

Players' Experience of an Augmented Reality Game, *Pokémon Go*: Inspirations and Implications for Designing Pervasive Health Gamified Applications

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Abstract. *Pokémon Go* is a mobile Augmented Reality (AR) game that blends gameplay with real-life outdoor physical activity. In this game, players locate, catch and interact with virtual creatures called Pokémon. Initial reports and online players' statistics suggest that *Pokémon Go* motivates players to go outside and become more active. This paper describes an online survey we designed and conducted with players from varied locations and different backgrounds. The goal was to gain initial insight about WHY players spend time on this game and WHAT are their primary motivations; WHEN and HOW they play the game; and WHAT potential changes in physical activity *Pokémon Go* may elicit from players. Free-to-play, location-based AR mobile games like *Pokémon Go* are likely to become a new design model for gamified applications that promote physical activity. However, our results imply that in order to sustain motivation and physical activity, the core gameplay and mechanics require thoughtful and engaging design. Further long-term research is needed to understand the benefits and concerns of the game.

Keywords: Augmented reality game · Motive · Physical activity · Play pattern · Implications · Gamified applications

1 Introduction

Admittedly, *Pokémon Go* seems to have caused a wave of popularity among different age groups and cross many types of players. Within the first week of its launch in July, the game attracted over 65 million users [4]. Nevertheless, by August, it only held around 30 million active players. However, very few academic research or papers have explored what caused this phenomenon and what motivated huge amount of players.

A sedentary lifestyle is a contributing factor to chronic disease. Thus, having an active level of physical activity is crucial to. Tools and technologies such as mobile games and some gamification applications have been shown to help people manage their health and wellness. Of particular interest are technologies that are designed for activity tracking and promoting behaviour changes in everyday life, like *Pokémon Go*. *Pokémon Go* is one of the most significant successes in location-based games so far. It has been a common phenomenon that *Pokémon Go* players walk very long distance

daily to capture certain *Pokémons*, gathered together to wait for the appearance of *Pokémons* at a certain location (*Pokéstop*).

The Human-Computer Interaction (HCI) community has conducted research of location-based gamification applications developed in commercial and academic contexts for many years. *Geocaching* [7] is only one of many examples. However, most of these gamification approaches had limitations, particularly those concerning the potential to change behaviors, such as physical activity. Limitations were attributed to the cost of equipment, the need for players to remain indoors versus outdoors, the inherent “unsocial” nature of games that accommodate or privilege certain groups of players over others, poor long-term adherence and so on [9].

Therefore, for researchers from a health technology perspective, one of the most intriguing aspects of *Pokémon Go* is that people must actually engage in a Physical Activity (PA) (e.g. walking, running, biking) to successfully play the game. Many prior reviews and studies of Active Video Games (AVG, games aimed at promoting Physical Activity) and gamification approaches on mobile platforms have been conducted [3, 5]. Some of these are positive and encouraging whereas others showed a contradictory results. As suggested in [10], *Pokémon Go* shows an early, yet compelling evidences that interventions to promote healthy behaviors should incorporate social dimensions, if they are to be appealing and successful in promoting long-term behavioral change. The article also shows the urgent interests to start creative research projects that measure outcomes from *Pokémon Go* as interventions for facilitating physical activity changes and explore the underlying reasons.

Furthermore, in recent editorial letters and articles in the *Games for Health Journal* [1] and in *Sports and Exercise Medicine* [2], health researchers have begun to pay attention to *Pokémon Go*, and propose potential empirical studies. Relevant questions focus on numerous facets of players’ profiles, their motives and play patterns, potential outcomes of playing *Pokémon Go*, and so on. Answers to these questions promise to shed light on gamification approaches and video/mobile games that are designed to facilitate PA. Therefore, in this research, we set out to explore these research questions in order to assess and provide insights regarding the design of gamified applications that intend to increase or to motivate PA.

2 What Is *Pokémon Go*?

Pokémon Go is an Augmented Reality (AR) mobile gaming application that uses GPS location systems to create a map of a player’s local environment. Individuals can use their smartphones to track and catch *Pokémons* (virtual monsters) [6]. It was initially released in some countries in July 2016, and has so far expanded to many other countries around the world. *Pokémon Go* was rated the most widely downloaded and used smartphone app in the entire world, surpassing longstanding frontrunners such as *Facebook*, *Twitter* and *Candy Crush* after its release [11].

Pokémon originated from a popular Japanese animé and has since become a huge franchise that includes movies, TV series, comics, toys, themed-products and shops. Therefore, it has huge population of fans. Soon after the associated game *Pokémon Go* was released, it was considered to be one of the most widely downloaded apps in the world.

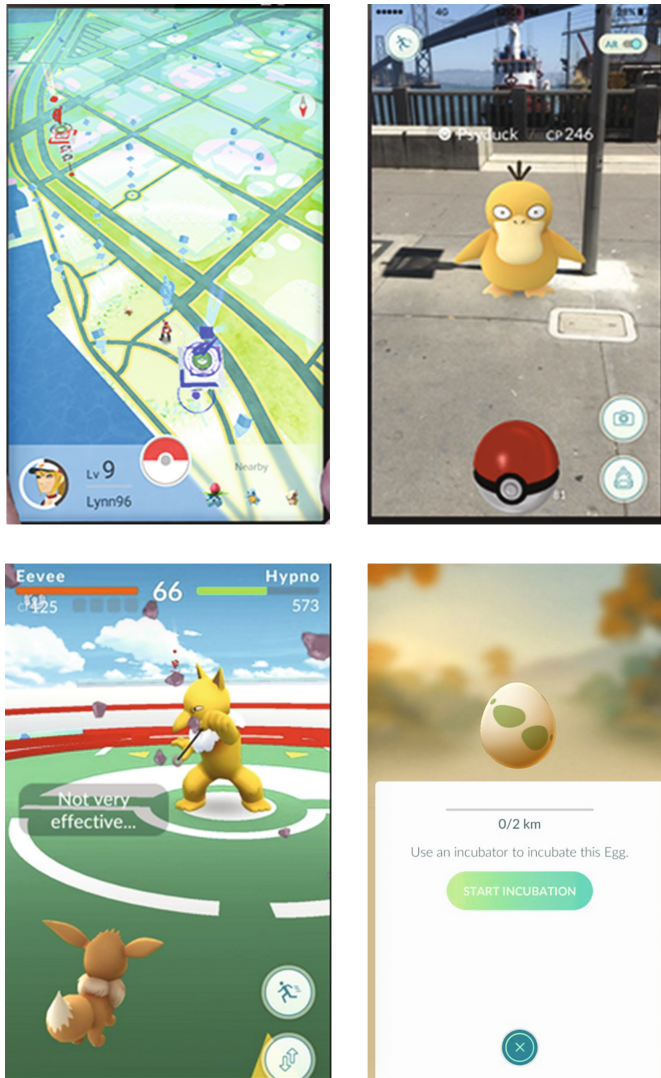


Fig. 1. The mobile game interface of *Pokémon Go*. Top left: the environment of the player's neighborhood with Pokéstops and Pokémon gyms. Top right: the player is throwing Pokéballs to catch Pokémon. Bottom left: players are battling each other in the gym. Bottom right: players use distance traveled to hatch Pokémon from an egg. Photo Credits @ Pokémon Go.

In this game, players can go “geocaching” in AR mode with their mobile phones, where the virtual monsters seems to be alive and co-located in the real world. Besides throwing *Pokéballs* to catch the *Pokémons*, players can battle each other with their *Pokémons* in a “gym”, hatch eggs by traveling a certain distance, get supplies (like *Pokéballs*) from *Pokéstops*, and so on. (as shown in Fig. 1)

Although a lot of AVG and gamified mobile Apps have been developed and researched for over two decades, few of them have successfully managed to (or have even considered to) engage players in a long-term commitment to facilitate or increase their PA [1]. *Pokémon Go* has a similar fate: the initial interest has not been sustainable and there has been a significant drop off in levels of engagement since its release. Nevertheless, recent data from Microsoft shows that the game can help to increase PA by around 25% [8].

3 Research Methodology: Exploring Players’ Motivation and Play Patterns

An online questionnaire designed to explore *Pokémon Go* players’ motivation and to identify player patterns was circulated among players through emails, flyers and online websites (such as *Facebook*).

3.1 Participants

Of the forty participants who took part in this study, thirty-two completed the survey. Therefore, incomplete data from the other 8 surveys were removed. The ages of the thirty-two participants ranged from 19-35 (as shown in Table 1), and sixteen were female. Nineteen were university undergraduates, graduates, faculty members and staff. The other thirteen reported holding jobs that varied from cook and chef to UI designer, game developer, cashier, pharmacist, office jobs, and a medical assistant. Most participants were from Canada, and a few from China and the U.S.

Table 1. Participants’ age distribution.

Age range	Amount of people
19–24	19
25–29	7
30–34	4
>35	2

Figure 2 shows the number of hours per week players spent on playing *Pokémon Go*, other mobile games, and video games. Most participants devoted more time to playing *Pokémon Go* than other video games or mobile games. Among all frequencies, most *Pokémon Go* players spent more than 10 h per week on the game. For instance, from the table, sixteen people spent 10–20 h playing *Pokémon Go* and ten even spent more than 20 h playing it. However, only seven people were willing to spend more than 10 h to play other mobile games, and three to play video games.

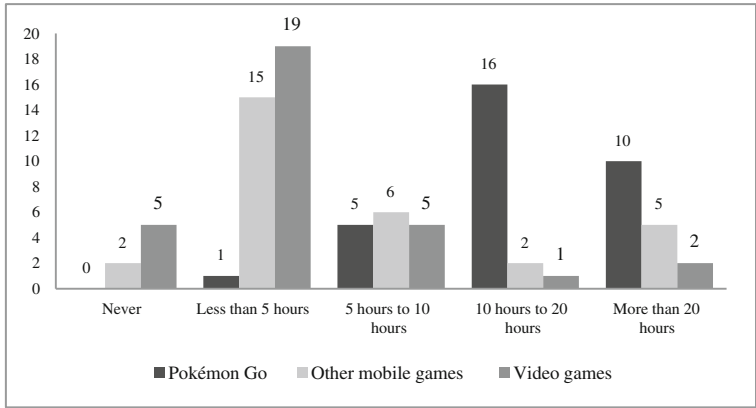


Fig. 2. Participants' weekly hours playing *Pokémon Go*, other mobile games, and PC/console video games.

3.2 Research Instrument and Questionnaire

In the online survey, the participants selected three of the most significant reasons motivating them to play the game, three things they like and dislike most about the game, and three reasons they stopped playing the game (if applicable) from options listed. Table 2 shows some sample answers and options the online survey provided. Moreover, questions regarding *When*, *Where*, and *with Whom* were asked. Other questions included: participants' self-reported PA changes, connections with others, chances meeting new people, and time holding cell phones on a 100 Visual Analog Scale. At the end, one open question was asked: what motivates/impresses you most when playing this game?

Table 2. Sample answers participants chose from in the survey questions.

Questions	Optional answers provided
“Three reasons i play <i>Pokémon Go</i> ”	a. I want to collect the <i>Pokémons</i> b. I like the <i>Pokémon</i> anime c. People around me are playing and I want to have common topics d. I can have more physical activities e. Nothing particular, just to kill time f. I can meet new people in the gyms/ <i>Pokéstops</i> g. Other, please specify...
“Three reasons i stop playing <i>Pokémon Go</i> ”	a. Friends stop playing b. Phone battery, data usage, Internet access or software bugs c. Catch all <i>Pokémons</i> d. Cost too much time e. Game gets repetitive f. Hackers g. Other, please specify...
“Three things i like most about <i>Pokémon Go</i> ”	a. I like the mobile Augmented Reality environment b. I enjoy chasing down <i>Pokémons</i> c. Placing the LURE mode and attract <i>Pokémons</i> to the <i>Pokéstops</i> d. I like hatching eggs using my physical activity data e. I like to collect all the medals, such as Breeder, Ace trainer, etc f. I enjoy the social accessibility of this game, the way I can interact with others g. I like to battle with others in the gyms h. Other, please specify...
“Three things i dislike most about <i>Pokémon Go</i> ”	a. Embedded players in the gym b. Catching almost the same <i>Pokémons</i> c. Simple and Repetitive game mechanis d. Phone battery, data usage, and Internet access or software bugs e. Time-consuming f. Other, please specify...

4 Results

From the results, we have learned the top three ranked motivations, three reasons that stop players from playing, and three game mechanics or features they liked and disliked.

Why play *Pokémon Go*?

Out of all participants, collecting Pokémon ranked first as the players’ primary motivation, while the social purpose ranked second, and nostalgia of the *Pokémon* animé ranked third.

Why stop playing *Pokémon Go*?

The main reason players reported that they stopped playing the game was that they caught all *Pokémons*. The second reason participants chose was that the game requires a lot of physical activity and thus too much time and energy.

What do the players like most about *Pokémon Go*?

The three game elements that the subjects liked most were catching *Pokémons* in an AR environment, *Pokéstops* mapped into real-world landmarks, and battling with others in the “gym”.

What do the players dislike most about *Pokémon Go*?

The three things subjects disliked most about the game were: the simple *Pokémon-catching* game mechanic (throwing balls); little variation (such as repeated *Pokémons*); and hardware and software problems (bugs, battery, network, etc.).

Regarding when they usually played the game, seven subjects answered “only in transit”, sixteen said “leisure time like lunch, or before or after work”, and nine reported “any available time”. In terms of whom they play *Pokémon Go* with, seventeen reported that they only played with their friends, coworkers or close ones; seven played alone; and eight said both alone and with friends.

These results reveal that the initiative of most players was to catch and collect all *Pokémons*, and that they enjoyed playing the game physically and virtually with others. Most preferred to play the game with people they are familiar with. Although AR was an attractive bonus, the simple game mechanics and repetitive game content led the players to quickly become bored.

For questions related to behavioral changes, most players thought the game kept them physically active ($M = 73.13$, $SD = 19.65$), and that playing *Pokémon Go* facilitated their connections with people around them ($M = 64.08$, $SD = 18.16$). A downside was that the majority of the participants reported they held their cell phones much longer than before ($M = 74.29$, $SD = 30.79$). For chances meeting new people, players held a neutral attitude and desire ($M = 34.30$, $SD = 24.24$).

However, many subjects left comments concerning safety and privacy issues, e.g., “the game collects location data via GPS, so it is easy to track me down,” “sex offenders or robbers may take advantage of the *Pokéstops*,” and “there were four *Pokéstops* around my house that attract people (who) keep coming!” As P16 reported in the survey, “There was (the) pitfall of this game that I was catching *Pokémons* with my friend, standing on the middle of the street, and there was a homeless person that ~~he~~ claimed he ~~got~~ was HIV positive and needed money to buy food. My friend and I were in shock. .. ~~that~~ we worried that person might attack us or something; therefore, it is very important to be aware of your surroundings while playing *Pokémon Go*.”

5 Discussion and Conclusion

We can conclude that an AR game with gamification approaches – rewards from *Pokéstops*, collections of *Pokémons*, social interaction (in the gyms) – did encourage players' physical and emotional activity in positive ways. As P28 mentioned in

answering the open question, “Pokémon Go is doing a great educational work by encouraging young generations to go to outdoors and exploring the real world.”

Although not the primary motivation, *Pokémon Go*’s social power should not be underestimated. Players who are friends or co-workers get together to “go hunting” the lovely monsters. Players are not only socially networking, but more importantly, are sharing a common hobby, which may enhance their emotional resonance or sense of belonging. As P05 mentioned, “*I remember once I went to Metrotown with my friend to have a dinner. I saw there were at least 50 people all around the ground where the Pokéstops were, and hoping to catch some Pokémons. I had never ever seen so (many) people outside before the game came out. At that moment, I felt the Pokémon Go has changed our daily life. People usually do not go outside. (They) tend to walk more because they want to catch all the Pokémons. Most importantly, I saw people gather together talking when they were at the Pokéstops catching Pokémons.*” Also said by P25, “*When friends point out there is a rare Pokémon nearby, you want to go with them and catch it together.*”

However, there are also a few problematic aspects of this game. In the game, monetary aspects can generate negative effects, as P08 observed, “*it is not fair that people buy lures to catch more Pokémons.*” The simple and limited game features also may reduce the fun, especially over time. This may render long-term motivation unsustainable. Moreover, players have safety and privacy concerns playing the game because of its location-based feature.

The top-ranked motivation to play was attributed to collecting all *Pokémons*, so players may drop out of the game once they fulfill this goal. For example, P01 reported, “*I noticed that a Pikachu was nearby. Usually, I would not go out of my way to catch Pokémon, but since it was rare, I wanted to catch it. I was motivated to walk around the mall to find it.*” But what will happen after P01 catches all *Pokémons* if her/his motivation was to be physically active? In other words, what are the roles of internal motivation, compared to external motivation [5], such as chasing *Pokémons*? Further, if one of the motivations to play *Pokémon Go* is nostalgia, what is the role of nostalgia over time? Similarly, most subjects reported they learned of the game from their friends, installed it, and started to fall in love with the game. To what degree is their “love” for the game attributable to nostalgia, social conformity or cohesion, or sheer novelty (a fad)? Therefore, although this game may act as a catalyst for networking, over time, it may also prove to be a short-term novelty or provoke unintended social and safety problems.

Because this research was conducted from September to October 2016 (a month after the game’s launch), a novel effect may have been at play. Other limitations include: (1) it is a global game, but most of the participants were from a few countries mentioned in Sect. 3.1; (2) players self-reported the ratings of their behavioral changes, however, longer term (more than 6-month) observations with concrete data are necessary to assess “change”; (3) a larger participant population will likely elicit more data and greater insights; and (4) the game’s popularity may be a short-lived phenomenon.

Overall, benefits reported by players were increased exercise, social connectivity, and outdoor activity. However, players cited concerns about safety, privacy, and time commitment, and some found the game mechanics wanting. Ironically, although players' increased their PA by playing the game, they spent the same amount of time looking at their phones instead of at non-augmented, real-world environments.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest with the *Pokémon Go* App or the company, and this study is for research purpose only.

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