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## Comparing the Effects of Mobile Games Using Location-Based Information on Promoting Walking

			
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### ABSTRACT

It appears that walking has a definite effect on maintaining health. Walking is a means of getting to a destination, such as commuting, shopping, going to a library, etc., and walking in itself, is rarely the purpose. Of course, walking is also a sport. But we often have a lot of time while walking, so it is common to count steps or listen to music to spend. In our previous paper or other earlier research, it was reported that a portable game application represented by “Pokémon GO” which progresses using location information has the effect of promoting and guiding walking. In this study, we selected four such games that were popular in Japan and which we have played. By playing these games, we compared the extent to which these promote walking effects such as a desire to walk and an increase in the number of steps.



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## INTRODUCTION

We previously reported that walking was important for maintaining health<sup>1)</sup>. The effect of walking is likely to affect the development of public transportation and the livability of the town where the house is located. When there are shops, libraries, etc., at a moderate distance; you are forced to walk; and in such places, walking is unlikely to be affected even in bad weather such as snowfall or rainfall. There are already many similar reports.

If the town becomes too compact and comfortable, the necessity of walking is reduced and people do not walk; whereas if the town is too large, people will be more susceptible to diseases such as arthritis due to excessive walking or will have to give up walking and consider using cars and buses. For this reason, it is necessary to determine people's physical ability for walking before forming the habit of walking, and how much walking is considered excessive or moderate for the general public. Surveys on multiple people in a single town showed different results depending on conditions in different cities such as living areas, traffic conditions, and undulating roads. Therefore, it was not always possible to deduce the optimal conditions for the size of the town and the number of daily walks.

By the way, the paper we reported earlier, mentioned the use of mobile apps<sup>1)</sup>. Apps that give gifts or discounts at shops, based on the number of steps, may increase the number of steps by driving the users' willingness to walk. Pokémon GO, a smartphone game app, famous in Japan and which has been certified by the Japan Sports Agency<sup>2-5)</sup>, already uses location information, and is thought to contribute to an increase in the number of walks on holidays. In this study, we have selected four of the most popular smartphone apps which we have played; and that we think will use location information to promote walking. We tried to consider the differences among the apps in promoting the walking effect. This study's purpose was not to compare the elements of fun in these games but to examine whether elements that would facilitate the middle-aged and elderly to continue walking had been included.

### **Mobile games using location information**

A mobile phone such as a smartphone is provided with a location registration system for notifying users' location. Position information games use this system to keep the games' operators informed of the position of their mobile phone terminals, thereby calculating the

moving distance and the current position, and proceeding with the game, based on this data. The content of the games varies. There is a stamp rally-like game that simply uses location information. There are also simulation games in which pets, cities, colonies, etc., grow by using location information and compete for the number of items, character strength, and total travel distance. There is a wide range of contents, and many of the games, integrate all the contents. There are cases where game apps based on existing computer role-playing games and location-based games; solve mysteries while walking around the city as part of a real mystery-solving game. Since the location registration system is a function attached to most mobile phones currently sold in Japan, anyone with a mobile phone can participate. Furthermore, the game progresses by two simple operations of "moving" and "accessing and registering a site." Therefore, it is easy to participate in the game. On the other hand, since "moving" is important, some people travel for the progress of the game. Also, a travel agency, tourist spot, transportation (station), convenience store, post office, store, and the game operator may cooperate to provide special data and services to a specific location. In some cases, sponsors are expected to create demand for each facility and introduce tourist attractions.

### **Types and outlines of the games considered**

In this study, we used four popular games: 1) Pokémon GO, 2) Yo-kai Watch World, 3) Harry Potter: Wizards Unite, and 4) Dragon Quest Walk. An overview is shown in Table 1. For serial numbers 1) and 3), the names, characters, and synopsis of the story are considered to be well known worldwide. Pokémon GO is derived from animation for children in Japan; and movies, etc., are spread all over the world. Yo-kai Watch World is also a derivative of Japanese children's animation, and its related toys and character goods showed extremely high sales at one point in time. Yo-kai (a demon, similar to monster) is an awe-inspiring phenomenon or an unusual object that is usually beyond one's knowledge. While movies are being screened, it seems that they are not trendy worldwide. Harry Potter is a fairy tale for children in the UK, but sales of its publications, movies, amusement park attractions, and other variants, have been recorded worldwide; and its name seems to be the best known. The Dragon Quest Walk is derived from a very famous video game in Japan. We recall that a movie was also made. The original game itself has been made more than 10 times and is still popular. It appears that Japanese people are well known as in Pokémon GO.

What all these games have in common is a mechanism to get items according to the distance

traveled. As the game continues, the character selected by the player grows (levels up), and a lot of belongings are gathered, and the growth can be confirmed on the smartphone screen. This is one factor that encourages continuation. There is also a mechanism that allows certain communications with other users of the game. For example, a mechanism has been constructed which can defeat a strong monster who cannot be defeated alone but through the cooperation of other members, or by having a friend's character help in the progress of the game. Basically, most games are free-to-play, but items can be purchased for a fee, and purchasing such items allows the game to proceed faster, and the story to progress more advantageously. It seems that the releasing company is distributing the apps for free to get the fee.

### **Specifics about the app**

#### **Pokémon GO**

Currently, it is the most famous mobile game in Japan as well as in the world that uses location information. Global events are also held regularly, and many of the effects of promoting walking that was written about earlier have been verified through this app<sup>3-5)</sup>. The basic process is to raise the level of a character (Pokémon trainer) whose appearance and name have been selected while collecting Pokémon.

The point is that the player has to walk, and he must first throw a monster ball to catch the monster. The ball will be obtained at the level up, purchased for a fee, and obtained at specific locations such as a bus stop, which are called Pokéstops. If you want to play without purchasing; you will need to stop by many Pokéstops, which are often found in places with shops, parks, post offices, and other public facilities. Probably, it is decided through tie-ups with such facilities. Level-ups are based on the number of monsters you have collected, the number of steps you have taken, and how much you have played the game (experience points); but they do not go up immediately. To constantly catch monsters, you need to walk and collect as well as prepare the balls. Also, there are gyms at bases such as stations, and there is a mechanism through which, you can fight with each team; and if you win, you can repaint with your group's color (one of the three colors).

Some of the good things about this game are as follows: Since the types of monsters that appear in different areas are different; you will want to play it in different places, such as

when traveling. Since moving at high speed is not counted in the number of steps; it is considered that the game does not progress when moving in a car or train. There are Pokéstops all over the country; so, it is easy to progress in many places other than the place of residence. It hardly progresses in the house; so, it seems that it will inevitably trigger a walk outside. Also, the screen reflects day and night as well as the actual weather, making it darker or rainier. This may provide information such as to stop walking.

The disadvantages are as follows: There are few Pokéstops in non-urban areas, making it difficult to obtain balls. Also, there are different types of balls; and strong monsters can only be obtained with advanced balls. The game will not progress without that ball. You can catch monsters in the house with the ball, but since the ball is not available in the house; you may need to go to a Pokéstop far away. It is questionable whether this distance is suitable for exercise (generally, there are a lot of Pokéstops in urban areas and few in peripheral areas); and whether it would be tempting to continue the game in such a situation.

### **Yo-kai Watch World**

It is a relatively popular game, but in a sense, it is made with a different idea from Pokémon GO. The basic concept is that players make yo-kai a friend. To do so, you need to fight against a yo-kai who is still wandering with your fellow yo-kai; and win and increase your fellows. If you are already a fellow yo-kai; you can make another player take on (take possession). As a result, the experience value accumulates according to the distance that the other player moves, or the type and number of yo-kai who became friends; and the level increases. The main difference between this game and Pokémon GO is that the players can play the game without moving. It is possible to level up even if another player moves while taking on your friend's yo-kai, and you can level up just by increasing the number of friends. If you plant a "Yo-kai tree," yo-kai will gather there; and you can catch it. Of course, you may get a different yo-kai if you walk outside the house than near the house.

So, you don't always have to walk. You need to walk only if you want to get a lot of yo-kai or increase the number of types, and if another player's yo-kai possesses you; walking will help the other players' level up.

The advantages are as follows: The game progresses without having to walk too much. Except for those who do not have problems walking; the progress of the game can be

expected for those who cannot walk too much because of pain while walking. Also, since the original animation was enjoyed by young children; it may be possible to enjoy it with grandchildren. The battle between monsters proceeds semi-automatically. In the case of Pokémon GO, a manual action of throwing the ball (actually snapping with your finger) is required, and it seems that this will affect whether you are good at it; but in this game; it is easier to win the battle, and the yo-kai is easier to get. Movement through walking is often considered; and when the app is started at the destination, it is recognized that the user has moved in a straight line distance from the house; and the experience value is obtained; and the game proceeds.

The disadvantage is that people who are not physically inconvenienced are less likely to walk. People who are not willing to walk may be able to stop walking because they are comfortable by calling the yo-kai home.

### **Harry Potter: Wizards Unite**

This is a game where you become like wizards, defeat monsters, gain experience, and level up. If you know the movie or the original; you can enjoy the situation where the characters are being attacked by monsters. It is impressive that you have to go into detail to see other wizards moving around on the screen while you play, or to automatically straddle a broom while moving at high speed. Defeating a lot of monsters will not only give you experience, but you will also be able to record it in the register and look back later. At home, you can mix magic potions and browse the registry, and use the collected port keys to gain materials and experience points.

As an ingenuity to having to walk; it is necessary to obtain energy for fighting monsters and to obtain or cultivate grotesque materials for magic potions (such as medicinal herbs that temporarily increase defenses) to advance the battle advantageously. There are botanical gardens, inns, and restaurants scattered outside, where you can get magic potion materials and grow plants. At the inns and restaurants, you can get energy.

The advantages of this game are: If you know the original; it will be easier to get familiar with the game and continue it. The game is so made that items cannot be acquired while moving at high speed, such as in a car. Since the game does not progress in the house; it is a means to encourage walking for those who intend to continue the game.

The disadvantages are: Similar to what was mentioned under advantages; if you do not know the movie or the original, you will not know what it is and you may find it boring. Unlike the previous two apps, since the monsters that appear in different areas do not change; it is not something you can enjoy on your travels. You have to cast a spell to defeat the monster; but you have to trace the screen of your smartphone with your fingers in a complicated way, which is difficult to do while standing outdoors.

### **Dragon Quest Walk**

In this game, the characters you have created, defeat monsters while traveling; and level up by accumulating experience points. To raise the level; you need to defeat many monsters; collect weapons and armor with the rewards; strengthen the character, and it seems, that attractiveness is when you gradually become stronger.

Many monsters appear on walking. You can also recover from fatigue and injured physical strength by fighting monsters. Besides, you will be able to obtain items to recover from sleeping or being paralyzed due to the magical power applied during the battle.

The good points are: Compared to Pokémon GO, this game is controlled in areas where progress is limited. The location where items can be obtained is set to be within 500 meters of the current location (after moving, the world will spread further), so that, it is not necessary to walk to a wide area, from the beginning. It is, therefore, suitable for those with the desire to walk a little; and it is also possible to walk a long distance with the accumulation. In the original game, if a monster was killed by fighting a monster, it would be necessary to use items or go to church and be revived. In the case of the present game, the game is automatically set to survive at the minimum gauge (life level), so that the game is easily devised after a short time. For the Japanese, there is a feeling that it is a familiar game that has been made into a series; and to start, familiarity such as background music is also an easy element. Once the battle has begun, you can move a little bit and continue the battle (this feature is not available in any other game). This seems to be a very suitable function for automatic progression while walking, and it also leads to suppression of rear-end collision with cars and people. The game in the house progresses a bit (since no ball or energy replenishment is needed). This is considered a negative factor. However, since the quests are done outdoors, 150 meters away or more; a small amount of game progress may trigger an outing. While monsters will appear near the house, their strength level will change according

to the level of the quest selected before going out (not the level of your character). This is designed to have a good fight and is also considered suitable for temporarily lending your mobile phone to another person, to continue playing. Since the actual weather along with the light and darkness of the day and night are reflected on the screen (actually, it will rain on the screen based on the forecast); it is easy to decide to stop walking and return home. There are plenty of places where you can get all kinds of things and recover your physical strength; regardless of whether you are in a residential or commercial area.

Negative points include the following: The time of one's play tends to belong. Monsters appear one after another compared to other games. If there is a place near the house where healing items can be obtained; you may be able to play indefinitely, and you may need to be careful with dependence. There is a "walk mode," and the game will automatically advance when moving at a constant speed (even while riding a car or bicycle). Since it is a game that only defeats monsters (does not make friends), it is thought that it is unsuitable for mental health.

## **SUMMARY**

Based on our experience, it is thought that using the games discussed in this article will allow us to go out or increase the number of walks to take a walk<sup>2-4</sup>). Some celebrities choose one of the games and walk more than 15 kilometers a day, immediately after the release of the game. Some influencers reported that they walked more than 30 kilometers a day, which could lead to increased use of the game and also increase walking. The game we are talking about is reasonably virtual reality, and several mechanisms trigger walking: First, the way the road bends when walking outside; and the shape of the buildings are close to reality. This is probably due to the application of Google Maps technology. Secondly, except for a part; it is designed to make you want to walk outside. Items needed to grow your character or collect monsters are almost exclusively available outside. Third, it is not easy to obtain multiple items even if you wait continuously at the same place where such items can be obtained; and it necessarily takes time. Therefore, depending on the players, there are cases, where they stop at the same place such as a park; and obtain an item many times, or go around various places. Fourth, regular events are held; and some rare items are available only at that time. Fifth, players can cooperate to defeat monsters and communicate a little with others. Sixth, in distant places other than the residence, since the monsters appearing are different; they can be enjoyed even whilst traveling. It was thought that these factors combined to promote going



out and to induce walking.

Although those in the 40s and 50s may be influenced by childhood experiences and preferences; Dragon Quest Walk seems to be the best of the four games considered. It progresses a little at home, but progresses greatly outside, which makes you want to walk. However, the place where you can meet monsters is nearby, which will lead to moderate (not excessive) walking. Presently, the game can only be played in Japan. Probably because it is a latecomer; it is thought that it was developed with consideration for more safety and walking distance, such as playing the game without looking at the screen.

If this game can be further improved for walking; it is better to reduce the number of monsters that appear in the house (indoors) and induce the feeling of playing outdoors. Also, we need to devise a way, whereby progress in the “walk mode” does not get recorded during high-speed movements such as a car or a bicycle. Then, the number of walks can be expected to increase further. In any case, the willingness to walk voluntarily is very important; and the game only assists it. In the future, we would like to liaison with the authors and investigate the opinions of different age groups (especially older people).

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**Table No. 1: - Overview of the games used for this study**

Name	Pokémon GO	Yo-kai Watch World	Harry Potter: Wizards Unite	Dragon Quest Walk
Provider	Niantic, Inc.	GungHo Online Entertainment	Niantic, Inc.	Square Enix
Target age	≥ 3	≥ 3	≥ 7	≥ 3
Release date in Japan	July 21, 2016	June 26, 2018	July 1, 2019	September 10, 2019
Supported OS	iOS app, Android app			
Price of billing item	≥ 120 Japanese Yen			
Downloads in Japan <sup>*1</sup>	≥ 100 million	≥ 5 million	≥ 5 million	≥ 1 million
Level up <sup>*2</sup>	By acquiring experience points			
Main experience points acquired <sup>*3</sup>	Acquire many monsters	Acquisition of many monsters and moving distance of possessed monsters	Win a battle with a demon and fill the directory with the demon list	Fight monsters and win
Elderly interests (Supplementary explanation above)	High Awareness is highest because it is globally popular and since many people have experience of playing; it is highly likely that they will try it once.	Medium? If you play with your family; you will be more interested.	Low? Expect to enjoy fewer movies and originals. The operation is slightly complicated.	Medium to high It is easy to play because many places progress automatically. How much can you enjoy? even if, you do not play the original game?
Walking promoting effect (Supplementary explanation)	Medium It is worrisome that the ball	Low You can proceed inside	Medium? Walking is necessary to	Medium to high? It progresses a little in the house.

above)	needs to be captured in advance to catch the monster and that it can withstand multiple stages of progress. In a residential area, there are few places where a ball can be obtained in a distant place; and it is sometimes difficult to obtain the ball only by purchasing.	the house and there is almost no walking effect.	obtain energy to fight. But if the original does not seem interesting, it is hard to imagine walking for it.	Since various things are relatively simplified; it is easy to play without having to look at the screen each time. Since there are weekly events and valuable items; it feels like a game designed to increase walking.
Author's recommendation *4	Good	Bad	Intermediate	Very good

\*1: As of the end of November 2019. Including re-downloading.

\*2: The growth of a character created by a player.

\*3: Monsters appear in multiple games, but their handling is different. In Pokémon GO, get it and make a picture book. In Yo-kai Watch, possess it and make it move more or take part in the next battle. In Dragon Quest, you only defeat them (do not collect or associate).

\*4: It is thought that there is a bias due to the author's idea, which has a certain amount of knowledge about fashion and animation in Japan (If you do not know the contents of characters and anime movies in advance, the evaluation may change).