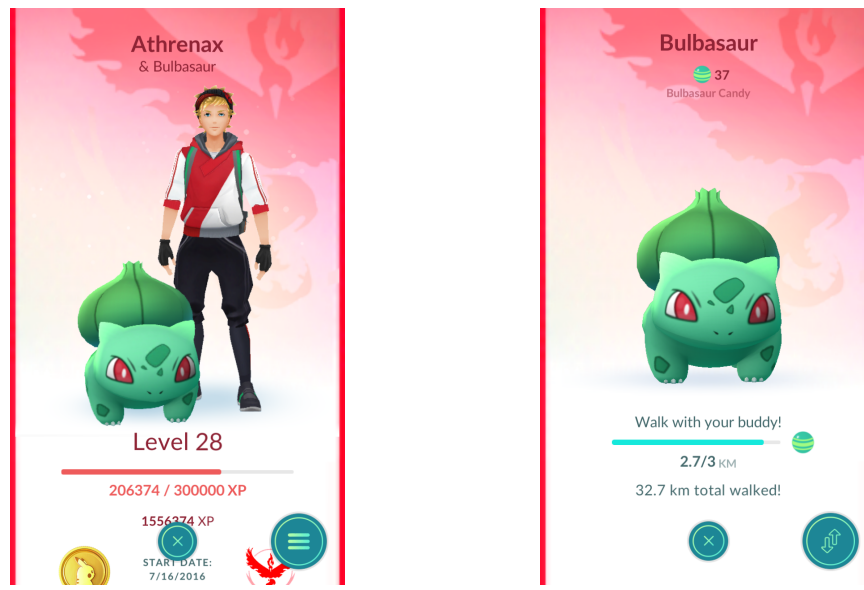
One way to combat the feeling of grinding without changing the amount of experience needed to level is to change the reward systems. Currently, the reward for catching a Pokémon is 100 XP (plus the potential throw bonus), 3 candy of the appropriate type, and 100 stardust, regardless of whether the Pokémon has a combat power (CP) of 10 or 2 000 and whether you spent one regular Pokéball or eight Ultra Balls to catch it. In most games, harder feats yield higher rewards, so why can Pokémon GO not work this way? Unless the player has nigh unrestricted access to Pokéballs, there is little reason to waste many balls on trying to catch a stage 2 or 3 evolution when catching unevolved Pokémon is easier, yields the exact same rewards, and is actually better because they can be used to gain more XP through evolution.

Since evolution costs candy, it would make sense that catching an evolved Pokémon yields more candy of the appropriate type, perhaps along with some additional XP and stardust. Performing a third stage evolution costs more candy than a second stage evolution, so unless you are missing the Pokémon from your Pokédex or are going to use the evolved Pokémon to battle, there is never any reason to evolve past the second stage. If these evolutions yielded an appropriately scaled XP reward, perhaps along with some other reward (e.g. stardust), it's much more likely players would be willing to switch up their current routine. By providing bonuses for catching or evolving different Pokémon, even more variation could be introduced.

Games like *Candy Crush Saga* can get away with less variation in game play because they are games typically played while doing something else, e.g. traveling, and often require the user to think strategically. Pokémon GO on the other hand requires active participation because you have to physically move for the game to progress. It also requires little to no strategic thinking. In the original games the player could battle wild Pokémon to weaken them, making catching them easier. Implementing this feature would make the game more complex and more difficult for those who have no previous experience with the original games, but introduces an element of strategy. This would also increase the active participation of the game, making it more engaging to play when not taking gyms. To keep it simple for new players, fighting the Pokémon could be optional.

While no new incentives for progression has been added to the game, Niantic has added some incentives to do some amount of playing every day. The first catch every day yield a bonus to XP and stardust, and getting this bonus every day 7 days

in a row yields an additional larger bonus. Similarly, the first claimed Pokéstop every day yields extra items, while the first Pokéstop on the seventh day in a row yields a large amount of items. The player can now select a Pokémon as their *buddy*, and while that Pokémon remains their buddy, the player will earn candy of that Pokémon's type every few kilometers, making it easier to get evolutions of Pokémon that are not common in the player's area.



(A) A player with their buddy

(B) The selected buddy and progress towards candy

FIGURE 8.5: Players can select one Pokémon at a time to be their *buddy*

Most holidays have special events where the game is slightly different for the duration of the holiday. The first event was the Halloween event, where for a week, there was an abundance of "spooky" Pokémon everywhere, and anything that yielded candies now yielded twice the amount. The next event was the Thanksgiving event, where all XP and stardust gains were doubled. The latest event was the Christmas event, with multiple bonuses spread out across the event. Special Christmas-themed *Pikachu* started appearing, baby Pokémon hatch probability was increased, and *starter Pokémon* (*Bulbasaur*, *Charmander* and *Squirtle*) families had their spawns increased.

8.6.7 Releasing too early

Players who have previously played the "main series" Pokémon RPG games for the Nintendo Gameboy or Nintendo DS have certain expectations for Pokémon

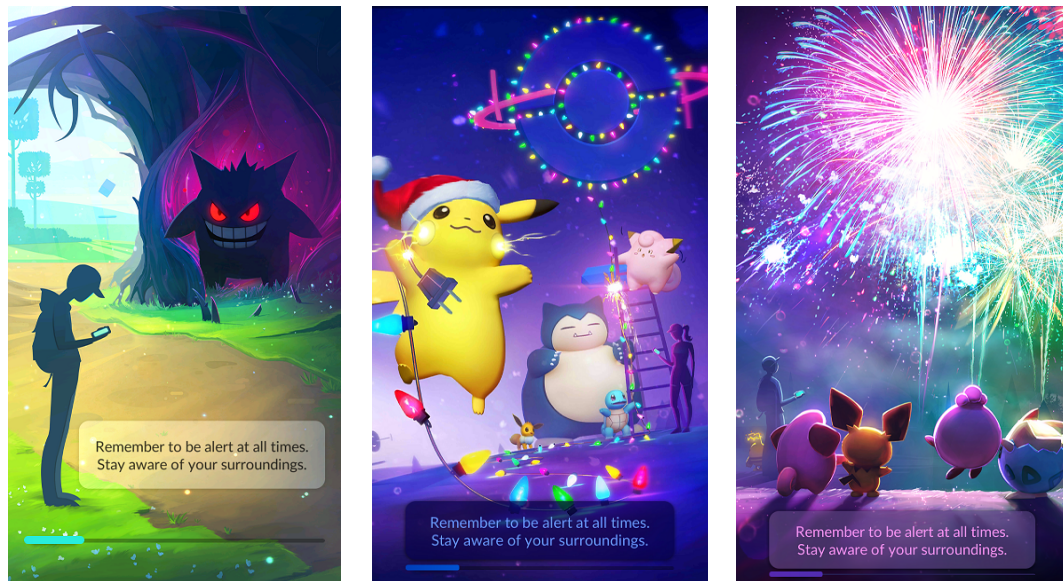


(A) A common outcome of spinning a Pokéstop with no bonuses (B) First Pokéstop of the day, by Sven Emm (C) 7-day Pokéstop streak, by Jim Arneson

FIGURE 8.6: Comparison of Pokéstop drops with and without streak bonus

games. While one goal is to *"catch 'em all"*, a central theme in the Pokémon games is that of using Pokémon to battle. In the original games, as well as the animated TV series, it is common for Pokémon trainers to battle when they first meet, and the original games allowed players to duel each other by connecting their devices. Additionally, trading Pokémon was a way of obtaining Pokémon that were rare in one area but might be common in another player's area. Both of these features, trading and player battling, were also shown in the original trailer for Pokémon GO, which certainly did not lower any expectations. When the game released with these features missing, there was some disappointment among previously excited players. They played the game despite this lack, with some hope that the features would be implemented soon. A little more than 7 % of respondents who had stopped or reduced their amount of playing listed the lack of features or content as a reason for doing so, with trading and player versus player battle the most mentioned features.

The lack of these core features, as well as the large amount of technical issues, caused many to say the game was released too early. While it may be correct and the game should have gone through more testing before being released, it is hard to argue with the success the game has had. As we discussed in Section 8.6.1, the release during summer may have been important to the explosive success of the



(A) The Halloween loading screen, depicting *GenGAR*, a ghost Pokémon that had an increased spawn rate
 (B) The Christmas loading screen, depicting the Holiday Pikachu
 (C) The New Year's loading screen, depicting the new baby Pokémon

FIGURE 8.7: Special holiday loading screens

game. Postponing the game while polishing it may have resulted in a larger portion of the player base sticking around in the long run, but may just as well have ended up less successful because it did not get as huge in the beginning. Postponing for a full year until the next summer was likely not an option, leaving too much time for potential competition to surface, making the game less revolutionizing, and possibly allowing the already generated hype from the trailers die down. The infrastructure problems causing the servers to falter is easy to overlook, as it would have been difficult (if not impossible) to predict the game would be successful to the explosive degree that it was. However, if one in the future aims to create a game with similar success to Pokémon GO, having infrastructure prepared to handle such a vast amount of players should be planned for.

8.6.8 Pokémon availability

Among the players who were leaving, a little under 7 % were listed the lack of variation in wild Pokémon as a reason. Because strong Pokémon are not found everywhere, they become more desirable. However, as discussed in Section 8.6.4, until recently suburban and rural players rarely encountered any of these Pokémon,



(A) The special Holiday Pikachu in the living room on Christmas morning, by Margaret King



(B) A regular Pikachu

FIGURE 8.8: Holiday Pikachu and regular Pikachu

being limited mostly to Pidgey and Rattata, with a few *Spearow* and *Weedle* every now and then. It was this very narrow selection of Pokémon that wore out the players, with several saying they "got tired of catching Pidgey and Rattata".

Another 6.56 % listed goal completion as one of their reasons. While a few of them had reaching certain player levels as their goal, for the rest the goal was to "catch 'em all" - capturing all 151 original first generation Pokémon, or at least as many of them as possible in the game. At the point the survey was being answered 145 of these were available in the game, 4 of which were region-specific. *Mr. Mime* could only be caught in Europe, *Tauros* only in North America, *Kangashkan* only in Australia and *Farfetch'd* only in Asia. Some players were angry that they were not able to catch all different species anywhere in the world, while others saw it as motivation to travel. Yet others simply counted the region-specifics of other regions as unavailable, and were content with catching all 142 species available in their region.

Adding more Pokémon to the game could help alleviate both these issues. The Pokémon franchise consists of many games released across 20 years, and many of these games brought new generations of Pokémon. Familiarity with the different generations varies between players, but most are familiar with the first generation. Most players in their twenties are also at least partially familiar with the second

generation, as the second generation games were released within 3 years (1996 for first gen and 1999 for second gen) of the original games for the same devices (Nintendo Gameboys), while the third generation was released for the Nintendo DS in 2002. Additionally, some second generation Pokémon (*Ho-Oh* and *Togepi* in particular) were present in the first season of the animated TV series. Many of those who had reached their goal of catching every "available" Pokémon said they were waiting for the second generation Pokémon.

Even for those who are not particularly familiar with the Pokémon in generations past the first, adding more Pokémon to the game could introduce more variety even in the common Pokémon, breaking up the monotony. It also gives players who have caught all Pokémon available to them from the first generation a new goal to work towards. Since the collection of survey responses ended, Niantic has added one more Pokémon (*Ditto*) from the first generation, as well as baby Pokémon from the second generation, for a total of 8 new Pokémon compared to the release. These new Pokémon cannot be encountered in the wild, however, with the exception of *Ditto*. The baby Pokémon have to be hatched from eggs, meaning they are even more difficult to get for rural players who do not have access to many Pokéstops. Not only are eggs random rewards from Pokéstops meaning you do not get them every time you claim a stop, but the eggs hatch into a random Pokémon out of a selection based on the walking distance required to hatch the egg. Obtaining just one of these may take weeks even for an active rural player. *Ditto*, while it can be caught in the wild, is not easy to hunt because it transforms into other Pokémon, meaning you would not know if you encountered a *Ditto* until you caught it.

While making certain Pokémon only obtainable in special ways does decrease the repetitiveness of the game, but the addition of new Pokémon to hunt and collect may be too slow to keep players interested. Some players who had been considering quitting are hanging around in anticipation of the release of the complete second generation (100 new Pokémon), while for others it is has not been enough. There are however arguments for Niantic taking their time adding new monsters to the game. The game is still relatively new, and if they want the game to last for years, they need to be able to supply new content for years as well. There are currently six generations of Pokémon (around 650 different species) not yet implemented in the game, with new generations typically coming every 3-4 years and the newest having been released in November 2016. If a new generation is added to the game roughly

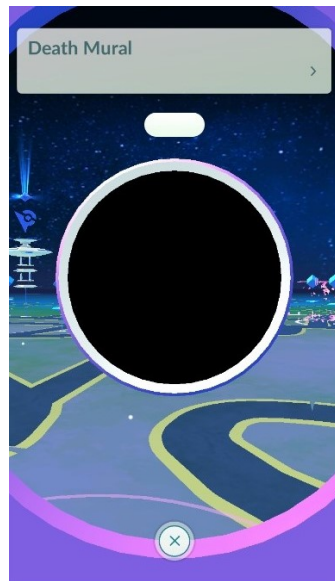
every six months, the eighth generation can be released for Nintendo devices and Pokémon GO simultaneously and on schedule, giving the game a life expectancy of at least 3-4 years. The other argument for pacing the addition of new Pokémon is that more different species in the game would make it more difficult for those who have not yet caught every first generation Pokémon to complete their collection due the ones they are missing likely having to share spawns with new species as well. This is a traditionally difficult question for developers where they have to decide between tailoring the game to casual players versus *"hardcore"* players.

8.6.9 Technical requirements

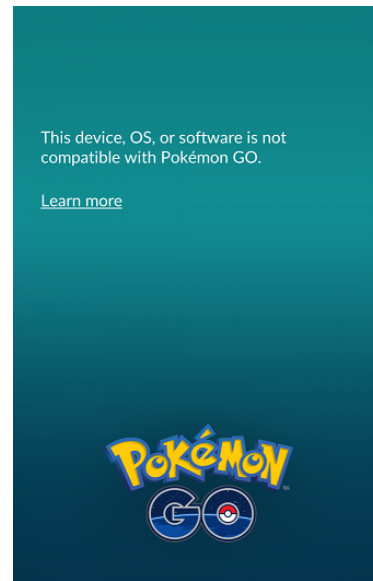
Less than 4 % of the subjects listed the technical requirements as a reason to quit or play less, but like the removal of the tracker, the technical requirements were much discussed in the Pokémon GO community. There are three parts to this topic: the battery drain, caused mainly by the screen having to be always on; the non-rooted device requirement; and mobile data usage.

The latter, mobile data usage, seems unavoidable. Pokémon are spawned server side because everyone encounter the same Pokémon in the same locations, and these spawns need to be fetched based on the player's location. Players can also interact via gyms and via lures on Pokéstops, so these also need to be controlled server side. It is however possible to limit the amount of data usage from Pokéstops. The location, description and photo for each Pokéstop all remain fairly static, rarely changing. Yet nearby Pokéstop locations seem to be transmitted every time the app is opened, which can be observed as Pokéstops often not being visible before a short while after starting the app, and sometimes not appearing at all. Similarly, the pictures and descriptions are fetched the first time the Pokéstop is selected each time the app is opened, which results in Pokéstops often not having a picture for the first few seconds after clicking the Pokéstop, as seen in Figure 8.9a. For someone who restarts the app a lot, which was necessary in the weeks following global release due to server issues, this could end up using quite a lot of mobile data. By caching the locations, descriptions and photos for longer and the server instead letting the clients know if they changed, some usage could be prevented.

The restriction of rooted devices was an attempt to hinder cheaters. Unfortunately, as discussed in Section 8.6.5, it failed to solve the problem. What it did not



(A) A Pokéstop with no photo loaded



(B) The message greeting players with rooted smart phones

fail to do was alienate players who at some point had rooted their device for reasons unrelated to Pokémon GO and were playing the game legitimately, but were greeted by the message in Figure 8.9b. These players were now unable to play the game, while the desired effect of stopping cheaters from spoofing their location was not achieved. Reversing the change now may not bring back the players who (were forced to) quit because of this, but it shows that Niantic is listening to the community and lets new players with rooted devices start playing and the alienated players can choose to return if they wish.

The largest portion of complaints regarding technical requirements is the battery drain and the need to always have the screen turned on. Niantic has provided three partial solutions to this issue: the in-game *Battery Saver* mode, the *Pokémon GO Plus* and an app for the Apple Watch. When active, the in-game Battery Saver mode dims the screen and stops rendering the game while your phone is facing downwards, but does little else. The Pokémon GO Plus is a Bluetooth-connected accessory that lets you (attempt to) catch Pokémon and spin Pokéstops as well as track distance without having the app open. The app for the Apple Watch lets you track distance and spin Pokéstops, and notifies you of Pokémon that spawn within catch radius, but requires that you open the app to catch anything.

Even though these options do help remedy the issue, they do come with their own set of problems. Not everyone has an Apple Watch, and not everyone can afford one or even have a device that supports one. Additionally the app eats the

watch battery rather quickly, so even for those who do have one, the problem is not solved if they want to spend the whole day hunting Pokémon. The Pokémon GO Plus comparatively had a much lower price tag at \$35 retail, but was sold out on pre-orders long before its actual release and does not seem to be readily available even several months later. It's also quite ineffective at catching Pokémon, but can still be used as an indicator of when there are Pokémon nearby for those who managed to get their hands on one. The battery saver mode is not always successful at detecting when the screen should be turned off, and for some time in July and early August, the function did not work at all on iOS devices.

While it does not completely solve the battery issue because of the need for constant GPS tracking and data usage, allowing the game to track players' movement in the background would allow the display to be turned completely off during play. It's uncertain why this function is not a part of the game already, but one could assume that players like being able to not have their location tracked by simply closing the app. There could however be an option inside the game that a player could enable to allow background location tracking. The take-away is that if possible to implement, allowing your game to run in the background while keeping some functionality intact, will please both users and their devices.

8.6.10 Uncontrollable reasons

Some of the reasons given are things that cannot be controlled when publishing a game. A combined almost 14 % of the respondents who had either stopped playing or reduced their time in the game had listed reasons in one or more of the following categories: *Hype died down*, *Climate/weather*, *Burnout* and *Too all-encompassing*.

It is a common trend especially present in mobile games for new games to be surrounded by lots of hype for some time before gradually dying down and stabilizing at a much smaller player base because the players who were only there for the hype fall off and move on the next big thing. This is largely unavoidable as there will always be people who come along just to be part of the new trend.

The players who got burnt out from playing too much and the players who were tired of the hype are in a similar situation, where the success of the game became too much for some players. For the game to not be so successful that some people fall off because of it seems like a counter-intuitive goal. To prevent it, you would

have to limit the success of the game, which is the opposite of what we are trying to achieve.

We can not control the seasons, and for a game that is played by moving around outside, there is bound to be some decay in player numbers when fall comes around with rain and wind, and even more when winter's snow starts falling. There are two possible ways to mitigate these losses: adding (temporary) features that let you play more of the game inside, or adding incentives for defying the weather and going out to play anyway. Unfortunately, the first solution is probably not in the spirit of the game, while the second gives somewhat unfair advantages to those who live in areas with comfortable winters.

8.7 Results for Comparison With Similar Games

Subjects were also asked whether they had previous experience with other Pokémon games, location-based or augmented reality games, and how often they played casual mobile games. The questions and options in their entirety can be seen in Appendix A, and the responses are given in the tables below (Tables 8.7, 8.8 and 8.9, respectively). Popular or relevant games mentioned using the *Other* options have been included as categories in the tables, while the *Other* categories consist of the myriad of responses with very few respondents.

TABLE 8.7: Previous experience with Pokémon games

TCG	Fighting	Puzzle	RPG	Mobile	Snap	Other	None
1179	786	333	276	262	26	47	509
54%	36%	15%	13%	12%	1%	2%	23%

TCG refers to the Pokémon Trading Card Game, both paper and digital versions. *Fighting* refers to Pokémon fighting games such as *Pokémon Stadium* and *Pokémon Colosseum*. *Puzzle* refers to Pokémon puzzle games for consoles, such as *Pokémon Puzzle Challenge* and *Pokémon Shuffle*. *RPG* refers to the "main series" Pokémon Role-Playing Games for hand-held devices, such as *Pokémon Red/Blue* and *Pokémon X/Y*. *Mobile* refers to other Pokémon games for mobile phones besides Pokémon GO, and *Snap* refers to *Pokémon Snap*, a popular game for Nintendo 64 consoles. *None* are respondents who had no previous experience with Pokémon games.

TABLE 8.8: Previous experience with location-based or augmented reality games

Game	Respondents	%
Geocaching	476	22%
Ingress	294	13%
Zombies, Run!	130	6%
Parallel Kingdom	16	0.5%
The Walk	11	0.5%
Other	33	1.5%
None	1461	67%

The *None* category are players who had no previous experience with location-based games or augmented reality games. The *Other* category consists of the respondents who had either played one or more of the less popular games that were suggested in the question's options (e.g. *Life is Crime* or *Clandestine Anomaly*), or one or more games that were not listed as an option, such as *Munzee* or *Run an Empire*. None of the games in the combined *Other* category had been played by more than 0.32 % of the respondents.

TABLE 8.9: Frequency of casual mobile game play

Every day	Every week	Every month	Less frequently	Never
346	352	186	617	692
16%	16%	8%	28%	32%

A total of 937 players chose to elaborate on their experience with Pokémon GO compared to their previous experience with other Pokémon games, and 706 players compared Pokémon GO to casual mobile games. 366 respondents had previous experience with augmented reality or location-based games and elaborated on the difference in their experiences.

The group of players with previous Pokémon game experience had a very varied perception of the game. Those who had played the hand-held console games ("*main series*") such as *Pokémon Red* were mostly disappointed, while those who only had experience with the Trading Card Game (TCG) or other Nintendo console games (such as *Pokémon Stadium* or *Pokémon Snap*) were mostly satisfied and excited about the game. *Gotta catch 'em all* is the slogan of the Pokémon franchise, and remains the most important aspect of Pokémon games. Players of the main series were already used to being able to do this, while those who had only played other games were happy to be able to work towards this goal. Both

groups greatly appreciated the immersion of being able to chase them in the real world. Main series players were not satisfied with the lack of variety in Pokémon species compared to the games they were used to, which is further discussed in [8.6.8](#).

Players from both Pokémon player groups were happy that the game could be played with no purchase required, and that the game was and is receiving updates post-release, leaving room for hope and expectations for new and exciting content, where the games they previously played (with the exception of the TCG) did not continue to evolve after being purchased. Players also appreciated that the game did not require a dedicated device to be played, praising both the accessibility and portability of this. They also applauded the game for its social potential, allowing and encouraging interaction with many other players. The players liked that the game motivated them to get out and walk, enjoying the exercise, fresh air, social interaction and exploration, but many did not like that they were unable to also play it while at home, or while waiting such as while in transit.

Players found it easy to get into because of the simple mechanics, but missed a better introduction from the game itself as well as a story. The main series players also found the combat to be too simple and devoid of strategy, although some players with less experience with these games enjoyed that aspect of Pokémon GO, finding the combat in the main series games to be too complicated for them. The randomness of Pokémon Go was mentioned as a particularly negative aspect, especially in the context of the movesets/attacks of Pokémon, where a player could spend many resources to evolve a Pokémon only to have it gain a pair of useless moves, forcing the player to start over if they wanted to use the Pokémon for battling.

One of the largest gripes of main series players, as well as fans of the animated TV series, was the lack of team building and connection with the Pokémon they collect. Where the main series games let you train your Pokémon by bringing them to battle, Pokémon GO has no such mechanics. In the original games, players would build their team and gradually increase their power through battle, while in Pokémon GO the Pokémon gain nothing from battle. The only ways to increase the power of a Pokémon in GO is to expend resources gained through catching Pokémon, and particularly in the early levels there is no reason to do so, as the player will quickly encounter stronger Pokémon in the wild. This results in no connection with the Pokémon collected, and any single Pokémon can be

discarded at any moment because it has essentially been replaced by a stronger Pokémon caught in the wild.

For the respondents who compared Pokémon GO to their experience with other casual mobile games, it had both advantages and disadvantages. For many of them, the inclusion of Pokémon was a huge boon. However, as discussed in 8.2, not all games can be Pokémon games. Additionally, not all mobile gamers are interested in Pokémon. However, they also enjoyed the social and immersive aspects of the game. Where the games they were playing previously to a large degree confined them to their own phone by themselves, Pokémon GO brought the game into the world around them and they were able to connect with the other players around. As opposed to their other games, however, Pokémon GO could not be played without dedicating time to go out and play it, whereas they would play *Candy Crush Saga* or *Angry Birds* while watching television, sitting on the train or waiting for their doctor's appointment.

Many of the mobile gamers also enjoyed the feeling of progression they got from playing their games, where every level they beat would give them access to a new, more difficult level, and missed this feeling from Pokémon GO. Some also mentioned the lack of strategy in Pokémon as a disadvantage. Some noted that because of the "go out and play" aspect of Pokémon GO, they felt that it encouraged longer play sessions, where their current or previous games would often get boring or tiring after comparatively much shorter sessions. They also applauded the lack of intrusive ads in the game despite being free-to-play, and that as long as they were playing in populated areas with plenty of Pokéstops, no purchase was required to play for as long as they wanted.

Players who had previously played or were currently playing Ingress were mostly positive towards Pokémon GO, although they did have some complaints as well. Where Ingress provided videos and audio clips to improve immersion by explaining what was going on, why certain locations were relevant in the game and the meaning of its events, Pokémon GO does not provide such means to immerse the player in the game besides the use of augmented reality to superimpose Pokémon on the real world. Some players also remarked that the lack of goals in the game makes it less of an actual game than Ingress. They also felt the game was less competitive, which had mixed reactions. For some, this made Pokémon GO less interesting to play, while others enjoyed that the game was not as "*cut-throat competitive*" and much more friendly, both within and between teams. The massively larger player

base also made the game more interesting to play for most, as things were always happening in the game, while in Ingress things could get stale and silent at times.

Some of those who had only limited experience with Ingress because they did not enjoy the "*unseen-aliens-and-mind-control sci-fi theme*" found the theme of Pokémon GO much more enjoyable, even if some of them had no prior experience with Pokémon. Others had tried Ingress but dropped out because of the complexity, and considered Pokémon GO to be at a much more comfortable level of complexity. The complexity was a point of contention, however, as many dedicated Ingress players found Pokémon GO to be lacking in complexity, regarding it as a detriment to the game.

The major advantage of Pokémon GO over Ingress from these veteran player's perspectives was the active component of the game. Where Ingress focuses mostly on its portals with only XM (*eXotic Matter*) collection happening between them, much of Pokémon GO's gameplay happens in the locations where Ingress players would previously only collect XM. For many Ingress players, the game had devolved into simply driving from portal to portal to set up so-called *fields*, which many of them did not enjoy, and felt that Pokémon GO provided more reasons to play on foot.

Respondents who had previous experience with Geocaching had a mostly positive outlook on Pokémon GO, with the ease of finding *things* being the main point of contention. Some players missed the challenge of searching for caches when arriving at the approximate location, while others did not really enjoy that particular part of the activity and were relieved that finding Pokémon was much easier. Most players enjoyed that they could play GO without having to plan their trip, and that they were able to stop playing at any time, while stopping a Geocaching trip before finding the cache(s) meant the entire trip wasted. They also liked that they had something to do between locations, as opposed to Geocaching where the only action happened at the locations of the caches. For many, the primary goal of Geocaching was the physical activity, and these players were happy that Pokémon GO added gamification of any walking, not just specific trips. Some players also mentioned that they liked that gyms provided a purpose for the things (Pokémon) they would collect, as opposed to most of the caches they collected which would often get discarded.

Players who had previously played other augmented reality games such as *Zombies, Run!* or *The Walk* were overwhelmingly positive towards Pokémon GO. They found the game to be much more immersive than the other games because of the visuals it provides. They also greatly enjoyed that Pokémon GO could be played at their own pace, while the other games compelled them to keep moving at all times. This was particularly relevant for players who used the games while walking their dogs, which usually required them to stop multiple times during a walk. They also found the game to be more suitable for play in cities than the other games they played, and appreciated that they could listen to podcasts or music while playing. Some players mentioned that *The Walk* required a lot of focus so as to not miss things in the game, and liked that Pokémon GO did not require them to pay as careful attention all the time. The only complaint from these players was the lack of story in Pokémon GO, with the other games (especially *The Walk*) being much more story-driven.

Players with experience from other location-based games, mainly exercise games such as *Munzee*, *Run an Empire* and *Stolpejakten*, primarily noted the player base as the major advantage. The larger player base of Pokémon GO made the game not only more social, but also more competitive. The players of *Run an Empire* especially experienced that the lack of players for their game caused the game to not work as intended because they had no one to compete with.

8.8 Analysis of Results for Comparison With Similar Games

Pokémon GO was for the most part a success among mobile gamers and players of augmented reality and location-based games. It also succeeded in bringing Pokémon games to old fans of the franchise who did not own dedicated gaming consoles to play other Pokémon games on, but for those who had kept up with the franchise and played multiple Pokémon games on hand-held consoles it was mostly a disappointment. So where can and should Pokémon GO move on from here, and what should other developers do when developing their own games in this genre?

The results in the previous section give us some areas to focus on. When creating a game whose game world is an extension of the real world, players appreciate more

story and more aspects to increase immersion than those Pokémon GO provide. Superimposing game elements on the world using the camera is fun and interesting, but its usage in GO is very limited and only does so much. One small example of improving this is to extend the AR mode to Pokéstops as well, allowing the players to gain some understanding of why Pokéstops give them supplies by superimposing some kind of vendor or similar when accessing these locations. Another possibility is allowing the environment to affect the content of the game. This is implemented in the game to some degree, where the type of environment can affect the types of Pokémon that spawn there, for example making water Pokémon spawn more frequently near bodies of water. However, the game could also let the current weather or time of day affect the game, spawning more water Pokémon when raining, fire Pokémon when it's warm and ghost Pokémon at night.

While the *GO* aspect of Pokémon GO is important and core to the concept of the game, allowing the game to be played in some mode in all situations would make the game a bigger success in the casual mobile game market. Adding a form of *mini-games* that players can play when not able to go out and play could help keep the interest of players who mostly play while in those situations, while also providing a means of experiencing progress.

When developing any game, it is also important to think about who you want your audience to be and what kind of lifespan you want for your game. By making the game simple, it is easier to reach the casual market and gain a huge player base in the short term. However, most of these players do not stick around in the long run, and leaning towards a more complex and strategic game is more likely to attract the gamer types that play the game for a long time. Finding a balance between these two can be difficult, but with a good introduction and gradually increasing complexity or difficulty it should be possible to maintain a player base consisting of both types in the long run. It is important to make the game easy to get into, while providing goals and give a feeling of progression to keep players invested in the long term.

Chapter 9

Physical Health Effects

This chapter examines the survey results in the context of determining the game's effect on the physical health of its players. The questions in Table 7.2 and their answers are the main focus of this chapter, but relevant answers to other questions are also included.

9.1 Results for Change in Physical Activity

This section presents the results for the player survey questions related to Research Questions RQ2.1, RQ2.2 and RQ2.3. A total of 2193 subjects responded to the questions "In an average week, how much time did you spend on physical activities (e.g. walking, running or biking) before you started playing Pokémon Go?" and "In an average week, how much time do you spend on physical activities since you started playing Pokémon Go?". Table 9.1 shows the number of responses to each question (column 2 and 3 respectively), as well as the change, within each time category. Percentages for the *Before* and *After* columns are the percentage of total respondents for the respective category, while the percentage in the *Change* column shows the relative increase or decrease (negative percentages) for that category.

Where Table 9.1 showed the number of respondents in each time range before and after Pokémon GO, Table 9.2 shows the number and portion of respondents who remained in their category, went up one or more categories, or down one or more categories. This is a good indicator of how many respondents became more or less

TABLE 9.1: Physical activity before and after Pokémon GO

Hours of activity	Before	After	Change
30 minutes or less	395 18%	32 1%	-363 -92%
An hour or less	324 15%	107 5%	-217 -67%
2 hours or less	384 18%	268 12%	-116 -30%
4 hours or less	477 22%	515 23%	38 8%
8 hours or less	394 18%	566 26%	172 44%
12 hours or less	132 6%	365 17%	233 177%
20 hours or less	61 3%	206 9%	145 238%
More than 20 hours	26 1%	134 6%	108 415%

physically active, but will not be exact as some players became more active within the same range while others became less active within the same range.

Figure 9.1 shows the change in physical activity relative to previous activity. The X-axis show weekly physical activity before Pokémon GO, while the Y-axis shows weekly physical activity after they started playing Pokémon GO, with both axes ranging from *Less than 30 minutes* to *More than 20 hours*. The green cells are players who increased their physical activity, while red cells are players who became less physically active after they started playing. Darker shades signify a larger difference, while the white cells indicate no change.

Respondents were also asked what activities lead to the increase in their physical activity, if they had become more physically active. Table 9.3 shows the number of respondents for each option out of 1823 respondents who reported an increase in physical activity.

It should be noted that 31 of these respondents (less than 2 %) also chose the *Not applicable* option, but it is uncertain what the implication of this is, given that they also selected other options. 25 of these 31 chose the same category for activity before and after, but because they are ranges it is still possible that they have increased activity within that range. The 6 remaining of those 31 reported

TABLE 9.2: How many respondents changed physical activity categories?

Initial category	Increased	Stable	Decreased
30 minutes or less	372 94%	23 6%	n/a
An hour or less	276 85%	44 14%	4 1%
2 hours or less	321 84%	44 15%	6 1%
4 hours or less	332 70%	136 28%	9 2%
8 hours or less	220 56%	166 42%	8 2%
12 hours or less	59 45%	65 49%	8 6%
20 hours or less	25 41%	32 52%	4 7%
More than 20 hours	n/a	23 88%	3 12%
Total	1605 73%	546 25%	42 2%

Hours of physical activity before Pokémon GO

	< .5	< 1	< 2	< 4	< 8	< 12	< 20	> 20
<i>W</i>								
<i>i</i>								
<i>t</i>								
<i>h</i>								
<i>GO</i>								
> 20	11	4	20	24	15	12	25	23
< 20	14	10	20	25	57	47	32	1
< 12	26	22	35	67	148	65	1	1
< 8	52	46	80	216	166	5	1	0
< 4	100	103	166	136	5	3	1	1
< 2	114	91	57	4	2	0	0	0
< 1	55	44	3	3	1	0	1	0
< .5	23	4	3	2	0	0	0	0

FIGURE 9.1: Change in physical activity with Pokémon GO per initial category

more physical activity after Pokémon GO than before, so we can safely ignore the *Not applicable* choice in their case

The three categories *Detours*, *Errands* and *Poké hunting* were further explained in the question's options, see Appendix A. Common examples of other activities leading to an increase in physical activity were players with dogs who walked them longer and more frequently to get in more play time or distance for their

TABLE 9.3: Reasons for increased physical activity from Pokémon GO

Detours	Errands	Poké hunting	Other
1136 62%	636 35%	1576 86%	89 5%

eggs, players who would walk during their breaks at work instead of sitting down, and players who went for longer or more frequent runs than previously. Many players who knew they should be going for walks but previously would not have, used Pokémon GO as a motivation to get outside and move around. Others found they enjoyed moving more and were motivated to start more rigorous exercise, while some even learned how to ride a bicycle so they could play more efficiently.

9.2 Analysis of Results for Change in Physical Activity

Figure 9.2 visualizes the data in Table 9.1. The blue line represents activity before Pokémon GO, while the red line represents activity with/after Pokémon GO. The X-axis shows the categories 1-8, which correspond to categories *30 minutes or less* through *More than 20 hours*, while the Y-axis represents the number of respondents per category.

The results were overwhelmingly positive. As seen in Table 9.2, 73 %, nearly three out of every four respondents, increased their physical activity enough to move up at least one category in physical activity after Pokémon GO compared to before. Table 9.4 shows how many respondents from each initial category moved 2, 3, 4, 5 or 6 categories. Table 9.5 shows how many categories players on average increased depending on their initial category. The *Only increased* category shows the average increase for those who did in fact increase physical activity, while *All* shows the numbers for all respondents who started within the respective category, including those who remained stable and those who decreased physical activity.

Because more than 92 % of our respondents are adults by the WHO's definition of adults being aged 18-64, we are going to focus on the recommendations for adults. As discussed in Section 4.1, the WHO recommends that adults do at least 150 minutes of moderate-intensity physical activity per week. Using this recommendation, we categorize the players who are physically active less than

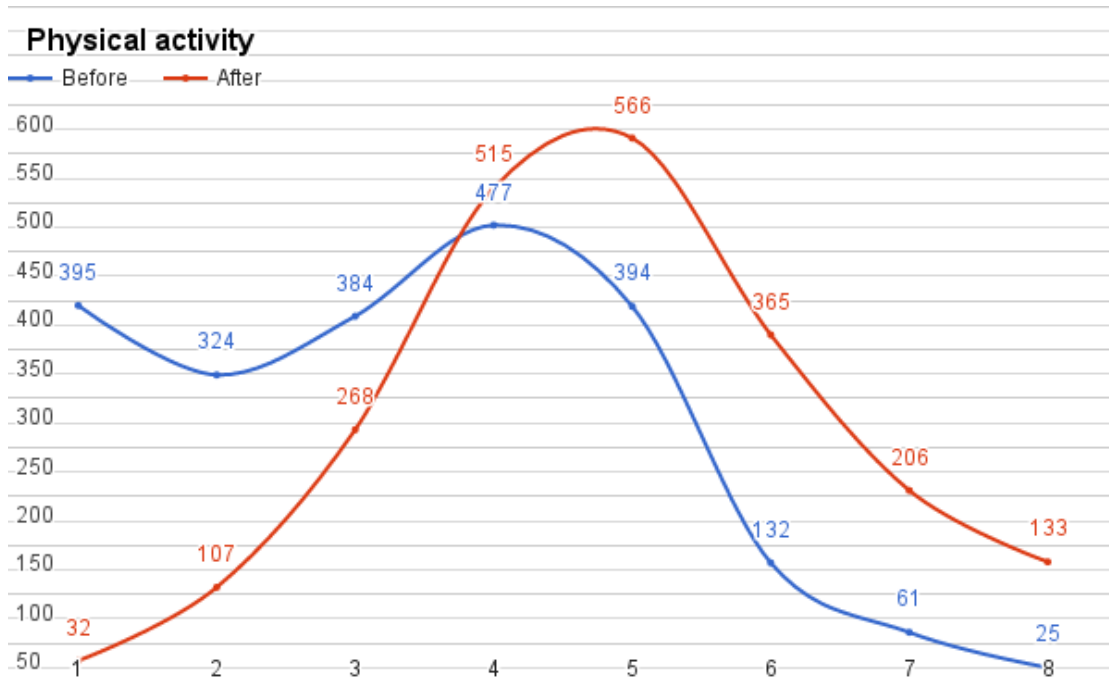


FIGURE 9.2: A graph of physical activity before and after Pokémon GO

TABLE 9.4: How many respondents increased physical activity by multiple categories?

Initial category	≥ 2	≥ 3	≥ 4	≥ 5	≥ 6
30 minutes or less	317 80%	203 51%	103 26%	51 13%	25 6%
An hour or less	185 57%	82 25%	36 11%	14 4%	4 1%
2 hours or less	155 40%	75 20%	40 10%	20 5%	n/a
4 hours or less	116 24%	49 10%	24 5%	n/a	n/a
8 hours or less	72 18%	15 4%	n/a	n/a	n/a
12 hours or less	12 9%	n/a	n/a	n/a	n/a
Total	857 39%	424 19%	203 9%	85 4%	29 1%

this (the lower three categories) as *Low activity* players. Respondents within the *4 hours or less* and *8 hours or less* categories will be categorized as *Moderate activity* players, while the three remaining categories are *High activity* players.

We see that while 50 % of respondents were of low activity before Pokémon GO,

TABLE 9.5: How many categories on average did players increase physical activity?

Initial category	Only increased	All
30 minutes or less	2.91	2.74
An hour or less	2.16	1.83
2 hours or less	1.90	1.57
4 hours or less	1.57	1.06
8 hours or less	1.40	0.75
12 hours or less	1.20	0.45
20 hours or less	1.00	0.23
More than 20 hours	n/a	-0.27
Total	2.00	1.43

TABLE 9.6: Low/moderate/high activity players

Activity level	Before	After	Change	Categories increased
Low	1103 50%	407 19%	-696 -63%	2.06
Moderate	871 40%	1081 49%	210 24%	0.92
High	219 10%	705 32%	486 222%	0.31

this group only consisted of 19 % of the respondents after Pokémon GO, a decrease of over 60 %. The effect was larger for the lower activity ranges, where the number of respondents who had previously been active 30 minutes or less per week decreased by 92 %, while the number who had previously been active between 1 and 2 hours per week only decreased by 30 %. This is partly because the *2 hours or less* category also saw an influx of players from the lower categories, but also because the lower ranges were narrower and thus easier to transcend. However, from Table 9.5 we see that more than 50 % of the respondents from the *30 minutes or less* category increased their activity to a moderate level by jumping 3 or more categories, with the average number of categories increased for respondents initially placed in this category was 2.74.

The number of moderate activity players increased by 24 %, which does not seem like a huge increase. However, paired with the fact that the number of high activity players more than tripled with a 222 % increase, the number becomes more impressive, as this means the moderate activity category also "lost" quite a few of the players originally in this category. Respondents in the moderate activity category increased activity by a little less than one category on average. While

this is not an enormous shift for these players, it places them safely within the range of the WHO's recommended weekly activity.

High activity players increased activity by 0.31 categories on average, with the majority of these increases coming from the players who had initially been active 12 hours or less. The initial members of the *More than 20 hours* category decreased by 0.27 categories on average. The sample size was very small, however, consisting of only 26 respondents initially. The 0.27 category decrease is the result of three individuals and does not take into account that those in the *More than 20 hours* category were unable to increase in category and that there were some respondents who mentioned in comments that they had in fact increased activity by 5-10 hours. It is however plausible that balancing a high physical activity week with playing Pokémon GO can be difficult, resulting in a slight decrease in physical activity from participating in game activities such as "camping" lures or nests. This "camping" refers to players who spend significant amounts of their play time stationary or near-stationary around locations with particularly high frequency of "good" spawns, such as clusters of lured Pokéstops (Pokéstops with lure modules deployed) or *nests* (a location which has multiple reliable spawns of the same Pokémon).

From Table 9.3, we see that 62 % of respondents listed *Detours* as a cause for increased physical activity, while 86 % listed *Poké hunting*. If and when a player stops playing Pokémon GO, they will no longer go out with the primary goal of catching or playing Pokémon. It is also unlikely that they will take detours when there is no goal with the detour other than taking it for the added activity. This unfortunately means that an increase in physical activity that originated from these sources is likely to revert should these players give up the game. 35 % of respondents said they had started walking, biking or similar when performing errands or other day-to-day activities where they would previously have used some other mode of transportation such as a car. If these players stop playing the game, they could feasibly keep up this new routine, having realized it is not only possible to perform the activities without a car, but it also feels better to stay active, though it is unlikely to be the case for all of these players. For some members of the low activity category, being physically active more than before helped them realize they felt better with some physical activity in their routine, and some of these players started exercising outside of Pokémon GO.

Results gathered in the follow-up survey and interviews showed that players who were no longer playing the game had in fact not maintained the same level of increased physical activity, although a few were slightly more active than previously due to having been inspired to start exercising regularly. Most of the players who were still playing were slightly less active than at the time of the original survey, with weather conditions being the primary reason for the decrease, along with some reports of reduced free time and some players finding the game to be less engaging without the blossoming community around. A few respondents said they were even more active now than at the time of the original survey, and all respondents who were both still playing and had initially increased their amount of physical activity were still more active than prior to Pokémon GO.

9.3 Results for Weight Loss, Feeling Healthier and Skipping Unhealthy Activities

This section presents the results for the player survey questions related to Research Questions [RQ2.4](#) and [RQ2.5](#). Table 9.7 shows the categorized responses of 1478 respondents to the question *Have you lost weight or in other ways feel more healthy than before you started playing Pokémon GO?*

TABLE 9.7: *Have you lost weight or in other ways feel more healthy than before you started playing?* responses

Yes	No	N/A	Unknown
738	671	19	50
50%	45%	1%	3%

The *No* respondents are players who did not experience any weight loss or improvement to health from playing the game. The *Unknown* respondents did not know whether they had experienced any changes. The *N/A* category are players who were already experiencing weight loss or changes to their health situation from other sources, such as diets, exercising or illnesses, prior to starting Pokémon GO. Their weight or health improvement progress continued while playing, but is assumed to be unrelated to Pokémon GO as the improvement had already started before they started playing, and these respondents were adamant that playing had not had an effect.

The *Yes* category are the respondents who reported either weight loss or an improvement to one or more areas of their health. Out of these 738 respondents, 155 (21 %) reported that they had lost weight. Other respondents reported a loss in body fat and/or gain in muscle mass while remaining at the same weight, while some noted a decrease in pant size while being unsure about changes to their weight. The most commonly reported improvement besides weight loss and generally feeling healthier was improved stamina or endurance, being able to walk or run faster, further and longer than before. Other improvements reported include eating and drinking better (drinking more water to stay hydrated and being less inclined to eat junk food), gain of motivation to exercise more, better sleep, less stress, easier breathing and feeling more alert. Some players reported that playing had helped them quit smoking, while a few lowered their blood pressure, experienced a positive effect on illnesses such as anemia, or an improved effect from their medication. Some players also used this question to note an improvement to mental health or happiness, which will be discussed further in Chapter 10.

Players were also asked whether they had skipped any unhealthy activities in favor of playing Pokémon GO. Table 9.8 shows the 1629 responses to this question.

TABLE 9.8: *Have you skipped out on less healthy activities that you otherwise would have engaged in due to playing Pokémon Go instead?* responses

Yes	No	Both	Opposite	N/A
415	1160	4	20	30
25%	71%	0.25%	1%	2%

The *No* category did not skip any activities they deemed unhealthy in favor of playing Pokémon GO, while the *Yes* category did. The *Both* category did less of one or more unhealthy activity, but more of another. The *Opposite* category not only did not skip any unhealthy activities, but participated in more unhealthy activities because of the game than they would have without. The *N/A* category said they did not participate in any unhealthy activities neither before or after Pokémon GO.

9.4 Analysis of Results for Weight Loss, Feeling Healthier and Skipping Unhealthy Activities

While certainly not all individuals need to lose weight, the WHO reported that 39 % of adults worldwide were overweight in 2014 [51], while the NIDDK reported that more than 2 out of every 3 adults in the United States were overweight [33]. Therefore we can assume that the fact that over 10 % of respondents lost weight is a positive thing overall. Out of the 84 subjects who responded with the amount of weight they had lost, the average respondent had lost just over 5.2 kg, ranging from 0.5 to 18.5 kg. However, not knowing the initial weight of these respondents, it is difficult to determine exactly how positive this is, as discussed in Section 11.1.

There are a few other points to note regarding the weight loss data. Some players categorized as *Yes*-respondents started diets or more focused exercise after they started playing Pokémon GO, meaning it is difficult to determine the impact of playing Pokémon GO in their weight loss. However, for many or most of these respondents, the lifestyle change was inspired by the increased activity and health improvements already experienced from playing Pokémon GO.

Others who lost weight were already underweight and actually needed to gain weight. While their loss of weight was not positive, most of these players also experienced a positive effect such as improvements to mental health, or help with physical conditions such as anemia.

Some of the *No* players not only did not experience an improvement, but worsened their current state by exercising less or adopting bad habits such as eating more junk food or going to bars drinking when they otherwise would not have done so. These are mostly the same players as represented by the *Opposite* category in Table 9.8, although there are some players that do not overlap.

As seen in Table 9.8, 25 % of respondents said that they skipped unhealthy activities in favor of playing Pokémon GO. While the activities in question for a lot of these players (roughly 38 %) were primarily watching TV or playing video games at home, it is not unlikely that many of these activities would have included snacks that were not consumed while out playing. There were also quite a few (more than 26 %) who went out to play Pokémon instead of going to bars or otherwise consume alcohol. Others cut down on junk food, and some stopped snacking and overeating in general. Some players even managed to stop smoking

due to playing. There were unfortunately also some players who started drinking more because their local bars had good access to Pokéstops, so sitting at those bars with lures became a habit.

There is nothing about Pokémon GO itself that causes the physical health benefits experienced by its players, which are all due to the lifestyle changes playing the game brought, primarily the increased physical activity. However, it managed to motivate many players to experience this increased physical activity without marketing as an exercise application, and 50 % of respondents experienced a tangible effect on their physical health from doing what they thought of as simply playing a game.

9.5 Results for Neglect and Negative Behavior

The players who started exercising less or drinking more are not the only negative side effects of playing Pokémon GO. This section presents the results for the player survey questions related to Research Question [RQ2.6](#). Players were asked whether they had neglected other important areas of their life due to playing Pokémon GO, and 220 players responded that they had neglected to eat, drink or sleep enough. Some of these players became dehydrated, while others had little energy because of the lack of sleep. Three respondents neglected giving their feet the rest they needed and experienced serious problems because of this, where two developed tendinitis and one made a chronic condition worse. Some players were not used to spending large amounts of time outside during summer and experienced sunburns of varying severity.

Players were also asked whether they had trespassed, put themselves or others in dangerous situations or gotten into accidents. Almost 15 % of the respondents had trespassed at least once, with 47 % of them doing so knowingly. While trespassing often is uneventful and without significant risk, it has the potential to be dangerous in addition to being inconsiderate. 238 players, a little less than 11 % of all the respondents, said they had put either themselves or others in one or more dangerous situations, with 94 % endangering themselves and 33 % admitting to endangering others. 92 players had been in accidents because of the game, whereof 2 were accidents with serious injury or property damage.

Of the players who had either endangered themselves or others, or gotten into accidents, 231 respondents chose to elaborate on the events. Table 9.9 shows the most common causes for accidents and sources of endangerment.

TABLE 9.9: *If you have put yourself or others in dangerous situations, or gotten into accidents, because of Pokémon Go, could you elaborate?* categorized responses

Driving	Surroundings	Traffic	Bicycle	Alone at night	Bad neighborhood
90 39%	38 16%	36 16%	28 12%	15 6%	8 3%

The *Driving* category respondents put themselves or others in danger by playing Pokémon GO while driving, or were in accidents with their car because they were playing Pokémon GO.

The *Surroundings* category are respondents who were not paying attention to their surroundings while playing (mostly on foot), many of whom got into accidents because of it.

The *Traffic* category are respondents who either did not pay sufficient attention when walking in or around traffic because they were playing Pokémon GO, or drivers who got into or narrowly avoided accidents because someone else was playing.

The *Bicycle* category are players who were playing while riding a bicycle, exposing themselves to risk and/or getting into accidents because of it. Another 5 respondents reported similar experiences using other methods of transportation, such as skateboards or *hoverboards*.



(A) A player playing Pokémon GO on a hoverboard, by David Pope



(B) A *Squirtle* on a hoverboard, by Pokémon GO player jesperoh

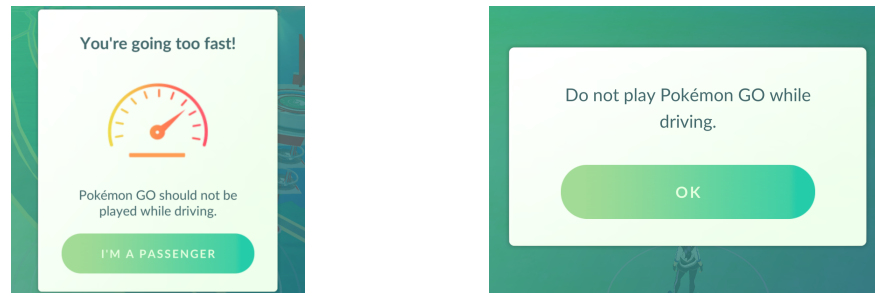
The *Alone at night* category are respondents who put themselves at risk by walking outside alone at night when they usually would not have, while the *Bad neighborhood* category are players who ventured into dangerous neighborhoods to play.

9.6 Analysis of Results for Neglect and Negative Behavior

Just as any other engaging activity, Pokémon GO caused some players (roughly 10 % of the total respondents) to neglect sleep, eating enough or staying hydrated. While this is not a new phenomenon, the extra physical activity Pokémon GO players are exposed to compared to activities such as computer games means that staying hydrated is extra important, particularly in the summer heat. On the game's loading screen, it encourages players to be aware of their surroundings. This place could also be used to remind players to stay hydrated while playing and encourage players to drink enough water. Another possible option is making every few Pokéstops claimed give this same reminder and encouragement, possibly based on geographic location or the current season to avoid making players tired of these warnings when the weather is less warm and prone to cause dehydration.

The greater issue, however, are players who drive and play at the same time. It is widely known [50] that using a mobile phone while driving greatly increases chances of accidents happening, yet many still do it. That almost 2 out of every 5 respondents who endangered themselves or others were doing so by playing while driving is a serious issue that Niantic did make an effort to fix by blocking the game with a warning whenever the player was detected to be moving too fast to be on foot, asking the player not to play while driving, as seen in Figure 9.4. Players were also warned when starting the game that they should avoid doing so, while Tennessee officials created a campaign to prevent this behavior, as seen in Figure 9.5.

Some of these players did not even seem to realize that they were endangering not only themselves, but also other innocent people with their actions, as shown by the difference in number of respondents who said they were playing while driving and the number who said they had put themselves or others in danger. Only 7 of these players (less than 8 % of the drivers) were involved in accidents because of playing while driving, and all of them were minor accidents with slight damage to



(A) Warning when moving too quickly to be on foot

(B) Warning on game start

FIGURE 9.4: *Do not play Pokémon GO while driving* in-game warnings

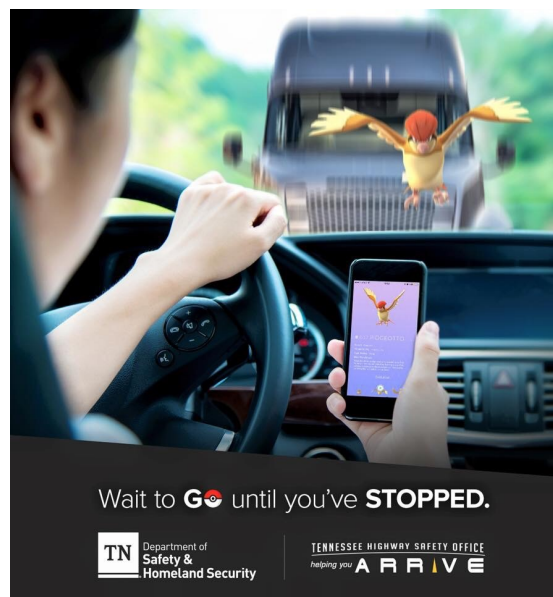


FIGURE 9.5: A Tennessee campaign to discourage playing Pokémon while driving

the car, but if any of these 90 players had been less lucky, their actions could have been fatal.

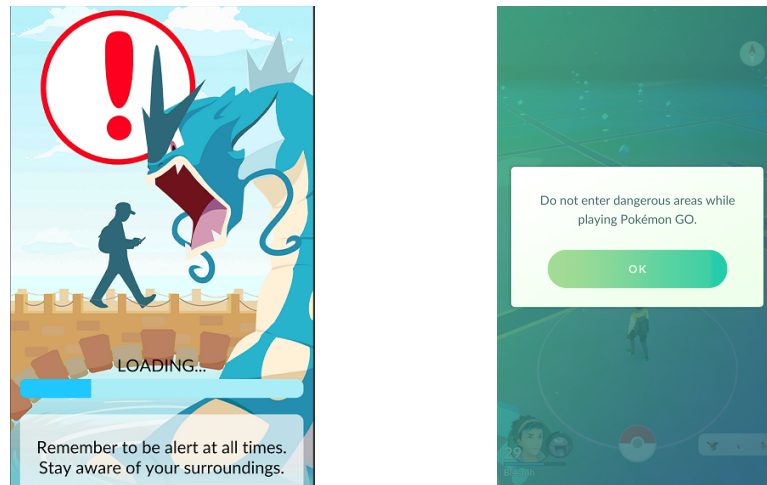
Bikers were not quite as lucky while playing, and 16 out of the 28 (or 57 %) got into accidents where they either hurt themselves, their bike, or hit someone else. Most of these accidents were minor, but one player hit an unexpectedly high speed bump while not paying attention and ended up with a broken arm. These numbers, while a small sample size, indicate that playing Pokémon GO while biking is not a good combination. While a total of 575 players reported using a bicycle as a method of transportation while playing, it is unknown how many of these played actively while on the bike, and we will have to rely on the numbers for those who explicitly mentioned playing while biking. It is however possible that the portion

of players who play while riding a bicycle is larger, as several retailers reported increased sales of phone holders for bicycles. This would imply that playing while biking is relatively safer than originally assumed, but players should still show caution.

As previously mentioned and seen in Figure 9.6, the loading screen for the game encourages players to remain aware of their surroundings while playing, and with good reason. Of the players who did not pay attention to their surroundings around traffic, 10 (28 %) were involved in accidents. These players wandered into the street without looking properly or walked too close to the edge of the sidewalk and were hit by cyclists or side mirrors of cars. That only ten of these players were involved in accidents, and that none of them suffered serious consequences, is likely thanks to a good dose of luck, and similarly to those who play and drive, this could have had a much worse ending with less luck.

26 (68 %) of the players who did not pay attention to their surroundings in general were involved in accidents. While this portion seems staggeringly high, based on general observation of players in the wild, a much larger percentage of players than the 38 who mentioned it were playing without paying particularly close attention to their surroundings. It is likely that the 38 players who mentioned it were the ones who were involved in accidents or near-accidents because of it, while the majority of the other players avoided this. The players in this category who were involved in accidents experienced events such as crashing into things (signs, lamp posts, parked cars, low balconies and similar), kicking things or misplacing their step. There were sprains, bruises and minor cuts, but no serious accidents.

The players in the *Alone at night* and *Bad neighborhood* categories ventured out into the night to play Pokémon when or where they should not have, and without Pokémon would not either. For the most part, no harm came to them, with the exception of two players: one player was mugged [40] and another was shot after, but not hit. Still, the placement of Pokéstops and spawns can cause players to take unnecessary risks and venture into areas they should not be in. This is also the reason why some areas, such as airports, often have no spawns or Pokéstops, and why the game also warns players not to enter dangerous areas in search of Pokémon. Another similar cause, if a little more innocent, is players who followed paths on the map that were not actually paths in reality, ending up in minor accidents such as those experienced by the players who were unaware of their surroundings.



- (A) Loading screen encouraging players to remain aware of their surroundings while playing
- (B) Warning on game start not to enter dangerous areas

FIGURE 9.6: In-game warnings to keep players safe

The other serious accident respondents were involved in because of playing Pokémon GO was a player who experienced serious damage to his car because he had driven out to play Pokémon. He was not playing while driving, but had he not gone out to play, the damage would not have happened. Other players reported similar, if less severe events with flat tires and minor damages to their cars because they had brought their car out to play.

Chapter 10

Mental Health Effects

This chapter examines the survey results in the context of determining the game's effect on the mental health of its players. The questions in Table 7.3 and their answers are the main focus of this chapter, but relevant answers to other questions are also included.

10.1 Results for Change in Social Activity

This section presents the results for the player survey questions related to Research Question RQ3.1. A total of 2192 subjects responded to the questions *"In an average week, during your spare time, how much time did you spend socializing with other people (in person, outside your home) before you started playing Pokémon Go?"* and *"In an average week, during your spare time, how much time do you spend socializing with other people (in person, outside your home) since you started playing Pokémon Go?"*. Table 10.1 shows the number of responses to each question (column 2 and 3 respectively), as well as the change, within each time category. Percentages for the *Before* and *After* columns are the percentage of total respondents for the respective category, while the percentage in the *Change* column shows the relative increase or decrease (negative percentages) for that category.

Where Table 10.1 shows how many respondents shows the changes within each time range of social activity, Table 10.2 shows the number of respondents who

TABLE 10.1: Social activity before and after Pokémon GO

Hours of activity	Before	After	Change
30 minutes or less	245 11%	138 6%	-107 -44%
An hour or less	220 10%	155 7%	-65 -30%
2 hours or less	396 18%	314 14%	-82 -21%
4 hours or less	499 23%	492 22%	-7 -1%
8 hours or less	416 19%	478 22%	62 15%
12 hours or less	204 9%	307 14%	103 50%
20 hours or less	116 5%	175 8%	59 51%
More than 20 hours	96 4%	133 6%	37 39%

became less socially active, more socially active or did not change their amount of social interaction.

TABLE 10.2: How many respondents changed social activity time categories?

Decreased	Stable	Increased
74 3%	1353 62%	765 35%

10.2 Analysis of Results for Change in Social Activity

Comparing Table 10.1 to Table 9.1, we see that players on average spent more of their spare time being social than they did on physical activity. This also meant that there was less room for this the time spent socializing to increase. Figure 10.1 shows the data from Table 10.1 in a graph, with the blue line representing social activity before Pokémon GO and the red line representing social activity after/with Pokémon GO. The X-axis shows the categories 1-8, which correspond to categories *30 minutes or less* through *More than 20 hours*, while the Y-axis represents the number of respondents per category.

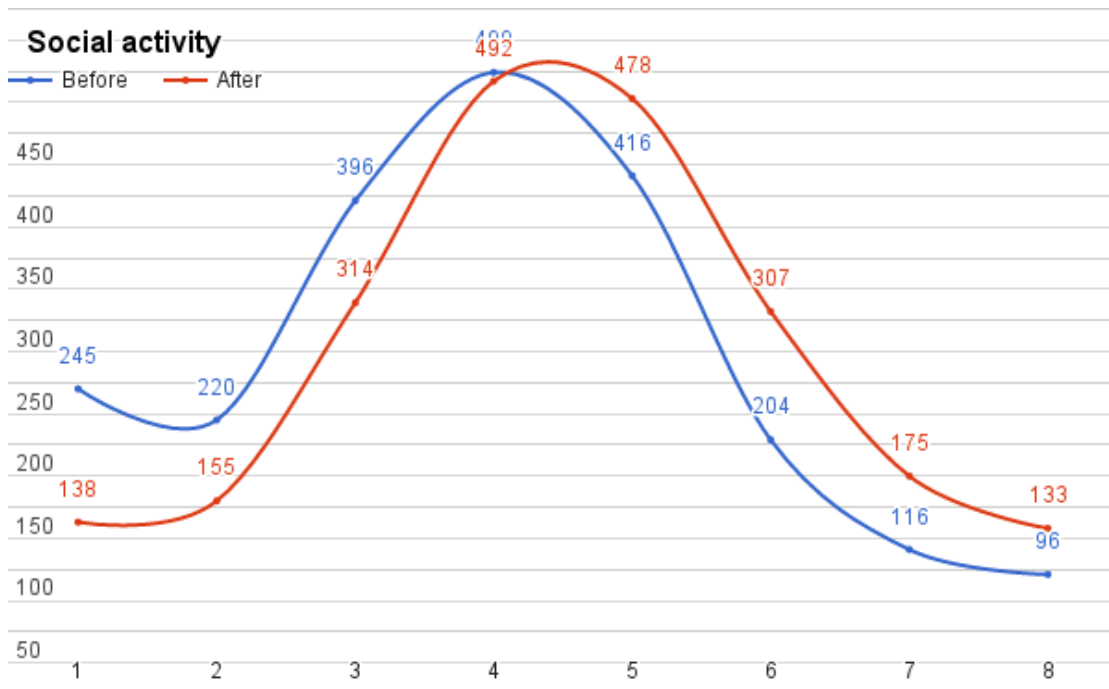


FIGURE 10.1: Social activity before and after Pokémon GO

We see that the graph more or less shifted roughly half a category to the right, with the *30 minutes or less* category naturally having the largest drop. In other words, players spent slightly more time socializing because of the game. The bigger changes to social interaction, however, were not the amount, but rather *how* players socialized, as we'll see in the following sections.

10.3 Results for Effect on Relationships

This section presents the results for the survey questions related to Research Questions RQ3.2 and RQ3.3. Table 10.3 shows the sources of increased social activity from the question "If you have increased the amount of time you spend socializing with people since you started playing Pokémon Go than before, what are the causes of this increase?". The *Other* option for the question was mostly used to elaborate on the increase or other selected alternatives, although some other sources of social activity were mentioned.

The *Not applicable* category are respondents who did not increase the amount of time they spent socializing. The *Friends* and *Family* categories are respondents who selected the options *Playing with friends* or *Playing with family* respectively. The *Strangers* category are players who selected the *Talking to people you meet*

TABLE 10.3: Sources of increased social activity

Friends	Family	Strangers	Not applicable
900 41%	358 16%	662 30%	1053 48%

while playing option. Common answers using the *Other* option included playing with coworkers, reconnecting with old friends to play together, or making friends with the people they met while playing and playing together with them. Some also used this option to specify that they were playing with their significant other. Sadly, some players also used this option to mention that they were playing alone because they did not have anyone to play with.

Subjects were asked whether they had talked to someone, in person, that they would otherwise not have talked to. Table 10.4 shows the distribution of answers for this question.

TABLE 10.4: *Have you talked to someone in person because of Pokémon Go that you otherwise would not have talked to?* responses

Yes	No
1780 81%	413 19%

Players were also asked whether they had made any new friends playing Pokémon GO, specifying the following definition of a friend in the context: *Friends in this context is someone you would make an effort to meet again in person and who you believe might want to meet you again. It could be someone you met for the first time while playing, or a previous acquaintance with whom you were not already friends.* Table 10.5 shows the answers to this question.

TABLE 10.5: *Have you made new friends through playing the game?* responses

None	One	A few	Many
1502 68%	108 5%	507 23%	76 3%

Finally, players were asked whether playing Pokémon GO had improved any of their existing relationships. Table 10.6 shows the number of respondents who improved each type of relationship.

TABLE 10.6: *Has playing Pokémon Go improved any of your existing relationships?* responses

None	Friends	Family	Significant other
940	823	366	421
43%	38%	17%	19%

10.4 Analysis of Results for Effect on Relationships

From the results presented in the previous section, we see that the largest increase in social interaction came from players who played the game together with their friends. 41 % of respondents became more socially active by playing with their friends, and 38 % of respondents said they had one or more relationships with friends improved by this.

16 % of respondents said they were more socially active with their family, and 17% of respondents said playing Pokémon GO improved the relationship they had with their family. Many respondents commented that they played the game for the sole reason of playing together with their children, and many parents were observed doing exactly that. Others started playing the game to have a shared activity with their significant other, and 19 % of respondents said their relationship with their partner was improved by playing Pokémon GO together.

Perhaps more surprisingly was how effective Pokémon GO was at connecting strangers. 30 % of respondents said they increased their amount of social activity by talking to people they met while out playing, and 81 % of players talked to at least one person they would not have talked to had they not been playing. This resulted in many new friendships, with 31 % of respondents making at least one new friend, and 26 % making multiple.

As discussed in Sections 8.2 and 8.6.3, Pokémon GO is a great social game, particularly at its peak when all the most attractive play areas were packed with players. When gathering at a location with a high density of players, such as a cluster of Pokéstops or a special Pokémon nest, it rarely matters what team players are on. The only thing that is important is what Pokémon are around to catch, what great ones they have already caught, and what other good locations there are to play at.

Even when it comes to gyms, the only part of the game where your chosen team matters, players from opposing teams are usually able to be friendly and have fun together. Because the game has three teams, players from the red and yellow teams can work together to take down gyms held by the blue team, while players from the blue and red teams work together to take down a yellow gym nearby. While there have been serious physical confrontations because of the game [20][32], even in situations where only two teams are involved there is friendly banter and competition more often than hostility. One example of this is the movement *Better Dead Than Red* ([1]), which humorously calls Team Valor *The Red Menace*, giving tips on how to defeat them.

While groups of friends who played together were prone to choose the same team, cases where there were multiple teams in a group often lead to friendly *trash talking* of each other, but did not break up any groups. Encountering players on the same team was how many of the new friendships were started. These players would get cooperate while taking down a gym, then get together later to do it again.

Another important factor in making the game a successful social game is the possibility of dividing up tasks. When searching for specific Pokémon, players could split up for short periods of time to locate it. When arriving at a new location, one player could take responsibility for locating the nearby Pokémon while another could scope out the different gyms in the area. For players who drive out to play, the driver can focus on driving while the passenger plays for both players.

10.5 Results for Effect on Mental Illnesses and Other Mental Conditions

This section presents the results for survey questions related to Research Question RQ3.4. A total of 635 respondents gave an answer to the question *"If you suffer from a mental illness, do you feel that playing Pokémon Go has had a positive effect on your mental health?"* other than *Not applicable*. We will use these respondents to attempt to determine the effect on mental illnesses and other mental conditions from playing Pokémon GO. Table 10.7 shows the number and portion of respondents for each of the mental conditions that were supplied as options,

and the number and portion of respondents for each of these conditions that did or did not experience and improvement.

TABLE 10.7: Mental conditions suffered by respondents and whether playing Pokémon GO has improved their condition

Condition	Respondents	Improved	No improvement
Depression	373 59%	293 79%	76 21%
Social anxiety	309 49%	240 78%	64 21%
Autism spectrum	27 4%	21 78%	5 19%
No/Undisclosed	84 13%	15 18%	62 74%
Total	635	430 68%	195 31%

It should be noted that this table does not contain all the respondents. Some players suffered from multiple conditions and experienced mixed results, where one condition was improved while another worsened. These players will be discussed further in Section 10.6. Some subjects were unsure whether or not they had experienced any effect from playing, and have been excluded as they could plausibly be in either group.

There were also reported other conditions, which are shown in Table 10.8. *Anxiety (other)* refers to respondents with either Generalized Anxiety Disorder (GAD) or an unspecified form of anxiety.

TABLE 10.8: Other mental conditions and the effect of playing Pokémon GO

Condition	Respondents	Improved	No improvement
Anxiety (other)	35 6%	23 66%	12 34%
ADHD	33 5%	25 76%	8 24%
PTSD	19 3%	18 95%	1 5%
Bipolar	18 3%	13 72%	5 28%
Panic disorder	11 2%	11 82%	2 18%
Agoraphobia	3 0.5%	2 67%	1 33%

10.6 Analysis of Results for Effect on Mental Illnesses and Other Mental Conditions

The respondents in the *No/Undisclosed* category are subjects who chose the option *No, or do not wish to disclose*. If a respondent chose this option, and additionally answered "No" on the question regarding improvement in mental condition, it is uncertain what they meant by this. If we assume that these respondents are not suffering from any condition, which is plausible, the combined numbers would instead look as in Table 10.9.

TABLE 10.9: Combined effect on mental conditions assuming "No, or do not wish to disclose" with no effect means no condition suffered

Respondents	Yes	No
573	431 75%	133 23%

For almost every condition reported, the majority of respondents with that condition reported an improvement from playing Pokémon GO. Roughly four out of every five respondents suffering from depression, social anxiety, panic disorder or conditions on the autism spectrum experienced an improvement, while three out of every four sufferers of ADHD experienced a positive effect. PTSD sufferers was the group with the largest improvement, with 95 % of these respondents experiencing a positive effect. Sufferers of GAD or unspecified forms of anxiety, agoraphobia or bipolar disorder experienced an improvement in closer to two out of every three cases.

Sufferers of depression felt the greatest effect from the fact that the game forced them to get out of their home, having to move outside their isolated zone where many of them felt a sort of trapped, if they wanted to participate and play the game. For some, the game worked as a distraction from the reasons they were depressed or just enough of a distraction to forget that they were depressed altogether. Some noticed that they enjoyed the exercise they were getting from the game, feeling their moods lift. This is a documented effect of exercise on depression, as discussed in Section 4.2. Some sufferers were helped by the feelings of accomplishment they gained from the game when catching a difficult or rare Pokémon or taking down a strong gym. Some depressed respondents felt their moods lift when the game facilitated social contact, connecting with friends and

talking to other people in general, something these players had been struggling with amidst their depression. Some enjoyed feeling part of something, while others experienced that the game gave them a purpose, which they felt they were lacking previously. For some, playing the game gave them the motivation they needed to do other things as well.

For sufferers of social anxiety, knowing they had the game as a common interest made talking to strangers easier, and many of these players found it much less scary to be outside among people when they were able to talk to others about the game. Sharing the common interest in Pokémon GO made some of them feel part of something bigger, which again made it easier to be in crowds. For others, having the game to focus on helped distract them from the people around them, allowing them to venture to crowded areas without their anxiety becoming a problem. Sufferers of Generalized Anxiety Disorder or unspecified forms of anxiety also listed Pokémon GO's ability to distract from their worries as the main benefit of playing the game.

The majority of ADHD sufferers reported that the game helped them focus. For most of them, simply going outside to get fresh air and sunlight was all they needed, and Pokémon GO provided something to keep them interested while outside. A few players said that the game was something concrete to switch focus to when they felt their attention slipping, making it easier to stay focused by switching between Pokémon GO and the task at hand.

Most PTSD sufferers did not elaborate on the ways in which Pokémon GO helped them, but those who did said that it made it "less scary" to leave their house, while a few said it provided a distraction from their worries. Players suffering from panic disorder or agoraphobia experienced similar effects, where they were able to leave their safe spaces with the distraction and motivation of Pokémon GO.

Sufferers of bipolar disorder recognized the benefits of exercise on their depressive moods, and wanting to play Pokémon GO helped them get out of the house when they were already depressed. Staying active and playing Pokémon GO helped keep a stable mood with fewer episodes.

Playing Pokémon GO was not solely therapeutic, however. A few players experienced worsened mental conditions because of playing. A few players experienced an improvement to their depression from being out of the house, while at the same time their anxiety got worse because they felt like they were avoiding their

problems, or because they felt like they were wasting their time. Some players found it harder to sleep, feeling more exhausted than before, affecting their mood or concentration. A few players also remarked that the game made them happy when things were going well and they were catching new Pokémon, but sad and disappointed when rare Pokémon escaped their clutches after having spent much effort trying to find or catch them, or when a 10 kilometer egg hatched into another useless Pokémon when they were hoping for a strong or new one. Some non-players also had a negative attitude towards players, and were quite open about it, sometimes berating or laughing at players. While hostility or condescension from outsiders is not new to Pokémon GO, some players who had been excited to bring their hobby outside were disheartened by the behavior.

Part IV

Discussion and Conclusion

The final part wraps up the contents of the paper, discussing issues with the player study and presenting a conclusion for the project. It also provides some thoughts for possible future work on the subject.

Chapter 11

Discussion

11.1 Problems and Risks of Survey

While the survey managed to bring in large amounts of data, some choices made while constructing the survey may have affected the results.

11.1.1 Issues with Collection of Results

There were some issues with the distribution and some of the questions that may have impacted the number and type of responses collected.

The majority of the survey responses were collected from members of Pokémon GO Facebook groups and internet forums. Players who are members of these communities are likely to be much more dedicated to and immersed in the game than the average player, who may have just heard about the game from friends or in the media and decided to check out the latest craze and have a few days of fun. This was attempted counteracted by approaching players "in the wild", but this unfortunately did not yield too many responses.

The survey contained 46 questions, a relatively daunting number which is likely to have deterred quite a few potential respondents. Originally, the majority of the questions were mandatory, and it is likely that most of those who decided to answer despite the length of the survey were very dedicated players, while the more casual players found the survey to be too lengthy.

A few counter measures were taken to attempt to reduce the impact of the survey being long. First, the questions were split across several pages, grouped together by the theme of the questions. Secondly, questions deemed less important were made optional. Finally, respondents were informed that the survey was long, but that any answers they could provide would be of great help, and that they did not have to write a lot for each question. It is impossible to know how these choices affected the responses received, and it is possible that one or more of them even have worked against their purpose.

After some of the first responses were delivered, several comments had been made on the length of the survey and the number of mandatory questions. This led to some more questions being made optional, but the damage may already have been done, as this was several days after the large distribution at the Pokémon GO event discussed in Section 7.2.

Originally, the plan was to conduct interviews with players in the wild and distribute the written survey to players online. However, as the number of questions on the survey grew large, we considered it unlikely that many players would be willing to participate in interviews as long as those that would be required. Additionally, we wanted to reach out to as many players as possible during the event, and asking them to respond to the survey at a later time would allow more players to be contacted while the park was still crowded and players were open to be approached. Another consideration was that it would take less time away from the players when they were out playing, instead allowing them to respond at their own pace when they had the time.

However, given the low number of responses yielded from approaching these players, it seems likely that constructing a shorter version of the survey and collecting live results from players through interviews using this shorter version may have been more successful. Not all the questions that were asked in the survey were used in the analysis of the results, and in retrospect should not have been on the survey at all. The collection of responses in the wild would certainly have been more successful with a shorter survey, whether it was conducted as an interview or handed out to be responded to at their convenience.

The unfortunate consequence of the issues mentioned above is that the results gathered do not necessarily reflect the average use of the game. The length of the survey and the platform for its distribution are both important factors that

are very likely to have affected the selection of players who completed the survey, and the average player who responded to the survey may be quite different indeed from the average player of the game overall. In what areas they differ is difficult to say, but it is not a stretch to assume that the results would indeed have looked a little different had other choices been made.

11.1.2 Issues with Accuracy of Results

There were also some issues with the questions and options that may have affected the accuracy of the collected data.

Many of the questions supplied multiple options the respondents could choose from, and many of these questions allowed multiple options to be selected. When answering these questions, in cases where multiple options apply to the respondent, it is possible that they stopped considering options once they found one that was applicable, despite it being possible to select multiple. One counter measure that was made in an attempt to prevent bias towards the first few options was to randomize the order of the options for each respondent, using the built-in functionality of Google Forms.

However, some questions that presented subjects with several options followed by an *Other* option where they could elaborate. This option always came last, which may have lead to the *Other* option to be underrepresented relative to the other options in the cases where more than one option could be selected. When a fitting option was readily available for selection without requiring a written answer, some respondents may have chosen to only select the simple option and ignoring the option for elaboration. Therefore it is not unlikely that some of these questions, such as the one asking about reasons for starting the game discussed in Sections 8.1 and 8.2, may be lacking some data for some categories.

Several of the questions asked about time spent on miscellaneous activities, providing options of ranges such as *2 hours or less*, *4 hours or less*, *8 hours or less* and so on. The goal was to make it easier for respondents to reply with estimates rather than having to figure out the exact amount of time they spend on the activity. A secondary goal was to create groupings of similar answers ahead of time.

This choice had two side-effects, however. The first issue was that the larger options such as *20 hours or less* were valid answers even for those who played

only an hour and a half, as 20 hours or less does indeed also include the same amounts that all the smaller options do, even though *2 hours or less* would be the preferred response in this case. During construction of the survey, an alternative version of the options was considered, with categories such as *Between 1 and 2 hours*, *Between 2 and 4 hours* and so on. However, it was believed that it was more likely that respondents would be confused by this type of alternative, as a play time of two hours could go in either of these categories, and expected that most respondents would understand to use the smaller alternative if more than one fit their answer. To further increase the odds of subjects choosing the correct option, each of these questions was annotated with *"Please choose the smallest alternative that fits"*.

While it was expected that most respondents would choose the most accurate option, there was another issue with the supplied options. The ranges became wider the longer periods of time they were concerned with. The reason for this was to better capture the differences in low activity groups, and an idea that the difference between 15 and 18 hours of activity was much less significant than the difference between 30 minutes and 2 hours. This resulted in low accuracy for the larger ranges, particularly for the *More than 20 hours* option, which was chosen as a cutoff to avoid too many options. On the question regarding physical activity after Pokémon GO, 67 subjects responded that they were active more than 20 hours per week after they started playing, as opposed to only 11 before. Because of the large number of subjects who increased their activity to this level (a 500 % increase), it could have been useful to further differentiate ranges within this range. Any increase made by players who were already in the highest range prior to Pokémon GO was also not tracked due to this cutoff point.

It is important to note that the question asking about time spent playing per day during peak activity cannot be used as a direct indicator of physical activity per day, as many players also reported that they played while driving or on public transit. This reported time playing should also be taken with a grain of salt when considering the success of the game, as it fails to take into account "inactive" playing, where players have the game open on their phone, but the phone is in their pocket or similar. In these cases one can hardly consider the player to truly be playing, as the app is simply open to track movement. The follow-up survey asked players about this, and while some said that most of their playing was active, some said as much as 90 % of their playing was inactive.

Several of the questions were worded in a manner where they only looked at possible positive effects, neglecting possible negative effects. Some questions asked whether players had become more active, more social or skipped unhealthy activities. These questions did not really consider those who used to exercise daily but were skipping those workouts to hang out at lures playing Pokémon; people with mental conditions such as anxiety whose conditions were worsened because of their focus on Pokémon GO; people who were already social but whose friends did not want to play, so they left their friends behind to go play alone; players who usually would not drink alcohol often, but started going to bars every night because their local bars had the highest concentration of Pokéstops. These people exist, and some of them mentioned these issues in their comments or open text responses. But because the questions were worded to look only at the positive side, they may not be properly represented in the results, as some of them may have simply chosen to answer "No" to those questions.

The question asking whether the subjects had *"lost weight or otherwise felt more physically healthy"* was also somewhat unfortunately worded. While many, especially in the western world [33][51], certainly would benefit from losing some weight, there are also those who either do not need to lose weight or in fact are underweight and need to gain weight. The question was optional, and it is very possible that some answers from people in this situation were lost because of these conditions. The value of asking whether the subject had lost weight is limited when we do not know their weight.

Some of those who reported having lost weight also mentioned that they had started exercising more or had started a new diet, not related to Pokémon GO. Others said that they did not know their weight, but felt like they probably had lost some. These respondents have not been categorized as having lost weight, as we cannot know whether they have actually lost any weight due to playing the game.

More than one out of every five respondents claimed to be suffering from either depression or some form of anxiety. The WHO and ADAA report that between 5 and 7 % of the global and American population respectively suffer from depression [4][49], and 18 % of the American population suffering from anxiety disorders [5]. While it is possible that these groups of people are attracted to Pokémon GO, leading to a larger portion of the player base suffering these conditions than in the population on average, there is also a possibility that quite a few of these

respondents are undiagnosed and do not actually suffer from these conditions, but think they do. However, even if they do not have the actual diagnosis, if they were experiencing symptoms of these conditions and playing Pokémon GO helped them combat them, the effect is still positive, but we need to keep this in mind when considering the effect on actual mental illnesses.

In addition to the problems with the questions themselves, the categorization of open text answers may have caused some accuracy issues. Particularly the question regarding reasons to quit playing was difficult to categorize, as many players gave multiple reasons as one answer. This resulted in many categories where some of them were quite similar, and most of them having only around 7 % or less of the responses. It is quite possible that some of these categories should have been combined. The question could possibly have been split into several questions asking whether certain things had caused the subject to quit or reduce play time, but to avoid leading the answers it was decided to keep it as one question.

Another similar case is the question asking about mental conditions. Only a few conditions were listed as options, encouraging respondents to list other conditions they were suffering from using the *Other* option. Some of the conditions that were listed had very few sufferers. The small sample sizes for these groups and some of the categories in Chapter 8 mean that the statistical significance of the results found for these groups is low. However, while the conclusions drawn from these results may not be entirely accurate, the results still give some indication of potential effects.

11.1.3 Minor Issues

The issues listed in this section may have had an impact on the results gathered, but probably very minor compared to the issues discussed in the previous sections.

When asking about the gender of the respondent, the only two options were male or female. While some potential respondents who did not identify with the binary gender division, causing some interesting responses to be lost before they even started, it is unlikely that the number of responses lost because of this is statistically significant. However, because the gender was not really used in the analysis of the results, the question could have been left out all-together.

Because the actual URL for the survey was quite long and difficult to enter into a web browser, when players were approached and asked to answer the survey, the link on the note they were handed was shortened using a link shortener. This same shortened URL was also shared on Facebook. While this made the URL much easier to enter into their browser, some people are skeptical of link shorteners as they do not know where they lead. This may have been a contributing factor to the low number of responses yielded from real world encounters. Sharing the direct link to the survey would most likely not have been more successful, but using Google's own link shortener may have helped slightly. It is however likely that the effect of this was negligible compared to the length of the survey, which is far more likely to have deterred players from responding.

One question asked respondents whether they would keep playing when winter came and the weather got cold. However, as the survey was distributed globally, the question failed to take into account those respondents who lived in warmer climates. For some respondents, the weather during summer was actually too warm to play outside for extended periods of time, and they were looking forward to cooler weather so they could go hunting for Pokémon on the same scale as others had been doing during the summer. However, as the game largely died down for other reasons before the worst of the fall and winter weather settled in, the importance of this question ended up very low.

Chapter 12

Conclusion

Pokémon GO was a huge success compared to previous similar games, at its peak grossing for more than all other mobile games combined. We studied the possible reasons for its initial success and its subsequent downfall as Pokémon GO players suddenly went from being everywhere to being a rare sight. We also studied the potential effects playing the game had on its players' health, both physical and mental. The study was performed through a survey that garnered more than two thousand responses from players of all ages and activity levels.

Not surprisingly, the results from the survey indicate that the success of Pokémon GO largely comes from the combination of a Pokémon game on smart phones for availability and nostalgia, and a game that encouraged players to go outside and explore during summer when it was warm and they had the time. Players enjoyed following in the footsteps of the protagonists of the franchise, endeavoring to *"catch 'em all"* and *"become the very best"*, and many were excited about trying an augmented reality game, a genre they had not previously tried.

Unfortunately the game was lacking in content and things to do once players had caught all the monsters, and failed to keep most of its players engaged in the long term when they were unable to catch new monsters and school and work were back on their minds and schedules.

The game was very successful at bringing players out to play, when many of them would otherwise have stayed home participating in sedentary activities. Studies show that inactive lifestyles are the cause of many serious health issues, and increasing physical activity through intrinsically motivated activities is an effective

way of preventing these kinds of lifestyle diseases. The game was particularly effective in making low activity players more active: where one in every two players were less physically active than the World Health Organization's recommended minimum weekly physical activity before Pokémon GO, only one in five were below the threshold while playing, while the group of players with a high level of activity more than tripled in size.

The increase in physical activity was not lasting, however, with most players falling back to their old ways after they stopped playing. Some players were inspired to start exercise by being exposed to exercise in a fun way, but for most players the increased physical activity was a side effect and not something to strive for without the motivation of Pokémon. Many players were also reckless while being consumed by the game, and risked playing while driving or while walking in traffic, or ventured into dangerous neighborhoods in pursuit of new adventures. Luckily, few serious accidents were caused by their actions.

While the game brought some disappointment and negative behavior, many sufferers of mental conditions such as depression or anxiety found the game helped them in dealing with their conditions through pushing them out of their safe spaces and into the world, where they were exposed to both exercise and human interaction. The strong community feeling of the game also helped foster many new friendships and improved existing relationships of all sorts.

The game showed promise, but ultimately failed to deliver in the long run. The style of game has the potential to have a serious impact on the collective health of society, as long as it manages to keep its players engaged for longer periods, and making a new success may be very possible if one can avoid the pitfalls that Pokémon GO fell into.

Chapter 13

Future Work

This chapter presents some thoughts for possible future work on related subjects.

13.1 Use of Pokémon GO in Serious Contexts

Pokémon GO was a great success for players with low physical activity levels, and players suffering from mental conditions such as depression or anxiety. Further more focused and rigorous research on these effects could potentially uncover new findings and a more detailed picture of what exact aspects of the game is associated with the effects. If such studies are done, it is possible that the game or similar games can be used in treatment of patients with any of these conditions.

It is also possible that adding some special items or rewards to the game could motivate players to be more physically active, and what kind of items would be suitable for such a purpose is a possible subject for a study.

The game was also very successful at getting players to explore their local area, and could potentially be used to teach local history.

13.2 Future of Pokémon GO and Similar Games

While the AR mode in the game was not widely used, players enjoyed the pervasive aspects of the game, being able to navigate the map by moving in the real world

and real world locations being tied to specific places in the game. The game's success was partly associated with the real-world integration and the technology used, and there should be potential for developing new, hugely successful games within these areas.

Entire communities such as the Pokémon GO Snap subreddit formed around the concept of taking fun, cute and interesting pictures using the in-game AR mode, and such pictures were also popular around the internet, so it would seem that AR technology still has much potential. The pervasive games genre is in growth, as seen in Chapter 5.

Appendix A

Player Survey - Final, English version

The following pages contain a printout of the survey generated by Google Forms.

Pokémon Go survey – Success factors and health benefits

This survey is a part of a Master's thesis on Pokémon Go that aims to identify the key success factors that led to this game's meteoric rise in popularity immediately following its release. It also attempts to investigate possible benefits playing the game has on the player's health, both physical and mental, and on the community as a whole.

Unfortunately, the survey is quite long, but responses give me loads of useful information that is likely to be of great help, so I really appreciate if you take the time to answer! The survey consists primarily of multiple choice questions, with some room for elaboration where the supplied options are insufficient. Questions that require you to write a verbal response are optional, but any responses to these questions give me much useful information, so if you have the time, please consider giving at least a brief answer to these questions.

If you are no longer playing, treat any questions that ask about what you do in the game (e.g. what features you use or how much time you spend playing) as asking about the time you actually did play.

The questions are split into the following eight categories: Introduction/demographic, initial and continued interest, play style and amount, activity and physical health, socializing and mental health, exploration and culture, negative behavior, and finally previous gaming experience. At the very end you can put any additional comments.

* Required

Introduction: Who are you?

The following questions aim to map who actually plays Pokémon Go, and whether different types of people approach the game differently or are affected by it in different ways.

1. How old are you? *

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2. What is your gender? *

Mark only one oval.

- Male
 Female

3. In what country do you primarily play Pokémon Go? *

.....

4. What is your (primary) occupation? *

Mark only one oval.

- Student in higher education (university, college etc)
 Student in other types of education (e.g. high school)
 Unemployed
 Employed

5. If you are currently employed or are a student in higher education, what is your industry/field?

Mark only one oval.

- Technology
- Retail
- Finance
- Health
- Entertainment
- Production
- Politics or social sciences
- Other:

Initial and continued interest

This section aims to identify what originally caused you to start playing Pokémon Go, and whether the game has managed to keep you interested.

6. Which of the following factors influenced your decision to start playing Pokémon Go? *

If neither of the listed options influenced you, please supply a short description of what made you start playing.

Check all that apply.

- The opportunity to get discounts or benefits because of Pokémon Go-related promotions
- Recommendations from friends/family
- Social media or internet forums
- Nostalgia or previous experience
- Official trailers/promotion
- Media coverage
- Other:

7. When did you start playing Pokémon Go?

If you are unsure, the date you started can be found by pressing the picture of your avatar in the lower left corner of the game.

.....
Example: December 15

8. Are you still playing? *

Mark only one oval.

- Yes
- Yes, but less frequently than during my peak
- No

9. **If you are no longer playing, when and why did you stop? If you are still playing, but have greatly reduced the amount you play, when and why did this happen?**

Approximate dates or simply the length of the period for which you played are adequate. If possible, please also describe what made you stop playing (e.g. no time to play, didn't enjoy the game, not suited for your area etc).

10. **On an average day, how much did you play per day during the period you played the most? ***

Mark only one oval.

- Less than an hour
- Between 1 and 2 hours
- Between 2 and 4 hours
- Between 4 and 8 hours
- Between 8 and 15 hours
- More than 15 hours

11. **If you are still playing and live in a climate with significant seasonal differences (e.g. warm summers but cold winters), will you continue playing as the weather gets colder? ***

Mark only one oval.

- Yes
- Yes, but less actively than during the summer
- No
- Not applicable

Play style and amount

12. **What level are you currently in Pokémon Go?**

13. **How many different Pokémon have you caught?**

14. Which of the three teams in the game do you belong to?

Mark only one oval.

- Instinct
- Valor
- Not affiliated with a team
- Mystic

15. What type of area do you primarily play in? *

Mark only one oval.

- Urban
- Suburban
- Rural

16. Which of the following game features do you use? *

Check all that apply.

- AR mode while catching/battling Pokémon
- Gym battles
- Lures
- Incense
- Incubators/hatching eggs
- Purchasing items in the shop
- None of the above

17. Which of the following qualities do you value or look for in the Pokémon you own/catch /search for? *

Check all that apply.

- Appearance
- Rarity / Scarcity
- Effort put into catching/hatching the Pokémon (e.g. 10 km egg, escaping many balls, going some special place to find it)
- High combat power
- High health (HP)
- Good moves/attacks
- Individual Values / Good result from the “Appraise” feature
- That you don't already have it
- Other:

Activity and physical health

18. How many kilometers do you have on your “Jogger” medal in the game?

The medal can be found by pressing the picture of your avatar in the lower left corner and scrolling down.

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19. How do you move around while playing? *

If you utilize none of the listed options when playing, please choose "Other" and specify.

Check all that apply.

- Walking
- Running
- Bicycle or similar
- Car
- Tram
- Bus
- Train
- Wheelchair
- Other:

20. In an average week, how much time did you spend on physical activities (e.g. walking, running or biking) before you started playing Pokémon Go? *

Please choose the smallest alternative that fits

Mark only one oval.

- 30 minutes or less
- An hour or less
- 2 hours or less
- 4 hours or less
- 8 hours or less
- 12 hours or less
- 20 hours or less
- More than 20 hours

21. In an average week, how much time do you spend on physical activities since you started playing Pokémon Go? *

Please choose the smallest alternative that fits

Mark only one oval.

- 30 minutes or less
- An hour or less
- 2 hours or less
- 4 hours or less
- 8 hours or less
- 12 hours or less
- 20 hours or less
- More than 20 hours

22. If you spend more time on physical activities after you started playing Pokémon Go than before, what are the sources of this activity? *

If you have not increased your amount of physical activity, please select "Not applicable". If none of the options describe your situation, please choose "Other" and specify the sources for the added activity (e.g. whether the increased activity is unrelated to Pokémon Go).

Check all that apply.

- Not applicable
- Taking detours or longer routes during other regular movement (e.g. walking to/from work)
- Walking/running/biking when doing errands (e.g. going to the store) rather than driving
- Going out with the sole purpose of catching/playing Pokémon
- Other:

23. Have you lost weight or in other ways feel more healthy than before you started playing Pokémon Go?

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24. Have you skipped out on less healthy activities (e.g. going out to drink) that you otherwise would have engaged in due to playing Pokémon Go instead? If so, please specify.

.....

Socializing and mental health

25. In an average week, during your spare time, how much time did you spend socializing with other people (in person, outside your home) before you started playing Pokémon Go? *

Please choose the smallest alternative that fits
Mark only one oval.

- 30 minutes or less
- An hour or less
- 2 hours or less
- 4 hours or less
- 8 hours or less
- 12 hours or less
- 20 hours or less
- More than 20 hours

26. In an average week, during your spare time, how much time do you spend socializing with other people (in person, outside your home) since you started playing Pokémon Go? *

Please choose the smallest alternative that fits
Mark only one oval.

- 30 minutes or less
- An hour or less
- 2 hours or less
- 4 hours or less
- 8 hours or less
- 12 hours or less
- 20 hours or less
- More than 20 hours

27. If you have increased the amount of time you spend socializing with people since you started playing Pokémon Go than before, what are the causes of this increase? *

If you have not increased the amount of socializing you do in a week, please select "Not applicable". If none of the options describe your situation, please choose "Other" and specify the sources for the increased socializing.

Check all that apply.

- Not applicable
- Playing with friends
- Playing with family
- Talking to people you meet while playing
- Other:

28. Have you talked to someone in person because of Pokémon Go that you otherwise would not have talked to? *

Mark only one oval.

- Yes
- No

29. Have you made new friends through playing the game? *

Friends in this context is someone you would make an effort to meet again in person and who you believe might want to meet you again. It could be someone you met for the first time while playing, or a previous acquaintance with whom you were not already friends.

Mark only one oval.

- Many
- A few
- One
- None

30. Has playing Pokémon Go improved any of your existing relationships? *

Check all that apply.

- Yes, with your family
- Yes, with your significant other
- Yes, with your friends
- No

31. Do you suffer from any mental illnesses? *

If you suffer from other illnesses than the ones listed, or you don't feel completely mentally healthy but are undiagnosed thus far, please specify with the "Other" option.

Check all that apply.

- No, or do not wish to disclose
- Social anxiety
- Depression
- Autism
- Other:

32. If you suffer from a mental illness, do you feel that playing Pokémon Go has had a positive effect on your mental health? If yes, feel free to elaborate on how it has helped you

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Exploration and culture

33. Have you explored any new areas or cities because you were playing Pokémon Go? *

Check all that apply.

- Yes, in your own town/city
- Yes, in another city that you were already travelling to
- Yes, a neighboring town/city
- Yes, a more distant town/city (that you would otherwise not have travelled to)
- No

Negative behavior

The popularity of the game may not be all positive. There is an abundance of media articles reporting negative behavior from players of Pokémon Go. This section aims to investigate what portion of the player base engage in that negative behavior.

34. **Have you trespassed or otherwise gone into areas you shouldn't be because you were playing Pokémon Go? ***

Check all that apply.

- Yes, knowingly
- Yes, by accident
- No

35. **Have you put yourself or others in dangerous situations because you were playing Pokémon Go? ***

Check all that apply.

- Yes, yourself
- Yes, others
- No

36. **Have you gotten into any accidents because either you or another involved party was playing Pokémon Go? ***

Check all that apply.

- Yes, minor accidents (only superficial or no injuries)
- Yes, serious accidents (serious injuries or property damage)
- No

37. **If you have put yourself or others in dangerous situations, or gotten into accidents, because of Pokémon Go, could you elaborate?**

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38. **Have you neglected other areas of your life because you were playing Pokémon Go? ***

Check all that apply.

- No
- Yes, work or school
- Yes, forgot/neglected to eat/drink/sleep
- Other:

39. **Have you harassed other players of Pokémon Go for any reason? ***

Check all that apply.

- No
- Only jokingly or online
- Yes, in person (verbally)
- Yes, in person (physically)

40. If you have harassed other players for any reason, what was the reason?

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Previous gaming experience

In an effort to determine what made Pokémon Go so popular, we also want to compare it to other similar games. If you have some experience with similar games (either other Pokémon games, location-based or AR games, or other mobile games), please let us know which ones.

The questions that require you to write an answer are optional, but any insight at all that you can provide to these questions is likely to be of great help! You don't have to write a lot, but just some keywords on what you liked or didn't like and how you feel Pokémon Go handles these aspects (better or worse?) goes a long way. This is especially true for the other location-based/augmented reality games.

41. Have you previously played any of the following families of Pokémon games? *

Check all that apply.

- Pokémon RPG for handheld consoles (e.g. Red/Blue, Gold/Silver, X/Y etc)
- Pokémon fighting games (e.g. Pokémon Stadium, Colosseum, Battle Revolution or Pokkén Tournament etc)
- Pokémon puzzle games for consoles (e.g. Pokémon Puzzle Challenge, Pokémon Shuffle etc)
- Pokémon Trading Card Game (either on paper or digital)
- Pokémon games for mobile phones
- None of the above
- Other:

42. Have you played any of the following location-based / augmented reality games/activities? *

Check all that apply.

- Geocaching
- Ingress
- Life is Crime
- Parallel Kingdom
- Real Strike for iOS
- Zombies, Run!
- The Walk
- Zombies Everywhere
- Clandestine Anomaly
- None of the above
- Other:

43. Do you play casual mobile games such as Candy Crush, Angry Birds, Wordfeud / Words With Friends, Fun Run etc? *

Mark only one oval.

- Every day
- Every week
- Every month
- Less frequently
- Never

44. If you have previously played any location-based or augmented reality games, what did you like about them and what did you not like about them? How does Pokémon Go compare on these points?

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45. If you have previously played any other Pokémon games, what did you like about them and what did you not like about them? How does Pokémon Go compare on these points?

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46. If you have previously played any other casual mobile games, what did you like about them and what did you not like about them? How does Pokémon Go compare on these points?

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Closing comments

If you have any comments or more insight you would like to supply, feel free to write them below. This is completely optional. If you wish to be contacted with further questions (should they arise), you can leave contact information here. This will not be shared with anyone else!

47. Any additional comments?

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Appendix B

Follow-up Survey

The follow-up survey was distributed using the contact information left by players in the comments on the original survey.

All those contacted were asked the following questions:

1. Are you still playing?
2. If no to question 1, what made you quit and roughly when did this happen?
3. If no to question 1, are you likely to start playing again, and if so, what would make you come back?
4. Have you picked up any alternatives, and if so, how do you like them in comparison?
5. If yes to question 1, what would make you quit the game?
6. Of the time you reported playing, would you say the majority was active playing while physically active, or was more of the playing inactive (app open in pocket) or while being transported (e.g. via car or public transit)?
7. The questions on the last survey were almost exclusively worded from a positive perspective, but did you ever have any negative effects from playing, e.g. becoming less social or skipping workouts?
8. Have you ever bought coins in the game?
9. If yes, roughly how much have you spent?

10. If yes, what have you spent those coins on?
11. When third-party map services such as Pokévision were around, did you use them?
12. If you did use the map services, what was your goal (e.g. locating nests, catching specific rare mons, just seeing what's in the area, etc)?
13. If you used the maps, roughly for how long did you use them, and were you planning on stopping the use if/when the in-game tracker was fixed?
14. You originally reported that you increased your physical activity from 2 hours or less per week to 8 hours or less. Have you managed to keep this level of activity since?

Additionally, players who were still playing when they responded to the follow-up survey were asked the following roughly one month after their response: *"Are you still playing? If so, how much compared to last time?"*

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