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Pokémon Go: Encouraging Recreation through Augmented Reality Gaming

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Mobile gaming has become immensely popular with the growing ease of access and the variety of inexpensive options now being offered. Pokémon Go, a cellular phone game that combines augmented reality (AR) and global positioning system (GPS) location to catch digital characters in the real world, is a free download that has broken participation records with its popularity. This article briefly reviews the evolution of mobile gaming and AR and then highlights the recent popularity and potential physical activity and recreational benefits of Pokémon Go. Moreover, this article also details how a Pokémon Go event was successfully hosted at Winthrop University by the Office of Recreational Services. In order to encourage more movement and social interaction, activity stations were integrated into the event that participants were able to complete for incentive prizes. A survey was completed after the event by the participants who returned to the starting point after visiting all four available stations. Survey results captured participants' perceived positives and negatives to playing Pokémon Go, their motivation for attending and overall opinion of the event, and their distance traveled during the event. Pokémon Go is an AR game that can be used to encourage recreation and movement. AR can provide many benefits and incentives when utilized in various technologies and curriculums. This article may assist recreation and physical activity leaders in creating events which integrate physical activity through mobile technology in a fun, unique way.

Keywords: campus recreation, AR, physical activity, mobile gaming, smart phone, virtual reality

INTRODUCTION

Since the late 1960's, when the first head mounted display system was developed, there has been much research and advancement in augmented reality (AR) technology (Nelson, 2014). AR technology superimposes digitally created images over a physical environment

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to create a new version of reality using a digital display or device (Howe et al., 2016). To see this altered reality over "real world" surroundings, users must have a device that blends the two environments. These devices are typically wearable (e.g., goggles) or hand-held devices (e.g., smart phone). AR mobile "exergames" (i.e., video games which incorporate exercise) encompass maps based upon existing real world streets where players collect virtual items or treasures and/or avoid items or traps placed on the map, thus requiring authentic physical movement (Baranowski et al., 2016). On the other hand, there are also devices used to display three-dimensional hologram images onto the environment, called spatial AR, typically used for groups of users (Carmigniani et al., 2011). Finally, other AR activities involve narrated interactive audio being played through earbuds while an individual is walking outdoors (Baranowski et al., 2016).

Ivan Sutherland developed the first wearable AR device with the intention of safety training for helicopter pilots (Simpublica Staff, 2014). This large head mounted device, called the Sword of Damocles, would use the pilot's head position and low light cameras to aid in flying at night. This early development for AR had transparent goggles because the users had to look through them to see the outside "real" world. More recent devices have displays that incorporate the physical environment as well as the graphic additions on one screen (Simpublica Staff, 2014). Improvements in AR have allowed this technology to be incorporated in many different scenarios and applications.

In this article, we first introduce current applications in AR, specifically addressing how AR has been used to provide physical activity with varying populations. Secondly, we present our experiences of using the AR application Pokémon Go in hosting a campus recreation event. Participant survey result findings may facilitate physical activity and campus recreation leaders in promoting exercise through AR technology in a novel and enjoyable approach.

APPLICATIONS IN AUGMENTED REALITY (AR)

AR can be used in many settings and in a variety of devices, including practicing various physical skills. AR teachnology can be used as an important tool with instant feedback for training (Yamabe & Nakajima, 2012). Applications of AR include job/skill training, aiding in medical procedures, providing entertainment, motivating physical activity, and assisting as a teaching aid (Carmigniani et al., 2011; Yamabe & Nakajima, 2012). For example, reports have surfaced where major college football programs and National Football League (NFL) teams are using AR to train quaterbacks in how to read and react to defensive schemes presented with AR devices (Adelson, 2016; Schroeder, 2015; Smith, 2015). Adding AR technology to traditional training programs can be beneficial for giving learners variety and more motivation to continue. This user-friendly technology offers alternate modes of learning to benefit a variety of learners. "The market for keyboard- and mouse-based gaming is gradually being replaced by real-time interactive and sensory games…[as practitioners] are beginning to exploit the capabilities of AR technologies to enable new forms of learning in various fields" (Chen, Ho, & Lin, 2015, p. 216). Exercise promotion professionals are also now starting to use AR technology to enhance recreation and physical activity programs.

PHYSICAL ACTIVITY THROUGH AR

For a variety of reasons, many people do not receive the appropriate amount of physical activity. Nearly one-quarter of Amercans (i.e., 81.6 million) do not participate in sports or fitness activities (Physical Activity Council, 2016). Recreating traditionaly sedentary activities (i.e.,video games) by adding AR technology can incorporate movement in an

entertaining way. This can be especially helpful for populations that are typically are not as active.

There are a variety of ways that AR technology and gaming have been used to encourage physical acivity. For example, Hsiao (2013) studied the effectiveness of using AR technology for physical education to assist in combining physical exercises with academic lessons and associated tests at a university in Taiwan with 162 first-year students taught in a classroom setting. Cognitive learning and AR technology were combined across four AR-fitness training activities – stair stepping, inverse jumping, sit-ups, and bending – with the aim of increasing knowledge in five physical education content areas (i.e., cardiopulmonary endurance, flexibility, explosiveness, muscular endurance, and sport injuries). The "AR-Fitness System" included a computer, webcam, projector, and movement-detecting "red glove" that allowed for the incoporporation of physical movements into the learning curriculum. Results indicated that the students using the AR-Fitness System retained significantly more physical education knowledge compared to a control group. Thus, AR movement-based technology may be able to encourage exercise while assisting in academic learning.

Moreover, one unique application called Monsuta Fitness (The PE Geek, 2016) uses AR in an effort to incorporate fun into physical activity in physical education settings. The "app" allows administrators to to place virtul monsters on a real world map of the school's campus displayed on the user's mobile device. The participants must then travel to the physical location that correlates to the virtual coordinates to find the monster and complete the exercise (e.g., jumping jacks, push-ups, etc.) that is assigned to that monster.

Likewise, video game systems such as the Xbox Kinect have integrated AR technology into video gaming by displaying the video feed of the player onto the screen which requires the player to have a more physically active and whole-body interactive experience (Jenny, Hushman, & Hushman, 2013). The use of AR gaming to increase fitness has been found to be helpful in elderly and adolescent populations. For instance, Sato, Kuroki, Saiki, and Nagatomi (2015) introduced four Xbox Kinect games designed to increase balance and coordination across three months in a study with healthy, elderly participants. The participants that played these games showed significant improvement in the various categories compared to the control group which did not participate in the video gaming exercises (Sato et al., 2015). Active gaming has also been seen as a positive intervention among children who struggle with motivation and interest for exercise (Gao, Chen, Pasco, & Pope, 2015). Other studies have demonstrated that motion-based video games (i.e., exergames) have been used as a positive motivational tool to increase physical activity in adolescents (Baranowski et al., 2016; Sandlund, Waterworth, & Hager, 2011). Thus, applying AR to fitness goals can be a creative way to increase physical activity. To that end, Baranowski (2016), for example, has called for more empirical investistigations regarding the potential effects of playing the massively popular AR game Pokémon Go.

POKÉMON GO. Pokémon Go (Niantic Inc., San Francisco, CA) is a mobile device game that was released July 6, 2016 by Ninentendo and the Pokémon Company (Grubb, 2016). Within four months of its release, downloads of Pokémon Go reached over 500 million globally, including 20 million active users in the United States within its first month of release (Smith, 2016). It took only 13 hours to reach the top of the highest grossing and most downloaded application in America (Grubb, 2016). The game brings cartoon characters called Pokémon to the "real world" combining global positioning system (GPS) and AR technology. As the player walks around the physical environment, an avatar mirrors the movement on a map on the phone's display. An avatar is a figure which represents the player on the on-screen map. The object of the game is to catch as many Pokémon as possible and to accrue experience points by exploring other facets of Pokémon Go.

Pokémon can be caught and items can be collected by exploring and physically walking around. These items can be collected at "Pokéstops" which are in-game locations that are typically placed at public monuments, parks, or other structures. "Lures" can be placed at any Pokéstop and for thirty minutes thereafter, Pokémon will appear in that area. Of note, the user must physically be at the real world physical location of a Pokéstop where they deisre to place a lure. These "lures" are earned by playing the game or can be bought using earned coins or actual money. Another feature the game holds are Pokémon "Gyms". This is another in-game location where players can go to battle Pokémon. Pokémon have varying levels of attacks and defenses and these are put to the test at the "Gyms". The nature of Pokémon Go encourages physical activity which is not traditional for most video games.

IN-GAME FITNESS INCENTIVES. Although walking is a key component to playing the game, Pokémon Go has other features that serve as incentives to exercise. Eggs that hatch Pokémon can be collected at Pokéstops. After receiving an egg as an item at a "Pokéstop", the player then has the option to incubate one egg at a time using a provided incubator. After incubation, the user must walk a certain distance for the egg to hatch into a Pokémom. After the egg hatches, another egg can start incubation. There are three types of eggs: 2 kilometers (km), 5 km, and 10 km. Typically the longer that must be traveled, the more powerful the resulting hatched Pokémon.

Another in-game incentive for physical activity includes the "My Buddy" feature – allowing players to choose a Pokémon as "My Buddy" and candies will be earned for the Pokémon as the player walks. Candies are specific to each Pokémon and allow the Pokémon to be powered up or evolved to become stronger. For example, a "Pikachu Pokémon" earns "Pikachu candies" which can only be used to benefit "Pikachu Pokémon". Each Pokémon has a different distance that must be walked in order to earn candy and these distances, again, correlate to either 2 km, 5 km, or 10 km.

An important feature of Pokémon Go is its updates. Periodically updates will be made to either improve the game or to offer a short period of time with bonuses. These bonuses include shortening the distance that needs to be walked to earn Pokémon candies. Also, for instance, during the Halloween weekend, the game may have a higher prevalence of ghost-type Pokémon and doubled the points awarded after catching the Pokémon. These updates are one of the motivational tools utilized to try and maintain user engagement.

BENEFITS OF POKÉMON GO. Physical, social, and emotional benefits have been demonstrated from playing Pokémon Go. Pokémon Go can have a significant increase in physical activity by players who consistently play. For example, on the weekend of the game's release, users of the Jawbone fitness tracker reported an increase of about eight thousand steps (Strange, 2016). However, due to the newness of Pokémon Go, no studies have researched the longitudinal effects of the game and some have questioned the long-term viability of interest of the game itself (Baranowski, 2016).

Some gamers have claimed that Pokémon Go has been the reason they are taking more daily steps. This motivational influence was examined for thirty days in participants using a microsoft band for measuring steps. It was found that users increased their average daily step total of about 1,500 steps per day compared to those who did not play Pokémon Go (Althoff, White, & Hortiz, 2016). A long-term increase of an average of 1,000 daily steps can decrease mortality risk by 6% (World Health Organization, 2010). This could be an important tool that could benefit public health. Not only was there an increase in steps taken among gamers, but these gamers were previously less active than the other microsoft band users. As time went on in the study, physical activity decreased again most likely due to losing interest in playing. Although interest and steps waned near the end of the study, the group that showed the most interest in Pokémon Go ended up with a higher daily step average than they did initially (Althoff, White, & Horitz, 2016).

Pokémon Go has features that encourage social interaction. Gamers report meeting new people as well as spending time with friends while playing this game (Grohol, 2016). Pokéstops and Gyms, where players can battle, are public places where many gamers interact with each other in the real world. As lures sit at Pokéstops for thirty minutes, many people congregate in these areas to catch Pokémon, possibly initiating social interactions amongst players.

Increases of physical activity are known to increase emotional health as well (World Health Organization, 2010). Emotional benefits have also been reported among gamers most likely due to the increase in exercise. Some have used Pokémon Go as an outlet for depression and to increase their mood. Many view the game as a fun activity that can be used as a reason to walk around outside and to be around other people (Grohol, 2016). Moreover, Pokémon Go is entertaining and encourages exercise, which is known to increase mood and confidence (Grohol, 2016). Mental and emotional health are positively influenced by physical activity as well as social interaction; features that are included in Pokémon Go (Ross, 2016).

Pokémon Go has been seen as an non-violent, age-appropriate activity for parents and children to bond over. Families and parent/child duos have been seen walking around and enjoying catching Pokémon together (Vital Record, 2016). This game encourages friends and family to be physically active, while exploring their surroundings together.

In an effort to tap into the popularity of Pokémon Go and offer a fun fitness-based recreation experience, a Pokémon Go event was held at Winthrop University. Next, we present on the experiences of using the activity-based AR application Pokémon Go.

EXPERIENCES OF USING AN AR APPLICATION: POKÉMON GO

Winthrop University (WU) is a small liberal arts public university located in Rock Hill, South Carolina. The Office of Recreational Services, whose mission is to act as a resource for students, faculty, and staff to pursue healthy lifestyles, hosted the event.

PARTICIPANTS

Participants were recruited through advertising flyers (see Figure 1) posted on bulletin boards in buildings on campus and an email was sent out to all faculty, staff, and students with information about the event. Thirteen individuals (12 WU students and 1 WU staff member) participated in the event. However, demographic information was only collected on nine of the participants (7 females; mean age = 20.0 years, SD = 2.4, excluding a 55 year old outlier) as this data was collected at the conclusion of the event and three participants did not complete the survey. The ethnic breakdown of the participants included one African-American, two Hispanic, and six Caucasian participants.

SURVEY

The 12-question survey (see Appendix A) consisted of six demographic questions, two open-ended questions about the perceived positives and negatives of Pokémon Go, and four final open-ended event-specific questions.

PRECEDURES

The Pokémon Go event included four activity stations (described below) which were set up within a one mile radius around campus in an effort to insure the experience would last no longer than one hour. This time frame was selected in order to attempt to recruit participants during the "lunch hour" as the event was held between 12:00 P.M. and 1:00 P.M. These stations were chosen prior to the event based on pre-existing Pokéstop locations that are shown within the game. At each of these stations, participants had the opportunity

to win prizes (e.g., drink koozies, shirts, etc.). Moreover, there were also Pokémon lures up for the duration of the event at each station. Each station was managed by at least one recreation staff member or volunteer. Figure 2 displays the event activity station location handout provided to each participant. Participants were not required to complete the stations in a specific order.

Figure 1. Pokémon Go event advertising flyer.

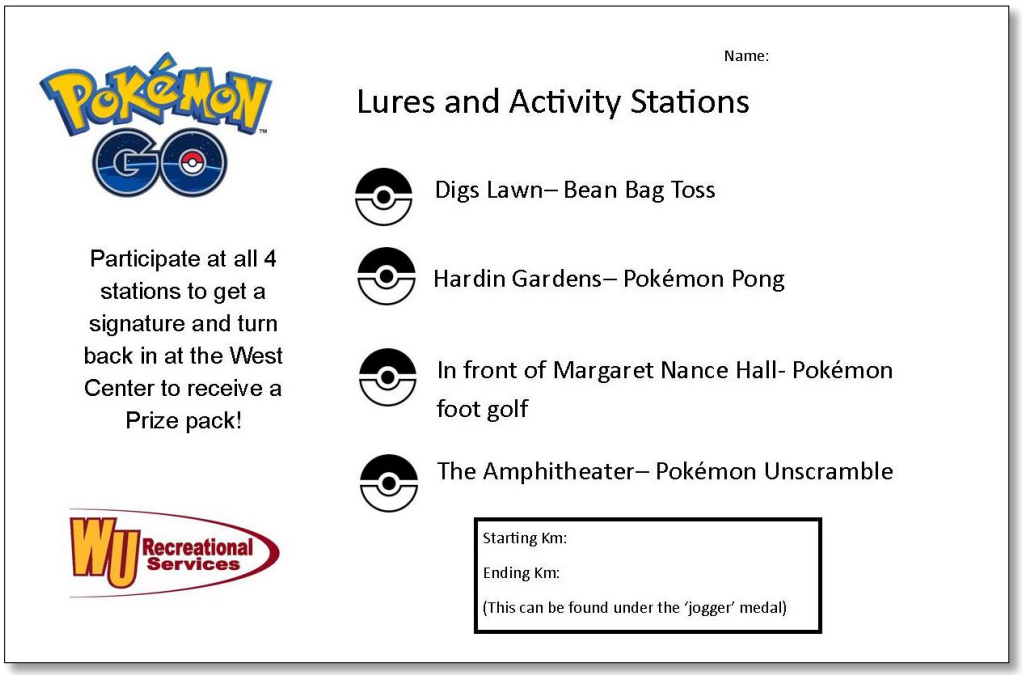

Figure 2. Activity station location handout.

The following includes a brief description of each station:

Station one: Bean bag toss. Participants had four tries to throw a bean bag onto a corn hole board. Prizes correlated to where the bean bags landed (i.e., on the board or in the hole).

Station two: Pokémon pong. Similar to the well-known drinking game called "beer pong", six cups filled with water were set up into a diamond formation on a table. Different Pokémon print outs were applied to these back of these cups which designated specific prizes for each. Participants had opportunities of throwing a ping pong ball into one of the cups for a prize.

Station three: Foot golf. Five soccer/golf holes were set up which consisted of a hula hoop on the ground with a flag stick inserted in the ground in the middle of the hoop. Participants were given two tries at each hole to kick the soccer ball and have it land in the hoop/hole. Prizes were given based on if the participant could land the ball in the hoop.

Station four: Pokémon unscramble. This station included a walk up the campus' long amphitheater steps to complete a Pokémon word search and a "Guess that Pokémon Sheet", where participants tried to match eight Pokémon based upon the provided shadow outlines.

Finally, after the participants visited all four stations and returned to the event starting location (i.e., fitness center), they would receive an additional prize pack (e.g., water bottle and lunch box) after completing the aforementioned survey (see Appendix).

RESULTS AND DISCUSSION

Before this event, all survey participants had played Pokémon Go with a mean of 4.8 hours per week (SD = 3.9 hours). Interestingly, the two male respondents reported that Pokémon Go has not affected their daily step total, while all except one female indicated that playing Pokémon Go had increased their daily step total. Howe et al. (2016) studied the effect of playing Pokémon GO on the number of steps taken daily up to six weeks after installation of the game and found that players' daily average steps increased by 995 steps during the first week, but gradually returned to pre-game levels by the sixth week. Moreover, no significant effects were found between sex, age, race, bodyweight status, urbanity, or walkability of environment. Thus, there appears to be a novelty effect provided by Pokémon Go which initially stimulates step counts, but diminishes over time. Future research might take a longitudinal approach and further compare potential activity level differences between genders as a result of using AR applications.

Participants were also asked their perceived positives and potential negatives of playing Pokémon Go. The commonly cited perceived positives included: (a) more walking/exercise, (b) better body confidence, (c) getting outside/out of the house more often, (d) socializing while playing, and (e) it is a fun game to play with friends. These responses are all synonymous with other gamers' reports, including the encouragement of increased socialization with friends and going outside more as a result from playing Pokémon Go (Grohol, 2016). Similarly, past research supports that AR can assist with health-related behavior change (Baranowski, Buday, Thompson, & Baranowski, 2008).

Major participant perceived potential negatives of playing Pokémon Go included: (a) not paying attention to surroundings, (b) dangers of getting hit by a car, (c) data usage, and (d) draining battery power. These responses correlate to other cited concerns of playing Pokémon Go where it has been suggested not to play the game alone (especially at night) and to be aware of one's surroundings while playing (Oswald, 2016). Of note, every time Pokémon Go loads, a safety message appears with reminders about not trespassing, not playing while driving, and to pay attention while playing.

In addition, all participants surveyed reported that they enjoyed the event and would attend a similar event in the future. However, this was only perceived intentions and not

actual measured behavior. Moreover, the participants only averaged 1.3 kilometers (i.e., 0.8 miles) of walking during the event, which was recorded in the Pokémon Go application. "Public health experts recommend taking at least 10,000 steps a day, which is equal to about five miles of walking" (Trust for America's Health, 2011, p. 25). It could be argued that across an hour of activity, one should accumulate much more than 0.8 miles in order to attain the daily goal of five miles. Additionally, common responses as to why people came to the event included: "to catch Pokémon and have fun with friends" and "I love all things Pokémon." Only one person mentioned "exercise" as a reason for coming to the event. It appears these groups of participants are motivated to play Pokémon Go more for enjoyment, rather than to increase physical activity. More research is needed which more thoroughly researches motivations for playing AR applications.

CONCLUSION

There are many ways that AR technology can improve traditional methods of gaming to include physical activity. Pokémon Go is an alternate, unique AR game that has the potential to be a viable outlet for increased physical activity and added motivation for exercise. AR games such as Pokémon Go can be incorporated into a fitness event seeking to encourage physical activity in a recreational setting.

The AR exergame Pokémon GO motivated participants to want to attend in an event where they would have to be active through walking and performing station physical activities. However, while Pokémon GO and other AR games may play an important role as a motivation tool to accomplish some exercise, overall event design and activity stations must be planned effectively to optimally reach the program's physical activity aims. AR applications might be used to merely supplement a comprehensive physical activity program as the amount of physical activity performed while gaming may be minimal (dependent on several factors – activity duration, exercise intensity, etc.).

REFLECTION AND FUTURE EVENT SUGGESTIONS

This was the first time an event was held through WU's recreational services that incorporated AR gaming in an effort to encourage movement and recreation. With this being so, there was no precedent for procedures or best practices prior to the event. The event was successful in the fact that all participants enjoyed it and would attend similar ones in the future. Major suggestions recommended by the participants regarding the event included lengthening the time of the event, adding more lures, and providing more activity stations.

For future events, if the primary goal is to increase the participants' steps, then the number of stations could be increased and/or the activity stations could be spread out further around campus or the city. For this event, the activity stations were fairly close together as the organizers planned for the event to only last one hour, thus necessitating closer station locations. Moreover, the participants could be encouraged to complete the station's activities multiple times or the content of each station could be more challenging or designed to last longer. A final suggestion could be to incorporate this event into a race. If a similar event was timed, the participants may be motivated to move more quickly, potentially increasing the intensity of the exercise during the event, with the aim of stimulating cardiovascular fitness. Future studies might measure outcomes (i.e., motivation, amount of physical activity, etc.) based upon these suggested improvements.

AUTHOR DISCLOSURE

No competing financial interests or conflicts of interest exist for either author.

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APPENDIX

POKÉMON GO EVENT SURVEY

Directions: Your responses will remain CONFIDENTIAL! This data will help us improve future events. Please circle or write your response for each item below:

1. What is your gender? Male Female
2. What is your age (in years)?
3. What is your ethnicity?
4. Have you played Pokémon Go before attending this event? Yes* No

   *If yes:

   *4a. About how many hours per week do you play Pokémon Go? (hours per week)

   *4b. Has your number of daily steps or walking mileage been effected by playing Pokémon Go? Circle which best describes you.

   - Yes, I take more daily steps when I play Pokémon Go
   - My number of daily steps are the same (no effect)
   - I do not play Pokémon Go enough to see an effect

- I do not know

5. What, if any, benefits do you see from playing Pokémon Go?
6. What, if any, potential negatives do you see from playing Pokémon Go?
7. Did you enjoy this Pokémon Go event? Yes No
8. Would you attend another event similar to this? Yes No
9. Suggestions for future events?
10. Why did you come to this event?