"It Should Be a Game for Fun, Not Exercise": Tensions in Designing Health-Related Features for Pokémon GO

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ABSTRACT

Leveraging existing popular games such as *Pokémon GO* to promote health can engage people in healthy activities without sacrificing gaming appeal. However, little is known about what potential tensions arise from incorporating new health-related features to already existing and popular games and how to resolve those tensions from players' perspectives. In this paper, we identify design tensions surrounding the appeals of *Pokémon GO*, perspectives on different health needs, and mobile health technologies. By conducting surveys and design workshops with 20 avid *Pokémon GO* players, we demonstrate four design tensions: (1) diverse goals and rewards vs. data accuracy, (2) strong bonds between players and characters vs. gaming obsession, (3) collaborative play vs. social anxiety, and (4) connection of in-real-life experiences with the game vs. different individual contexts. We provide design implications to resolve these tensions in *Pokémon GO* and discuss how to extend our findings to the broader context of health promotion in location-based games.

Author Keywords

Pokémon GO; game design; health promotion; health-related game feature; design tension; location-based game; augmented reality game.

CCS Concepts

•**Human-centered computing** → **Human computer interaction (HCI);** Empirical studies in HCI;

INTRODUCTION

The idea of combining games and health promotion has already been well-established in the healthcare field [6, 21, 31, 57]. However, the approach of simply adding game elements to health promotion activities has had limited impact [13, 16, 21]. A common pitfall is that people still consider health games as part of "health programs," not games for entertainment, even though games are designed to make healthy activities more fun [16, 21, 69]. One strategy to address this challenge can be adding a layer of health promotion to games whose primary purpose is for entertainment. Rather than creating a new game, if game designers can integrate elements for health promotion as a secondary motivator into an existing game that is regularly played by a substantial user base, the impact could potentially be broader and more immediate [69].

Location-based games (LBGs) offer a great opportunity to adopt such a strategy. LBGs inherently reward players for visiting certain places or physically moving a certain distance, which can affect players' physical, mental, and social health. In practice, many studies and media articles have reported that *Pokémon GO* widely impacts players' health in all three aspects [3, 4, 7, 26, 35, 37, 38, 46, 50], although the game includes only a few simple features related to health promotion (e.g., players must walk a certain distance to get items or capture Pokémon). As location-based games become more common, we believe that there will be a larger number of games with similar design goals, emphasizing the beneficial impact on player's health.

The key to the successful implementation of health-related features in these games is to engage players in health-related activities without sacrificing the appeal of the game from an entertainment perspective. However, designing health-related features for existing games comes with inevitable tensions that demand resolution. In particular, for LBGs, unique design tensions surrounding health-related features might arise compared to other games built for health promotion (e.g., exergames), as a player's life in the real world is closely intertwined with the game experience. For example, a game company could consider adopting a new sensor technology for those who enjoy swimming but avoid walking due to their health condition (e.g., back pain). However, this might exclude people who cannot afford the new technologies and also make some players feel confused about new and unfamiliar features. This short example illustrates the complexity of the tension surrounding gaming appeals for players, players' perspectives on health promotion, and available health technologies. As such, it is necessary to identify potential tensions to effectively design health-related features for existing games.

One methodological approach to this problem is participatory design (PD), a method that incorporates players' perspectives in the design process [20]. Although many studies have suggested considering a PD approach when designing new health games [21, 29, 30, 42], little is known about design tensions that arise from incorporating new health-related features to

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already existing and popular games and how to resolve those tensions from players' perspectives. By unpacking such tensions and identifying ways for how to resolve them, we may find design strategies that resonate with players' expectations of health promotion within an existing game. Our aim is to explore how to make players feel that health-related features are naturally incorporated in the existing game rather than simply tacked on, overemphasized, or detract from what makes the game fun.

In this paper, we explore the design tensions that result from integrating health-related features to an existing location-based Augmented Reality (AR) game and derive design guidelines to resolve such tensions from the players' perspective. Here, we consider health broadly as a concept encompassing physical, mental, and social well-being based on the literature [27]. Targeting a direct outcome of being healthier (e.g., weight, stress) can be considered a specific method for health promotion [27]. From this perspective, we use as a case study the popular mobile game *Pokémon GO* [45, 67]. As mentioned above, among several location-based AR games, *Pokémon GO* serves as an excellent target for our case study because it is regarded as one of the most successful mobile games that has health promotion as part of its goal, although the game is not marketed as a health game [41]. Although its health features are minimal, it has been reported to impact users' physical, mental, and social health [3, 28, 41, 65].

With surveys and PD workshops with 20 avid *Pokémon GO* players, we identified four design tensions: (1) diverse goals and rewards vs. data accuracy, (2) strong bonds between players and characters vs. game obsession, (3) collaborative play vs. social anxiety, and (4) connection of in-real-life (IRL) experiences with the game vs. different individual contexts. We describe how each tension is formed and also design ideas players generated to resolve the design tension. We extend our findings to other games by providing design guidelines to resolve the tensions when game designers and researchers develop new health-related features for other existing games. The main contributions of this paper are (1) an empirical understanding of tensions in designing health-related features in the context of *Pokémon GO* and (2) design implications for resolving design tensions to obtain positive health outcomes while preserving gaming appeal based on the player's perspective. The findings from this study can provide insights for how health-related features can be seamlessly integrated into popular, existing games in ways that encourage people to play them actively and continuously.

RELATED WORK

We examine game-based approaches in the healthcare field and review how *Pokémon GO* was incorporated into the discourse of health promotion. Then, we look into design tensions framework and design workshop method adopted in this study.

Health Games and Appeal of Games

Many studies have used game-based approaches (e.g., health games, gamification) to engage people with therapy or healthy behaviors in the long term [6, 21, 31, 57, 59]. There are several well-known game-based approaches, exergame (or exergaming) as a combination of exertion and video games [47], and serious games aiming to change behaviors and attitudes more broadly in the area of healthcare and other fields [21, 59]. The growth of mobile technology has provided opportunities to design and evaluate mobile health games that can intervene without the constraints of time and space [6]. Researchers believe these approaches can have positive effects on clinical outcomes or healthy lifestyles, educate health-related knowledge, and improve self-efficacy [6, 21, 31, 57, 59].

However, there often has been a challenge of achieving a balance between player engagement and the game's effectiveness at addressing people's health goals [16]. Consistent with the previous studies [11, 12, 53], Cheng et al. identified that embedding serious content (e.g., health goals) into an engaging gameplay experience is crucial but challenging [16]. In a similar vein, Whitehead et al. pointed out that people are likely to quit the game if a whole game is geared at health goals [69]. This leads us to focus on the appeal of games, which is important but less considered when designing health games. Appeals are different elements that draw people in by evoking certain emotional and intellectual experiences when people play games, and various appeals (e.g., narrative, fantasy, fellowship) can enrich game experiences so that players stay interested in the game over time [36]. Thus, appeal of the game is an important aspect to consider when integrating health features into existing games from the players' views.

Pokémon GO and Health Promotion

Many studies have reported that *Pokémon GO* has been one of the most successful health games, although the game was not marketed as a health app [41]. *Pokémon GO* is a location-based AR game that was published by *Niantic, Inc.* in July 2016 [45]. The basic idea is to use a mobile device's GPS to explore various real-world locations and catch a new kind of mythical creatures (e.g., Pokémon) on screen. Over the last three years, *Niantic, Inc.* has added a variety of features, including Raid Battles [43] and Adventure Sync [44], offering players chances to engage in activities affecting their social health and physical health respectively as they play the game.

A number of studies and media reports on *Pokémon GO* have emphasized that it can enhance physical health by, for example, increasing time spent outside walking and decreasing time spent sedentary [3, 4, 7, 26, 35, 37, 38, 46, 50]. Some articles have even reported that playing *Pokémon GO* can ease the burden on patients with Type 2 diabetes or cardiovascular diseases [32, 60]. In a recent study, Althoff et al. identified that *Pokémon GO* significantly increased players' physical activity over 30 days by examining step count data from 32,000 people [3]. They suggest that *Pokémon GO* has demonstrated the possibility of reaching a wider population than popular health apps and thus have a greater impact on public health [3].

Some studies have shown that playing *Pokémon GO* can contribute to both social health [38, 52, 65] and physical health. Vella and colleagues identified that playing *Pokémon GO* improved players' sense of belonging and strengthened social ties [65]. Moreover, *Pokémon GO* can also enrich social networks by providing chances to meet a broader diversity of players

representing different races, ethnicities, cultures, and socioeconomic levels [8]. In addition, in terms of mental health, a few studies have argued that *Pokémon GO* may also be effective in improving depression [24, 49, 51] and "Hikikomori" (shut-ins) [28, 62].

However, negative consequences for players' health have been continuously raised, such as car crashes, pedestrian injuries, incidents of trespassing, and even muggings [5, 66]. According to Wagner-Greene et al.'s survey of 662 respondents who played *Pokémon GO*, they reported being likely to play the game while driving (27%), biking (43%), and walking (without paying attention; 32%) and sacrificing sleep to play the game (38%) [66]. These dangerous behaviors can cause serious and even life-threatening health problems for players.

As the previous literature showed various health-related aspects regarding playing*Pokémon GO*, we believe that *Pokémon GO* serves as one of the most appropriate cases for studying health-related features in games. To further explore design opportunities, we focus on active *Pokémon GO* players to understand how they envision health features that are relevant and enjoyable. We assume that players with higher engagement are more likely to better understand the different ways the game can be played as well as its different appeals. We also expect that they have had more experience facing positive and negative health issues when playing *Pokémon GO* [3, 66]. In addition, they would have a deep understanding of the history of the game, such as what features or events have been successful in the past, the community itself, and their needs.

Design Tensions Framework and PD approach

The design tensions framework proposed by Tatar emphasizes the balancing of considerations when designing an entire system rather than focusing on certain individual components of the system [61]. Tatar described that tensions arise from not only the complex interrelation between the social and technological aspects of system design, but also conflicts between design features that are as-is and to-be [61]. In this sense, this framework is an ideal mechanism by which to explore design considerations for the multifaceted consequences of design decisions. The goal of this study is impacted by various aspects: social and technological aspects of health promotion that individuals differently perceive and accept; conflicts between existing features and health-related features; and the feasibility of mobile health technologies for games. According to this framework, some issues at one level may be separate from or interact with tensions or elements at other levels, which lead to increasing complexity of design decisions [61]. Thus, in this paper, we apply the design tensions framework to examine and integrate disparate considerations when implementing health-related features into an existing, popular game.

Considering that the design tensions framework emphasizes user perspectives, participatory design (PD) can be a suitable method to examine design tensions. According to DeSmet and colleagues [20], the PD approach highlights user roles in two different ways in designing health games: (1) as an informant who is asked for feedback [20, 55, 64] or (2) as co-designer who is an equal design partner [15, 19, 20, 30, 42]. With a meta-analysis of 61 studies on serious game design, they found that the user role as informants can often be more beneficial than as co-designers since users tend to focus on game characteristics rather than the goal of the design (e.g., promoting healthy behaviors) [20]. In this study, we adopted user roles as informants through our PD sessions, corresponding to our study aim of discovering tensions surrounding gaming appeals and health promotion from the players' perspectives.

Age	18-20 (2), 21-30 (10), 31-40 (4), 41-50 (1), 51-60 (2), 61+ (1)
Gender	Male (12), Female (7), NR (1)
Avg. play hrs/wk	5-10 (8), 11-20 (5), 21-30 (4), 31-40 (2), 60 (1)
# of play months	12-17 months (2), 24+ months (18)

Table 1. Demographic information of participants (N=20). NR indicates "No Response."

METHODS

To discover new health-related features from the game players' perspectives, we conducted design workshops and surveys with 20 *Pokémon GO* players. We collected data in Washington state between December 2018 and February 2019. The study was determined exempt by the university's Institutional Review Board.

Participants

Twenty adult *Pokémon GO* players participated in our study (Table 1). We recruited participants through online posts (e.g., Discord channel[1]) and offline flyers (e.g., university bulletin boards). To examine game players' perspectives in-depth without power dynamics among various types of stakeholders (e.g., healthcare providers, game designers), we limited the type of participant group to the game players. Recruitment materials requested that participants be adults and identify themselves as active *Pokémon GO* players. In the recruitment survey, all participants identified themselves as an individual who either (1) has been working on or engaging in healthy behaviors (e.g., physical exercise, diet and nutrition, self-tracking) (n=5), (2) is interested in health behavior (n=6), or (3) both (n=9). Participants who completed surveys and a workshop session received a $25 gift card.

Procedures

We conducted informant workshops to incorporate players' expertise with *Pokémon GO* and their lived experiences with the benefits and challenges to their health. We expected participants to be able to identify implicit needs that might be hard to obtain through more direct study methods, including interviews and surveys. Before and after the workshops, we asked participants to complete online surveys to elicit the participants' individual perspectives not fully covered by the group workshop session.

Informant Design Workshops

We conducted five informant workshop sessions with three to five participants at a time. At least two researchers attended

[1]Discord is one of the largest communication platforms for the video gaming community. https://discordapp.com/

to facilitate each session and took notes on prominent ideas, the overall atmosphere, and noteworthy conversations for data analysis. All sessions were audio and video recorded with the participants' permission.

Each workshop session consisted of three stages: warm-up, brainstorming, and idea sketching. In the warm-up stage, we asked participants to share their answers to six questions about both the positive and negative impacts of *Pokémon GO* on their health. One of the researchers did this activity with the participants to promote a friendly atmosphere, but the ideas from the researcher were excluded from the analysis (as she used different colored sticky notes).

In the brainstorming stage, we instructed participants to generate ideas for new health-related features for *Pokémon GO*. We handed out information sheets with a list of healthcare technologies (e.g., fitness, sleep, food, exercise tracking apps and sensors), existing features of *Pokémon GO*, and its different types of appeals (e.g., fellowship, competition, achievement) to help them generate new ideas. While participants wrote down their ideas on the sticky notes, the researchers collected and categorized them in the background. After finishing the brainstorming session, the researchers briefly presented the roughly categorized themes, and each participant shared their favorite ideas. Participants took a 5–10 minute break after this session, during which researchers summarized and listed six to seven themes from the categories. These themes were later used as initial codes for data analysis.

In the idea sketching stage, participants picked one idea and expanded on the details with their design partners. The researchers asked each participant to vote on two themes derived from the brainstorming activity first and then vote on one theme to flesh out the idea. Researchers helped them make groups of two or three people who voted for the same theme. A total of nine groups (to referred to Group A–I in the rest of the paper) were created from five sessions. Each team was asked to refine the details by filling out the activity sheet where they described the title of the idea, sketches, a possible scenario, and expected challenges and benefits. After, each team shared their ideas in detail with other participants.

Surveys

We conducted open-ended surveys before and after the workshop sessions instead of interviews because participants were allocated time to present individual experiences and ideas in workshop sessions. The pre-survey was designed to examine participants' healthy and unhealthy behaviors related to playing *Pokémon GO*, perceptions of the current health-related features in *Pokémon GO*, and design considerations for health-related features for *Pokémon GO*. The post-survey consisted of questions including lessons participants learned from the workshop.

Analysis

We collected 435 ideas on sticky notes, nine design sketches, 10 hours each of video and audio recordings, and researchers' notes from five workshop sessions. We also obtained 20 pre-survey responses and 19 post-survey responses. Using thematic analysis [10] and the design tensions framework [61], we integrated different types of data and derived findings. The first and fourth authors derived 22 subcodes based on three main codes that represent un/healthy behaviors related to playing *Pokémon GO*, design ideas, and potential challenges. All data except for video recordings were displayed on a large board (i.e., miro.com) and all authors reviewed them together. The authors conducted affinity modeling and identified design tensions by coupling design ideas (e.g., collaborative play) and potential challenges (e.g., social anxiety). While reviewing the derived tensions, the authors adjusted and finalized the design tensions by integrating the subcodes of un/healthy behaviors regarding playing *Pokémon GO*. Lastly, to present a rich context in which ideas were formed, the first author watched video recordings and selectively transcribed participants' conversations.

FINDINGS

We identified four tensions by pairing the challenges and opportunities and here present design ideas participants proposed to balance those tensions.

Tension 1: Diverse Goals and Rewards vs. Data Accuracy

While many participants suggested diversifying goals and rewards, they were also concerned about data accuracy and the risk of cheating. To balance the tension, participants proposed design ideas, such as offering cosmetic rewards that do not impact gameplay, and providing health goals that can be personalized.

Diverse Goals and Rewards

Many participants gravitated toward ideas of improving the currently available health-related features in the game including Adventure Sync, which allows players to record the distance traveled even when the app is not open and also synchronize their data with Google Fit or Apple Health. The rewards for walking at the time of the study included hatching eggs to obtain new Pokémon by walking and weekly rewards according to the walking distance (5, 25, or 50 km) with Adventure Sync [44]. Some participants wanted more granular goals for intervals and distance. P05 suggested, *"[I want] lower or more thresholds for Ad[venture] Sync rewards. I regularly get 18 km, but rewards only care about 5/25/50 km."*

Participants recognized that players have different abilities when it comes to how mobile they are, as well as different lifestyles. They felt that it is not reasonable to expect that all players can walk the same distance each week. For more flexible or detailed rewards, P11 introduced an idea of exchanging distance as *"walking currency"* for earning Pokécoins (i.e., game currency) for a certain number of steps. Also, partnering with fitness devices and health data platforms was frequently suggested to improve the current Adventure Sync. P12 remarked in the pre-survey, *"Adventure Sync is a good start, but I wish that it worked with Fitbit and other devices more easily."*

Some participants stressed the importance of offering rewards that are valuable and meta-relevant (i.e., directly related to the main gameplay) when integrating health functions. They pointed out that the relationship between currently given health goals in the game and the corresponding reward is *"random"*

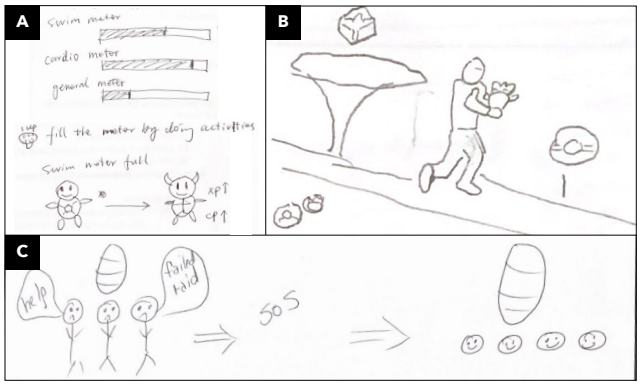

Figure 1. Participants' idea sketches. Sketch A represents an idea from Group C where the stats of Water-type Pokémon Squirtle are improved when the user swims (Tension 1). Sketch B illustrates Group B's idea of having walking buddies that walk next to players or are held up by players (Tension 2). Sketch C is an idea of the collaborative game feature, S.O.S system that Group I suggested (Tension 3).

or not special enough to motivate them. P12 suggested that attractive incentives are required to engage players in healthy activities: *"Give a good reward for it and people would do [anything], what if you go to somewhere to get some special candy or something, and you'd like say 'Oh, it's worth it."'*

Another idea participants proposed was to connect game rewards with fitness activities in greater depth and variety. Participants argued that in addition to walking, which is currently available, there is a need to increase the types of activities (e.g., swimming, boxing, weight training) reflecting various preferences of players. In addition, they thought it would be necessary to synchronize different types of activity data from wearables or health data platforms to verify various activities. In Session 2, Group C (P05, P06) selected and further developed the idea of how a certain type of activity can be linked to a certain type of game characters (Figure 1-A). They thought receiving candies for Pokémon with appropriately matching workout types (e.g., boxing for Machamp candy [a fighting type], swimming for Kyogre candy [a water type]). The group expected that the idea would help users engage in a wide variety of activities by closely linking the game's content and various fitness activities in a way that makes sense.

Data Accuracy

Many participants complained that the distance and step count data currently used to earn rewards are unfair due to its inaccuracy. Some highlighted that inaccurate detection of different contexts could not only discourage players to walk more but also enable some people to cheat in the game. P11 remarked, *"It (speed threshold) is often used as a strategy by some players to cheat. I know many people who are playing [Pokémon GO] in the car with very slow speed to pretend as if walking."*

Participants were uncertain about the transparency of data sync. In the pre-survey, P05 pointed out, *"It (Adventure Sync) is unclear when and how it syncs with GoogleFit or Apple Health and when it doesn't. [...] Many players have experienced frustration that their activity outside of the game is not being incorporated properly into the game."* Indeed, data accuracy can vary depending on people with different devices or operating systems, and some participants were confused about its operation. P09 noted, *"According to my [Android] phone, it's still meeting 50K but Adventure sync is no longer syncing properly, so I get like 20[K]."*

This issue was also extended to the discussion of accessibility and affordability. Participants were concerned that adopting new technology that might not be accessible for most people, such as a highly expensive device or limited purchase regions, may cause a divide between those who can afford it and those who cannot. P13 argued that there are already similar issues in the current *Pokémon GO* community: *"[...] the fact that some people don't have data enabled devices and can't use Adventure Sync."* Furthermore, P10 commented on the potential problem when introducing new types of health data or sensors, *"I think as for gamers' perspective, [the] biggest concern is the in-game equity, [...] some of the players may feel unfair depending on the feature. If there were to be new functions in games around existing health gears like Fitbit, it may introduce unfairness 'cause it would be exclusive to ones with the gear."*

Most participants were skeptical of introducing new types of data for health activities such as sleeping, swimming, or boxing because of concerns that this sensed data would be inaccurate. P08 said, *"Even though I'm not gonna cheat, others might try to cheat. So, why don't I (also) do that?"* For this reason, although many of the health priorities participants suggested were about eating, they rarely pursued design ideas regarding eating which completely relies on self-report.

Design Ideas to Balance the Tension

Participants brainstormed the ideas of personalized goals or alternative ways to get rewards. P18 explained an idea in which the game provided tiered rewards based on personalized goals. Group H (P17, P18) envisioned a scenario where a player who reaches large rewards or milestones can select rewards from a pool of three or four options that have roughly equivalent values. P17 suggested that cosmetic rewards (e.g., outfits) may be good options because they will not impact the main gameplay (e.g., ability to catch or battle Pokémons) but will be a lot more appealing than generic consumable items such as Pokéballs. Another idea for minimizing the impact to the game balance was to split rare items (e.g., a special stone) into several pieces and providing one piece at a time as a reward. These rewards can be a strong motivator for players to achieve health goals and may lead to less cheating and data issues. Above all, these rewards do not sacrifice the appeal of the game. P13's response from the post-survey highlight this aspect: *"I still think it should be a game that's for fun, exploration, and being outside, not exercise."*

Tension 2: Strong Bonds between Players and Characters vs. Gaming Obsession

Participants generated ideas to maintain healthy lifestyles by building on players' attachment to partner characters, the *"buddy"* Pokémon, in the game. On the other hand, participants also discussed that this attachment might encourage players to be further immersed in the game for a longer time,

which could cause unhealthy behaviors, such as sleep deprivation or obsession with the game. Participants also proposed design ideas for cutting down playtime (e.g., passive play).

Strong Bonds Between the Player and Characters

Participants were highly interested in improving the buddy system to contribute to player's health, such as *"improve "buddy" function to increase the quality of reward for walking a long distance with the same buddy"* (session 2) or *"have your walking buddy remind you to take a walk or break"* (session 1). Three groups out of nine selected and developed ideas related to this concept. Group B (P03, P04) sketched an idea (Figure 1-B) and described that the players would *"have the walking buddies actually walk next to them or be held up by them if it's a baby Pokémon in the main game screen and that would add an extra layer of adorableness."* Having the game characters be able to speak the player's nickname was also considered as an additional feature to improve the attachment. This group explained that the improved buddy system can contribute to increasing physical activities as well as having positive impact on players' affect. They described its benefits, *"People might play more if their favorite Pokémon can be interacted with, which could allow other health interventions to become more effective. [...] By empowering the buddy with more time spent or distance walked, it would encourage more activity."*

Some participants suggested connecting a player's lifestyle in the real world with game characters. This could manifest as players' actions affecting the health of the buddy Pokémon or the buddy Pokémon teaching healthy behaviors or reinforcing healthy habits to players via vivid interactions. P18 mentioned, *"Do you know Plant Nanny [application]? Every time you drink a certain amount of water you water the plant. The plant would die if you don't water it then. [...] You could do like the same thing with your buddy Pokémon."* In session 3, participants further discussed how this idea can be connected to promoting daily healthy behaviors and extended to building and maintaining social relationships with other players.

> P12: I mean, like Tamagotchi[2] thing, imagine you had a buddy Pokémon and you had fed it to be healthy everyday. [...] 'cause we're conscious of the fact that like, 'Yeah, I fed my Eevee good food and now he's healthier. When I fed him an ice cream bar, he didn't feel good.' They could even add a social aspect to it. You can feed your friend's Pokémon but only good things.
> P11: Or even like, 'Oh, did your buddy visit somebody else's buddy today?' and then they're gonna walk together.

Gaming Obsession

Most participants reported problematic behaviors related to obsessive play, confirming findings from previous work [58, 23]. Mental stress like *"stressed out"* (Session 5) or *"FOMO (fear of missing out)"* (Session 2) were often mentioned. Playing *Pokémon GO* for a long time sometimes interrupted the goal of sustaining a healthy lifestyle: irregular eating (e.g., *"always hungry and thirsty"*); lack of sleep (e.g., *"staying up later than I should go out to catch"*); too much screen time (e.g., *"I'm on my phone more, even while I'm outside"*); and disturbance of work and study (e.g., *"distracted during team meeting"*).

Moreover, although being outside and walking more was known as the primary health benefit of playing *Pokémon GO* [3, 7, 46], some avid participants tended to take it too far. They shared their experience of walking too much, which caused pain in their feet, legs, or back, or choosing to be outside for a long time despite the bad weather or late hours. As P01 said, *"It's raining, just like last night, and actually really cold but there was a raid five blocks away that I wanted to do [...] [being] outside in the rain is not good for you. It's probably a really good way to get sick."*

There were more problematic situations caused by the addictive element of the gameplay. P12 talked about her injury and pain, *"I have had a very severe injury related to Pokémon [GO]. [...] Basically, I have like repetitive stress injury doing Pokémon [GO]. Now I spend hours a week in physical therapy. I had to have a very expensive and very painful procedure."* P11 mentioned about playing while driving: *"Last night, [there was a] Bronzer in this area, it was 12:30 a.m. So, I got up out of my bed and drove out to get there. There were other people [...] in their cars also driving slowly."*

Participants were concerned that reinforcing the attachment to their characters might aggravate obsessive playing habits. This aspect corresponds with Clark and Scott's argument about game addiction: feeling needed by game friends or game characters keeps players from being able to leave the game [17]. P12 stated that features like Tamagotchi might lead players to spend more time in the game by asking players to keep checking in on the game. It also might cause different issues with regard to making choices about the buddy. P04 said, *"Choosing a buddy to spend all this time and distance with could cause someone anxiety because of the investment involved of choosing correctly or being unable to switch out because of the increased attachment and time investment."*

Design Ideas to Balance the Tension

Participants discussed having some kind of reminder feature where the game or game characters are sending a check-in message related to health. This could be a game notification that players can opt-in to receive which for instance, reminds people to take a break or when it is time to eat a meal in case players forget to eat during their playtime. P13 suggested, *"Something as simple as a check-in message would be nice. For example, if a person is recorded walking more than x km in y amount of time, a message reminding them to stay hydrated, eat to keep the body fueled, and take breaks."*

Multiple participants considered playing the game too much as potentially a serious problem and brainstormed ideas to intervene. Similar ideas were generated across all sessions: *"passive playing that can lead to less screen time"* (session 1); *"have a sleep mode where players are rewarded for getting sleep (8+ continuous) non-logged in time"* (session 2); *"set timer for 'driving' and if traveled without playing Po[kémon] GO, reward with something"* (session 3); *"sleep monitor to*

[2]The Tamagotchi is a digitalized pet housed in a small egg-shaped device. Users should take care of their pets by feeding, washing, and playing with them.

get bonus stardust with eight hours sleep" (session 4); and *"game blocker which players can pre-set to encourage sleep"* (session 5).

Tension 3: Collaborative Play vs. Social Anxiety

Participants in this study were highly interested in playing *Pokémon GO* together, emphasizing how *Pokémon GO* has positively impacted their social well-being. However, concerns about forced social interaction and social anxiety were also raised.

Collaborative Play

In addition to more obvious health benefits such as improving physical activities, participants also highlighted the benefit of improving their social well-being. Ideas of collaborative playing with friends were extensively discussed in Sessions 1, 4 and 5. P16 proposed the idea of team events to unlock special Pokémon by walking a certain distance with players who were friends. Participants also suggested features such as customizable messages with sending gifts and visual markings for friends' locations on the map (if they agree to be tracked and have their locations shown to specific friends) for enriching the play experience with existing friends IRL and in the game.

Based on their own experiences in Pokémon GO's raid system, some participants discussed scenarios where they could also cooperate with strangers. P17 demonstrated an idea of *"Trainer Parties"* where a player can team up with other players to increase each player's Pokémon's Individual Values (IVs), which leads to more powerful attacks and defense against opponents. In session 5, participants discussed and developed the idea of *"Kudo system"* where players (both strangers and friends) can complement each other or reward other players for their positive and/or helpful behaviors.

Several ideas for competitive play were also proposed. For example, similar to the social ranking system in Fitbit, an idea of challenging friends based on healthy behaviors, such as increasing step count, was suggested. In Session 4, participants suggested an idea to expand the existing competition among the three teams (Mystic, Instinct, and Valor) in *Pokémon GO* in terms of health promotion.

Social Anxiety

Some participants reported that the increase of social interactions with people related to *Pokémon GO* depleted their quality of time with people who do not play *Pokémon GO*. Because one's resources for social interactions such as time and energy are limited, the increase of new social relationships can cause a decrease in effort and time spent on existing social relationships. Talking about the relationship between his friends who do not play *Pokémon GO*, P01 said, *"I'm unintentionally not gonna hang out with them."* Concerns about decreased family time were a common theme. P12 talked about her family's negative feelings, *"[I] play [Pokémon GO] every few days, and my family feels [that it is] getting in the way of family."* This tension was exacerbated by the recent trend of back-to-back events in *Pokémon GO* on almost every weekend, which many participants considered to be family time.

A few participants also brought up and discussed their social anxiety that could be triggered or aggravated by encouraging social interactions both online and IRL due to the game. In Session 4, one participant mentioned that the sudden increase of social interactions was *"kinda stressful [and] sometimes cause social anxiety."* P15 also shared that they have too many new friends related to this game and often feel the social pressure of having to hang out with all of them. This was consistent with findings from a previous study investigating raid-based social interactions in *Pokémon GO* where some participants felt pressure for *"forced socialization"* [8]. P18 reported that she usually did not play the game with others to avoid this kind of anxiety. P18 said, *"I have a lot of social anxiety around technology and so I'd really prefer to play alone. Some of the [Pokémon GO] Facebook groups are really vile and in some ways, it's giving me some social anxiety."*

Design Ideas to Balance the Tension

Participants in Group I (P18, P19) in Session 5 developed the idea of collaborative play and presented an idea called *"S.O.S. system"* to relieve the tension (Figure 1-C). They wrote a scenario where a group of players who are short of other players to win a raid can ask for help through an S.O.S. system. To avoid social anxiety and ensure safety, they envisioned showing the location information of the gym near the player rather than the exact location of the players and the nearby players can choose to accept or decline the S.O.S. request. They expected that the benefits would be two-fold: 1) helping people raid more effectively by being able to identify other nearby players who might be interested in raiding together, and 2) encouraging people who may be more introverted to have reciprocal social interactions such as thanking the players.

Tension 4: Connection of IRL Experiences with the Game vs. Different Individual Contexts

Participants generated a few ideas that can connect IRL experiences or resources with the game context. Through discussions in the workshop sessions, participants realized they need to consider different personal contexts when integrating the real world into the game. They brainstormed suggestions for improving diversity, accessibility, and personal preferences.

Connection of IRL Experiences with the Game

Many participants reported that game-related events in real life contribute to their mental and social health. In the pre-survey, P14 wrote that people who participate in raids *"coordinate on social platforms, such as Discord, which is healthy social behavior."* Also, P19 described mental health benefits, *"The game (Pokémon GO) is inherently social. For users who may otherwise be experiencing isolation, socially lubricated interactions result in a myriad of positive mental health benefits."* Participants believed that these *"expanded "off-screen" features"* (P02) give a chance to build physical communities where they can get along with people with diverse interests, demographics, and abilities. P19 emphasized how playing *Pokémon GO* impacted her perspective, *"It (Pokémon GO) provides a full range of social connection which I like. So, it's on seeing a wider, realistic range of humanity. I think that really helps make the world a better place."*

On the one hand, taking advantage of health-related resources or experiences in real life was considered one possible way to integrate health promotion and the game. A few participants generated ideas about incorporating healthcare events (*"rewards for annual checkups"*) and linking with related institutions (*"provide sources for local institutions that could provide help for mental health"*).

Different Individual Contexts

Participants were concerned that IRL features or events could be unfair to those who come from different backgrounds or do not have enough resources. Referring to *Pokémon GO* Fest that has been annually held in Chicago and community days, P19 raised the issue, *"We need to repeat events (on community days). A lot of people I've met, they don't work nine to five Monday through Friday, and they're working on Saturday and Sunday. [...] I think it'll lead a discriminatory against people who don't come from the common background."* In a similar sense, P12 explained that the idea of using medical checkups for the game might be *"biased against those without health insurance."*

Participants discussed that different health conditions should be considered to meet individual health needs in the real world. P12 noted, *"Health needs depend on ages or personal preferences."* We observed there were conflicting needs for health information due to preferences or medical history. P11 wrote that he wants to see calorie counts in the game, *"It would be interesting to see actual or estimated calorie counts lost next to Adventure Sync distances."* This is completely opposite of P13 who had been recovering from anorexia. She noted, *"Eliminate the "calories burned" metric [...] When exercise becomes about burning calories, there's a risk for unhealthy, disordered thought patterns and habits to develop."* This illustrates the need to be able to customize different kinds of information players want to see on the screen.

Some participants complained about avatars that do not reflect diversity in real life. P19 said, *"I would like the avatar to be more realistic. [...] It's kind of disturbing that we're stuck in the same avatar."* P12 highlighted presenting stereotypes of body image, such as *"skinny body with big boobs"* (P12), and presenting that body type as the only option is also problematic, especially for kids or teenagers.

Design Ideas to Balance the Tension

Most participants actively discussed how to consider different individual contexts when connecting the real world into the game. P19 suggested that the game company hold repetitive IRL events (e.g., GO Fest) for those who have a different financial or geographic constraints. She said, *"We should expand the Chicago event to other cities for those who don't make it, can't afford travels."* In addition, providing customizable options for avatars (e.g., non-binary genders, different ages, appearance) were discussed across all sessions.

DISCUSSION

To extend our findings beyond the case of *Pokémon GO* to other LBGs, we suggest seven specific design techniques under four principles to resolve tensions when integrating health-related features into existing games.

Leverage the Existing Game Context to Keep the Core Appeal of the Game

In *Pokémon GO*, we found many opportunities to connect the game with health in the real world due to its nature and connection with reality. However, our findings suggest that implementing all possible opportunities for health is not necessary, and furthermore, is not recommended. As Tension 1 shows, simply tacking on health-related features to the game without meaningfully connecting them to the gameplay might cause confusion and boredom among players, which is also aligned with findings from the prior work [69]. Using existing features with which players are already familiar and considered critical could help by not disrupting the core gameplay or feeling unnatural. We provide two specific design techniques for connecting health promotion to the game context by extending existing features.

Utilize Existing Rewards but Keep a Balance between Meta-Relevant and Cosmetic Rewards

As Tension 1 reveals, connecting existing rewards to health promotion is simple but effective. This technique is called an item granting system that gives virtual items for avatars, which is widely adopted in video games to maintain players' interest [68]. With the item granting system, the game can motivate players to do healthy activities to get meta-relevant rewards that are directly related to the main gameplay. In particular, if the rewards are rarer or difficult-to-get items in the game, they might be attractive enough for players to achieve advanced health goals—usually challenging to achieve due to the lack of long-term engagement. For example, if they can get a shiny Pokémon (e.g., a rare form) when achieving walking goals continuously for 30 days, they may think it is worth it to try. This technique can lead players to do healthy activities even though the rewards are not semantically related to health promotion.

However, as prior work has pointed out, one downside of this technique is the risk of feeling addicted and a threat to game balance [68]. To prevent this, the game can provide cosmetic rewards (e.g., new outfits for an avatar) in addition to meta-relevant rewards. Cosmetic rewards are suitable rewards for health-related features in that health promotion should be left as a secondary motivation. This technique can resolve two tensions (Tensions 1 & 2). Cosmetic rewards can be developed in various ways within the existing context while avoiding the risk of cheating and obsession because they may be enough to attract users but are not as critical for the main gameplay. For example, the game could offer appropriate cosmetic rewards (e.g., a new pair of shoes) that match each healthy activity (e.g., daily walking goal).

Take Advantage of Game Character for Light-weight Nudges

Game characters are one of the known appeals of the game [9, 25], and players forge a strong bond with them over time [25]. This implies that if players' healthy behaviors impact their characters, they are likely to continue the behavior. Synchronization of the players' behaviors with their character, similar to Tamagochi, can be one way to implement it but it requires a sophisticated mapping of behaviors in the real world onto corresponding elements in the game. If players' behaviors do not

match with appropriate elements, they may feel it is unnatural and thereby the original game context might be overshadowed by the health promotion feature.

To keep a balance between health promotion and game appeal when leveraging the bond to game characters, we suggest providing light-weight nudges, such as just-in-time prompts (e.g., draw users' attention to a healthy behavior at appropriate times) [14] by using game characters. For example, game characters can remind players to stay hydrated or take a break when players continuously play for too long. Players can get back to the real world and take care of themselves. The effect can be more immediate if the game characters have a strong bond with players and seem to take care of the players [17]. This technique tries to call players' attention to the real world, ironically, by using game characters to which they are strongly connected.

Help Players Reduce Unhealthy Behaviors

Preventing unhealthy behaviors needs to be considered as an aspect of health-related features, but it may be more difficult to achieve than increasing health-promoting behavior [1]. While participants were aware that their addictive behaviors resulted in negative outcomes as reported in the findings, they confessed that it was difficult to stop playing the game by themselves. This is natural, given that the appeal of game is also often the most addictive element. This implies that we must consider preventing unhealthy behaviors as a part of health promotion. Some examples of unhealthy behaviors reported in our findings are visiting unsafe locations or walking for too long. This is consistent with Sharma et al.'s study reporting that too much immersion in the virtual world can make a player unsafe as they focus more on the virtual world at the expense of the physical [56]. Proactively showing space usage rule data (e.g., no access) [54] can be a good start to encourage players to avoid unsafe behaviors.

Give Rewards for Planned Non-Play

In this study, participants as avid players feel that they need to reduce their playing time to prevent unhealthy behaviors (e.g., sleep deprivation) or safety issues (e.g., playing while driving). Providing a reward for non-play can help players learn how to control playing time. Design of idle games that support playful idling, rewards for waiting, and short game sessions have the potential to support long-term engagement [2]. In LBGs, to encourage players to turn away focus from the game and focus on activities in the real-world such as driving, sleeping, or attending to family, there could be a "driving/sleeping mode" in which players need not actively play but can still earn rare rewards in the game. This would be very effective in LBGs because it addresses both safety and health concerns and can also be implemented in any game to counterbalance the addictiveness of gameplay that often has detrimental effects on players' physical and mental health.

Unlike other techniques, this technique can be affected by the context outside of the game, the willingness of players, and the game design company. What players really want is often different from what is good for their health. Although most participants considered obsessive playing habits a serious problem and suggested ideas related to interventions to reduce playing time, only one team (i.e., Group E) ended up choosing and developing the idea. In addition, participants were often concerned that there may be a backlash from the game company in that their first and foremost goal is to increase user engagement with the game to make a profit. However, we believe that game companies should pay attention to fostering sustainable engagement within games because it will reduce players' burnout and promote longer-term engagement and retention of the customer base. Indeed, the latest advances in entertainment games reveal their willingness to promote health with game elements. Recently, *Niantic, Inc.* announced the use of sleep tracking data to reward sleeping habits to prevent players from sleep deprivation due to game obsession [33].

Incorporate Social Elements with Safety and Preference

Unlike other types of games, for LBGs, a transition from online to the real-world environment and interactions with strangers has constructed the essential part of the gameplay. One of the distinct benefits that LBGs provide is active and frequent face-to-face social interaction mediated by the online experience. As many participants mentioned, they can experience diversity through this game by meeting new people from across a wide range of communities through the game's raiding features or Community Day events. However, at the same time, social anxiety and limited social resources were identified as potential threats to their social and mental health. We suggest two specific techniques that not only address those threats but also incorporate social elements toward the direction of improving physical, mental, and social health.

Encourage Players to Collaborate for Positive Interactions and Collective Goals

Players valued social features as an opportunity to contribute to sustaining the game community by collaborating with other players. They were frustrated that there are few features that encourage this aspect, such a 'Kudo' system. They noted that some players in their communities are willing to go out of their way to help others and be kind to them. A feature that praises players' voluntary kindness by giving them symbolic rewards (e.g., badges, Kudo points) can contribute to players' emotional states and a sense of belonging [63]. This technique could be extended to online multiplayer game environments where intense interactions among players often cause disputes [22] by rewarding kind behaviors to help reduce the toxicity of the players' interactions.

In addition to interactions contributing to social and mental health, good design can help players engage in healthy physical activities through collective goals. For example, the game could allow players to organize small groups with their friends and then give them a collective health goal that everyone in the group should achieve (e.g., "Keep the average sleep time 6+ hours this week for everyone in your group"). This can involve players with physical healthy activities in a social way.

Consider a Safety Net for IRL Interactions

Playing the game with strangers or in new places can be fun and adventurous, but may not be appropriate for all players or all situations. Some players like P18 in our study might not want to expose themselves to strangers and may prefer

to just play with friends who already know each other due to personal preference for social relationships. Even players who prefer to actively interact with strangers may sometimes want to play alone or with limited people in specific situations. The dynamics of locations in a real-world environment are entangled with this social anxiety and safety issue [8, 58], which undermines the game's benefits for health promotion.

To support these needs, game designers can provide options to turn on/off various privacy options and adjust the level of friends for certain interactions. For example, if the S.O.S. system—proposed by one participant group in our study—provides a location-sharing feature to promote players to easily meet up, options to adjust the accuracy level on real-time location might ensure their privacy and personal safety. Furthermore, as prior work suggested [8], providing further information on the location of Gyms (e.g., "unsafe at dark", "usually crowded during the daytime") can help players decide if they go to a certain gym or not. Design can allow players to choose how to organize friends in the game (e.g., closeness, purpose of play, locations) so that players can interact with their friends or share their location information depending on their social preference in different contexts.

Provide Various Options to Reduce Built-in Bias

When introducing health-related features into the game, it is important to know that health is inherently bound to a player's personal context and available resources in the real world. Some health-related features might unintentionally discriminate against or disadvantage certain people. We suggest aiming to overcome potential biases by always considering diversity and fairness as part of the goal when integrating health-related functions to the game.

Offer Alternatives for Players Situated in Different Conditions

Players in the same game can play the game in different geographical, economic, or physical conditions. For LBGs, those differences can widen the gap in achieving game success and enjoyment. For example, in *Pokémon GO*, using distance data to hatch eggs and get buddy candies resulted in disadvantaging those who are mobility restricted due to illness or disability, as related literature has identified [39]. People of certain ages, races, or genders might be restricted in mobility for various reasons including safety issues [18, 34, 58]. Those who cannot afford devices with adequate network abilities are also not able to take advantage of these features. Unless there is an alternative method of getting the same rewards in the game, the fairness of the gameplay will be compromised.

By diversifying the ways rewards are offered for achieving health goals, this dynamic can be addressed. There are four different design ideas proposed from players' perspectives: (1) provide tiered rewards based on personalizable health goals; (2) offer multiple rewards leading to different pathways for reaching the same milestones; (3) offer part of the reward through multiple stages that will collectively become rare items in the game (e.g., Special evolution stones, incubators); and (4) provide players who have advantages with a "hard" mode that adds additional challenge and sense of achievement.

Enable Players to Customize the Display of Health Information or Graphic Elements

We should strive to avoid built-in biases when selecting the methods for displaying health data or body image in the game. As P13's objection to the "calories burned" metric showed, a specific method of presenting health data can shape how players think of the relationship between healthy behaviors and health data and also how they may feel about the game and decide whether or not to continue to play it. Orji et al.'s design guidelines for health games [48] can be considered as one feasible way to address this problem. They have suggested that the game should provide both personalization (system-controlled tailoring) and customization (user-controlled tailoring) to support players' different preferences [48].

In addition to health information, avatars presenting stereotypes of body image as the only option is also problematic, especially for children and teenagers. Participants repeatedly commented on the limitation in the avatar system in *Pokémon GO* that currently does not provide diverse options for gender or age. This was not selected as an idea to further explore, however, because participants felt that the idea is clear enough that it simply needs to be implemented. Since prior studies including McArthur's work [40] have suggested how to design character creation interfaces, game designers can consider earlier findings to provide flexible options for avatar representation.

LIMITATIONS & CONCLUSION

Our findings uncover design tensions in integrating health promotion into a location-based game from the players' perspective. However, there are some limitations to our study. Because our participants were mostly active *Pokémon GO* players, our findings might not reflect findings from other types of players, including more casual players. Also, our participants' perspectives of health promotion might not be representative of a larger, more diverse sample. As the same health-related features might work differently depending on player types, ages, gender, or residential areas, we need to further investigate a broader range of participants. In addition, as this work did not implement or validate the proposed designs from players' views, future work needs to empirically validate the feasibility of those designs with game designers and developers as well as players. Exploring the views of the game from people with a public health perspective may also be fruitful.

Our study contributes to an empirical understanding of players' perspectives of designing health-related features and implications for the design of game elements to obtain positive health outcomes. We believe that our approach of integrating health promotion into an existing game and highlighting players' views can help players more enthusiastically engage in healthy behaviors via gameplay.

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