

This is Not a One-Horse Race: Understanding Player Types in Multiplayer Pervasive Health Games for Youth

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ABSTRACT

Technology-based interventions for promoting health behavior-change frequently leverage multiplayer game mechanics such as group-based competitions. However, health interventions successful for groups writ large may not always translate to successful behavior change at the individual level. In this paper, we explore the tension between group and individual success, based on an empirical study on a long-term real-world deployment of a pervasive health game for youth. We report five distinctive player types along the dimensions of motivation, behavior, and influence on others. Based on the findings, we provide design suggestions to help game designers integrate group mechanisms that maximize intervention effectiveness.

Author Keywords

Pervasive Games; Physical Activity; Adolescents; Behavior Change

ACM Classification Keywords

H.5.m. [Information Interfaces and Presentation (e.g., HCI)]: Miscellaneous; K.8.0 [Personal Computing]: Games

General Terms

Human Factors; Design

INTRODUCTION

Many health applications and games leverage cooperation and competition [22], social support [7], and peer pressure [33], with the presumption that social components positively motivate users and foster behavior change. These social components are typically embodied in multiplayer mechanics such as broadcasting progress to a group of friends [7,33] or competing against other groups based on aggregated performance of each member [17,22]. Although group-based mechanics are promising, research studies report conflicting results on their effectiveness. For example, the *Fish'n'Steps* study found that team-based competition did not have a

significant effect on step counts compared to a single-user equivalent [22], while the *Step Matron* study showed that participants significantly increased their step counts when sharing the numbers and status updates with a Facebook group [15]. This apparent conflict in the quantitative behavior outcomes calls for qualitative research to gain a deeper understanding of the dynamics of individual participants that may lead to differential effectiveness and enjoyment of multiplayer health games.

In this paper, we describe the diversity of individual participation styles in multiplayer health games, based on our evaluation of a large-scale field trial of a pervasive technology-based health game for youth. Our findings shed light on the concerns and cares of youth participating in health games, and the impact of group-based competition on individual players. Our research identifies and describes the five distinctive player types that emerged during the play of this game: *achievers*, *active buddies*, *social experience seekers*, *team players*, and *freeloaders*. In addition to describing genres of players, we also provide concrete design suggestions for integrating group-based mechanisms more carefully and effectively in health games for youth, as well as populations that are more diverse.

Our findings are timely given the recent increase in commercially available fitness games and group-focused interventions for promoting behavior change; as these programs increase in popularity, there is a need for deeper understanding of real-world gameplay practices and diversity in player styles.

THE AMERICAN HORSEPOWER CHALLENGE (AHPC)

Researching player diversity in multi-user pervasive games is particularly challenging because it is not amenable to lab experiments. To let player diversity in these games emerge, there must be long-term deployments, natural settings, and minimal overt researcher presence.

Thus, the case study we present is the American Horsepower Challenge (AHPC), a multi-user health game created by Humana's Games for Health and sponsored by The Humana Foundation. The AHPC was a multi-month school-based competition to encourage students to increase their daily physical activity levels both inside and outside of school.

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What makes the AHPC an ideal candidate for studying individual differences within groups participating in health interventions is its multi-site, long-term, and authentic implementation.

The AHPC Intervention

Youth are an especially important audience for physical activity intervention programs because they often face the challenge of the “adolescent slump,” which is a significant drop of physical activity occurring at early adolescence [31]. After this slump occurs, many adolescents will transition into sedentary lifestyles as adults. The AHPC aimed to address this slump by incentivizing participation in unstructured physical activity in daily life (e.g. walking rather than riding in a car, or taking the stairs rather than an elevator).

The goal of the game was to win a virtual “race” against other schools participating in the program. Students in the competition wore on-body sensors about their physical activity that fed information into a web-based game. When a student participated in physical activity, he or she earned points for his or her school. To determine each school’s rank in the competition, step counts from all students on a school’s team were aggregated daily and position on the track was updated accordingly.

It is important to note that the AHPC was *not* intended as an intervention to improve body composition. As such, the program does not use body composition information as an input for the game, nor did the research team collect body composition measurements at any point during the study. Instead, the game focused on increases in physical activity.

Technical Components

The AHPC has three technical components: a wireless pedometer worn on the shoe to collect step data (Figure 1. left), a base station in the school to wirelessly collect step data when students were in range of the device (Figure 1. right), and a password-protected website accessible from school or home (Figures 2, 3).

On the website, each school is represented as a school bus on a racetrack, and the busses’ positions on the track represent the schools’ rank in the competition. Each player is also represented by a horse avatar, which is customizable using a virtual currency earned by taking steps throughout the day (Figure 2). When using the website, players can check bus positions in the race, purchase items for their avatars, update their individual status messages, or view graphs depicting their recent step history. Players can also view their classmates’ horse avatars (see yellow box in Figure 3) and status messages (see yellow box in Figure 2), but they cannot see their classmate’s *individual* step counts.

Deployment Sites

Before our research group’s involvement with the project, the Humana Foundation recruited eligible schools. The schools, located in a variety of communities across the US, were chosen based on having high participation in the National School Lunch Program, a government-sponsored program offering affordable meals to low-income students. Sixty-one

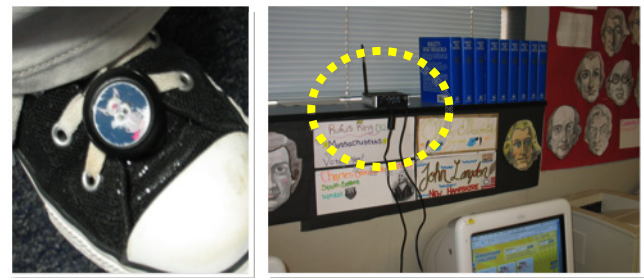


Figure 1. A pedometer clipped to a shoe (left) and the wireless base station (dotted circle) in a classroom (right)

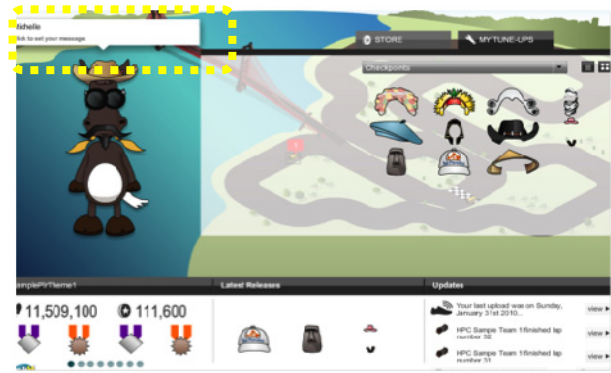


Figure 2. Avatar customization, racetrack in background. Status message bubble appears above the avatar (dotted box at top left)

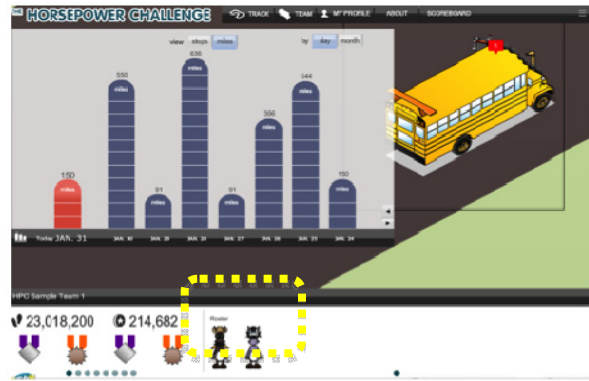


Figure 3. View of aggregate step counts (top left), View of other players (dotted box on bottom)

schools participated, with thirty-seven continuing through all three phases of the program. The game was deployed in three “heats” between April 2009 and Feb 2010, each heat lasting 4 to 5 weeks.

Participants

In total, 1,743 students participated in at least one of the heats of the AHPC. The majority of the schools had 20 participants each. Within individual schools, there were varieties of mechanisms to select participants, such as first-come-first-served (e.g. students who returned permission slips first) or explicit teacher selection from a pool of student volunteers.

RELATED WORK

The aim of this paper is to describe the diversity of individual player types in group-based health games for youth. Accommodating and coordinating a variety of play styles is critical yet challenging for game design. In this section, we first examine the nature of gameplay in pervasive games, and then we situate the AHPC within the gameplay taxonomy literature.

Defining ‘Play’ in Pervasive Games

The AHPC is a pervasive game, which extends the traditional boundary of gameplay spatially, temporally, and socially [26]. The core game mechanism of the AHPC is multi-session group-based competition, similar to sports tournaments, a familiar concept to most American schoolchildren. Although the AHPC tracks steps continuously, it does not give real-time feedback, nor does it support real-time communication between remote players. The AHPC is most like *Fish ‘n’ Steps*, [22] which renders the user’s steps into the progress of an online character. Because the AHPC is a health intervention, its ‘gameplay’ is integrated into a user’s everyday life [8]. This tight relation between gameplay and real life makes identifying and categorizing styles of play challenging within a traditional pilot deployment, and may require a long-term study that allows players to develop their own ways of integrating a pervasive health game in their environmental and social context [4].

Taxonomies of Play

Game researchers, and more recently psychology and HCI researchers, have categorized play and players based on factors such as motivation [19,28,36], enjoyment [6,20,24], dedication [3], emotional triggers [21], and position in a social network [1]. Indeed, taxonomies of play predate the existence of computer-based games. For example, in 1958 Caillois divided games into four categories based on their structure and rules: *competition*, *chance*, *simulation*, and *vertigo* (*being physically out of control*) [6]. The advent and popularity of online collaborative games has led to renewed interest in understanding players. For example, Bartle famously analyzed player behaviors in online Multi-User Dungeons (MUDs). Bartle focused on two key dimensions: the degree to which the player emphasizes the virtual world or other players, and the degree to which the player interacts with other objects/players in the game. These two dimensions led to a quadrant of player types: *achievers*, *explorers*, *killers*, and *socializers* [2].

In developing our own taxonomy, we employed three dimensions: motivation, behavior and social influence.

Motivation and Behavior

Most game taxonomies address two basic questions: what players seek from the game (motivations and expectations), and how players act during gameplay (behaviors). These questions become heightened in health games, where changes in motivation and behavior are essential. Behavior change theories from health psychology highlight the role of motivation in the behavior change process. For example, in

Fisher and Fisher’s information-motivation-behavioral skills (IMB) framework, motivation is critical for generating a favorable attitude and affection towards physical activities [14]. When player motivations align with behavior change goals, video games can be an essential tool in increasing healthy behaviors [5]. Accordingly, we derive player types from their motivations—not just for enjoyment, but also for behavior change. We also examine players’ behaviors as both outcomes and indicators of the players’ motivations. These behaviors might include their interactions with the game, with other players/teachers, and the change of activities for themselves, and so on.

Social Influence

One further recurring theme in the game taxonomy literature is the social aspect of gameplay. For example, Olson et al. surveyed why middle school children play video games, and social motivations include: “*hang out*”, “*compete*”, “*teach each other*”, “*make friends*”, and “*lead*” [28]. As pointed out by Lazarro [21], “*it’s the people that are addictive not the game.*” Health game designers have incorporated a myriad of multiplayer game mechanics for behavior change [7,15,17,22,33]. For example, one way to motivate physical activity is to mediate social-physical activities in outdoor environments through communication technology [27]. However, social influence may vary depending on the condition and characteristics of the individuals involved, as highlighted by Maitland and Chalmers [23]. In addition to motivation and behavior, we use social influence to generate player types, with the focus on understanding group dynamics.

We also aim to understand the reasons why social influence is sometimes not positive. Although group members oftentimes share a goal and may play cooperatively, rewards for individuals sometimes conflict with those for the group. For example, in *World of Warcraft*, players might argue when they pick up rare treasures after battling together against a monster [10]. Even when there is no explicit conflict among group members, players still sometimes play in “individual” mode when they are fully engaged with the computer, and sometimes in “group” mode when they construct shared awareness and outcome, and ‘sacrifice’ for the team [34]. Social reality in a game group is constructed through individuals and their interactions, rather than being pre-defined by the game. Hence, it would be oversimplifying to consider the group as one unit.

METHODS

The main findings of this paper draw upon data from site visits to 15 schools towards the end of the AHPC deployment; for full reporting of survey and step log data, please refer to [12]. At these school visits, we conducted 18 student focus groups with 4-10 participants each, 17 teacher interviews, and 56 individual student interviews. In total, we talked to over 200 participants. We also received tours of facilities and shadowed the teachers during their physical education classes if invited. After each site visit, researchers wrote field notes that included observations about the school.

The profile of the 15 schools we visited was representative of the overall group socioeconomically (71.8% of students receive free or reduced lunch), demographically (male-female ratio=1.03, similar ethnic makeup), and regionally (covering 8 states and a mix of rural/suburban/small town/city schools). We also collected the step count log as a triangulation for the qualitative data.

We derive player types from an inductive, iterative analysis on qualitative data. In prior research, players' reflection on their experience has been used as a key data source for the player taxonomy research [2,28,36]. Due to the emergent nature of multiplayer game experience, we choose an empirical method that focuses on user-reported data over critical analysis, which was most common in the earlier work of play taxonomy in game research [6].

Our data analysis involved four researchers reading and coding each interview focus group transcript, and the field notes. One of the most prominent themes to emerge from this phase of analysis was the variety of play styles students and teachers reported to us, even within the same school, independent of a school's ranking at the game. Our large data set allowed us to verify these observations through cross-school comparison. Based on a player's motivation, behavior, and influence, we extrapolated the player types that were distinctive from each other and happened across multiple schools. We iterated this process until we reached theoretical saturation.

Based on existing literature on player taxonomies and the role of motivation in behavior change, we focused on three dimensions of gameplay experience: motivation (i.e. why did a player care about the game?), behavior (i.e. what kind of things did a player do during the game?), and influence (i.e. what is the social impact that a player brought to the rest of the group?). In the findings section, we describe each type of play by these three dimensions.

FINDINGS

In this section, we describe five types of players found among the AHPC participants. While players naturally varied in their existing athletic skills, social relations, interest in the AHPC system, to form our categories we focus mainly on the differences in their motivation, behaviors, and influence on others in the group. We define the five player types as *achievers*, *active buddies*, *social experience seekers*, *team players*, and *freeloaders*.

Achievers

We define the term *achiever* to be the same as in Bartle's definition of this type on MUDs, meaning players who "give themselves game-related goals, and vigorously set out to achieve them" [2]. In the context of AHPC, achievers are keen on improving their individual step counts and getting confirmation of their improvements from the game system.

Motivations and Behaviors

Achievers were motivated by making individual progress and increasing personal performance. Achievers set step goals for themselves regularly during the AHPC. Some showed us that

they wrote numbers down in a notebook to have easier access to their step count trends. They used the AHPC website mainly for checking their steps and the step history.

Although it is logical to assume that highly athletic students would be achievers, we found that it was not the case for the AHPC participants. With respect to athletes, just by doing their existing physical activity routines (e.g. sports practices) they managed to obtain high step counts, so they rarely changed or reflected on their routine. Moreover, as AHPC required almost no athletic skills, it did not reward athleticism in the typical way seen in most sports.

Achievers were oftentimes participants who had previously led sedentary lifestyles and those who were not seen as 'athletes.' Although they were keen on competing with themselves, they typically did not like being compared with others. They tried various physical activities to get more steps, such as walking to school instead of getting a ride, playing more exercise games at home, or walking the dog more. Of note is that these activities were typically low-intensity and non-competitive.

Influence

Achievers exemplify the tension between individual and group performance in the game. For example, in the following dialogue, we asked the student interviewees to give advice to new AHPC participants, and the player emphasized the goal of individual improvement, and remarked on the stress of being picked on during the AHPC:

SE_Boy_3: Well, when you're doing the Horsepower Challenge and it's complicated and you're nervous; just set a goal for yourself...

Interviewer: Complicated and nervous? – what kind of, exactly, emotion that you're talking about?

SE_Boy_3: Nervous that you're going to lose. Like if they change the website and see who has the more points and you have the lowest points. And your team loses, they're going to blame the kid that did the less steps.

Interviewer: Did anyone do that to kids in your school?

SE_Boy_3: I've heard it before.

Interviewer: What kind of things did they say?

SE_Boy_3: They'll make fun of other kids. They'll be calling other kids losers and stuff. But the kid is not good at that stuff and he's just trying the thing that the other kids are good at. He's kind of making another goal for himself, because he's trying that thing out but he has never done it.

This participant wanted to focus on the "goal for himself," but was afraid that it was not good enough for others. Although the boy knew that others could not see his step counts, the stress of being blamed and teased still existed. He hoped to prove himself in front of the rest of the group. Later in the interview, he shared with us his cousin's experience of redeeming himself in another physical activity promotion program with similar group-based competition structure.

Interviewer: What happened to the kid who was teased?

SE_Boy_3: He probably felt bad. Probably eventually he had gotten better at it....And the kid might catch up sometimes.

Interviewer: How do you know?

SE_Boy_3: Well, I had my cousin that used to do this. And he had the lowest points and everybody teased him about it. And at the end of the year he had more points than everybody in the school... He walked from his house to the ____ and back. And his house is like in _____. So he just walks back and forth. Because he told me this and he won. And the school won because of him...

In this example, the boy attributed the success of his cousin's school to his cousin's personal improvement. He considered his cousin a positive example. Overall, the achievers' experience in AHPC had the potential to be inspiring and encouraging to kids who were not typically athletic, as they tried many new and different activities. However, we found that their influence on other members in the group was actually limited. While the achievers might have individually improved more than other types of participant, the group did not always recognize this effort. This was especially true for the students who were overweight and less athletic; they were picked on anyway, irrespective of the fact that others did not have access to their step numbers. The social pressure was stressful and isolating [33]. Here, the current AHPC system design does not seem to support the need of achievers to prove their progress to the group and become positive examples. Instead, a points system based on personalized progress or goals might prove more successful.

In summary, achievers focused on personal improvement. They used the AHPC website mostly for functional purposes of checking the steps. They did not like being compared, although they did want to prove themselves in front of others.

Active Buddies

Active Buddies are players who enjoy the company of a small group of close friends who create and enjoy fun physical activities together.

Motivations and Behaviors

Active Buddies were motivated by social play and physical exertion. During the AHPC, they often paired up with one or two close friends to perform physical activities together. They not only reminded each other to be active, but also joined each other in outdoor games, and even created fun activities that involve physical elements. They sometimes competed against each other to add more tension and more emergent social play was evident, such as "bragging" about who had the highest count. Because the buddies trusted each other, such competitions were playful and fun rather than stressful. The following example illustrates a creative mini-game that two girls invented during the AHPC:

SD_Girl_6: Me and my friend, we would always brag about who had more steps...So at the end of the

day, we'd call each other and go on the Internet and see how many steps we got, and whoever got the most had to pay the other \$1.00.

Although it is not clear whether this mini-game actually contributed to step count increases, it did add to their enjoyment of AHPC.

The three components of a successful physical game: *sociality, engagement, and exertion* can reinforce each other [27]. Active buddies enjoy social bonding with physical activities that might seem daunting or boring otherwise:

SB_Girl_7: You're just talking with your friend and you walk more than you wanted to walk and then you get more steps.

Influence

Friends cast a powerful influence through strong social ties, which in the AHPC was beneficial for positively changing the health habits of buddies/peers [32]. The extent of this influence was not limited to participants in the AHPC. For example, a boy mentioned that he turned his sports video game buddies, who were not AHPC participants, into outdoor soccer buddies. However, *couch potato buddies* can have strong influence as well. In the following example, the interviewee intentionally tries to avoid activities with his friend because:

SA_Boy_5: There could be like a football game on TV that he would really wanna watch and you don't really wanna watch it 'cause you don't wanna sit around [but you do anyway]

Although the influence between the buddies was strong, we did not find indications that this influence extended beyond small cliques or existing strong social ties. One of the biggest boundaries we observed is gender. Gender differences were pervasively adopted among adolescents to create clique boundaries. During one of the school visits, the boys and girls in the focus group started a debate about whether everyone worked as a team for the school:

SG_Boy_1: People were doing different things. The guys were playing basketball. Some guys were playing football. Girls doing jump rope and playing volleyball and stuff. And yeah. Like and so we didn't work as a team....

(heated discussion erupts amongst the participants)

SG_Girl_4: Well, I think that like some of the – like all us girls are friend, so we all be with other friends. Some of us got the same friends. So I don't know why he say we don't hang out together because he hang out with boys. We hang out with girls. So and while playing football they wouldn't let nobody else play football so...

While this argument demonstrates the perceived boundary between gender groups, this boundary can also sometimes be enforced from the outside. When talking to the PE teacher at this school, we found that the school divided students by gender into different physical activities during PE class and

seminar time. Here it seemed that the externally enforced boundaries between gender-groups were potentially limiting the range of influence between sub-groups.

In summary, active buddies enjoy physical activities as fun, social activities with their close peers and cliques. Nevertheless, between the cliques, there might exist boundaries that constrain spreading their influence. Designing health games that leverage interactions within the boundaries seems to be easier than that across boundaries.

Social Experience Seekers

Bartle defined socializers as players who “use the game’s communicative facilities, and apply the role-playing that these engender, as a context in which to converse (and otherwise interact) with their fellow players.” In the case of the AHPC, social experience seekers are a subset of the participants who enjoyed entertaining social aspects of the game, rather than physical activity or teambuilding; for this group in the AHPC, dressing up their horse, showing it to others, and talking about it with other players is more engaging than physical activity.

Motivations and Behaviors

These students are motivated by dress-up play, socializing, and showing off new customizations. They decorated their horses and changed their avatar looks frequently. They enjoyed showing their horse to others and chatted about their customizations. The AHPC website allowed a player to view another player’s horse as a thumbnail in a list (as shown in the dotted-line frame in Figure 2), and the enlarged image with a username and status message appears when clicked. However, we found that social experience seekers often enjoyed sitting together, looking over each other’s shoulder, and talking about their horse customization during class breaks or lunch time. Sometimes they even gave other players their username and password so that they could log onto the account and look at it together.

While dress-up play can be an “escape from the dulling rhythm of salaried work and household labor” [16], it can also be an exploration of self-image in front of others for schoolchildren. It affects their interpersonal behavior and attitude [30]. Some players wanted the dress-up to support them in portraying their self-image:

SI_Boy_1: I understand it’s called the Horsepower Challenge...but you should be able to like create your own person. You know like get your body shape and stuff like that.

SI_Boy_2: Yeah, that’d be more age-appropriate for us.

SI_Boy_1: Cause like a horse has a big head, and everybody’s head’s not big, so—

SI_Girl_1: —Most people’s heads.

Although social experience seekers were interested in using the AHPC website, they did not associate it with getting more steps, hence their motivation to improve their fitness was low. The AHPC game made it too easy for them to purchase any costume without striving for more steps, and

they could always sell their old costumes with the same amount of points they purchased them with. Their interest in decorating the horse (and hence their interest in the AHPC) was relatively short-term. Players eventually realized that there were limited dress-up options, which were the same for everyone, and reduced the interest in continuing their conversations about customization.

Influence

The dress-up feature provided opportunities for discussion with friends. In Miller’s writing about dress-up play [25], he brought forward the concept of “three selves of fantastic socialization”. These three selves involve public dress-up, or costumes worn in a public context; private dress-up, or costumes worn among friends or in the context of family/childhood play; and secret dress-up, which could include both activities that are solitary or intimate. In the context of AHPC, we found that the social experience seekers combined all three representations of self and cared most about interactions with friends. With the current design, they did not connect physical activity behavior with the dress-up play. Therefore, their influence on friends was constrained to fashion tips rather than influence in real-world physical activities.

In summary, social experience seekers are interested in the playful aspects of the AHPC website. Dress-up play, as one example of common interests introduced by games, gives opportunities for players to represent themselves online and offline in a new form, and socialize with their friends around this topic. Social experience seekers do not exhibit much interest in improving their physical activity levels given the current health game design.

Team Players

We use the lay term *team player* to refer to players in the AHPC who were most motivated by group achievement and ranking, and encouraged others to improve the team’s performance. Good team players were often defined by other students and the teachers in trait terms; that is, dependable, flexible, or cooperative [9].

Motivations and Behaviors

Team players were motivated by team achievement and a sense of belonging. They were the most enthusiastic about having the opportunity to win for their school, and to contribute to a large cause. They often kept an eye on their schools’ rank, tried to improve their own steps with long-term persistence, and reminded others to be more active.

One unexpected behavior of the team players was increased communication with the teacher(s) about their progress. In the AHPC, the team players actively sought attention from the teacher. In the following example, the PE teacher shared her observations about such behavior during the program:

SA_Teacher_A: J_ cracks me up. I have seen a change in him as well. He comes to me almost on a daily basis. Oh, I had forgotten. There was a specific story about T_. Shortly after I gave out the pedometers, she came to me, and she said – she

stopped me. I was out here on the field and she said, "we had to go to the grocery store last night and I talked my mom into walking to the store instead of driving." She said, "Because I had to get steps for my pedometer." ... She goes, "So we walked to the grocery store and got what we needed and walked back." ... It was really neat that she would actually stop me and tell me the story, that she was excited about it. She very much wanted to...feel like she was a part of something, and I think that's something that all these kids have in common is they feel like they belong. They belong to a group.

In above example, the teacher was pleased that the students initiated the conversation about physical activities with her. In this school, most of the participants that the teacher drew from the students who volunteered were not athletes. Instead they were those who the teacher thought might benefit most from the challenge. She also created a ritual in the beginning of every PE class that the whole group checked the rank and step count of their school together on a large display. This ritual helped to create a shared group identity by reiterating the shared group goal. For those participants who had never been involved in a sports team, the AHPC was an opportunity to be a part of one.

Occasionally, leadership in organizing activities might also emerge from team players. During site visits, we found a few cases of one or two students organizing and leading some physical activity for the whole group, with encouragement from teachers. However, as expected the teachers' leadership role was most pervasive and accepted among different schools given their organizing and resource providing abilities in the AHPC deployment.

Influence

Team players have the potential and motivation to influence many people in the team, however, for most this influence is limited to their friends. If they were motivated to attain wider influence, they still typically required assistance from teachers to understand how to do so most effectively. This might be caused by the conventions in middle schools, where the students expect and rely on teachers to make arrangements and organize groups. Indeed, the teachers themselves did play an important role in establishing and promoting group identity, and creating fun group activities for the students. However, we also found that teachers had different availability, dedication, and attitude towards physical activities, which was not always supportive in some cases. Thus, it is important to provide in-game scaffolding mechanics for team players to turn their enthusiasm about group success to day-to-day influence on other members in the group.

In summary, team players care for the group achievement the most. They seek attention and confirmation from their teachers. They use the website for functional purposes of

checking school record and rank, and for reinforcing the shared group identity.

Freeloaders

Ang et al. define freeloaders to be those linger on the edge of the social network of a guild in MMORPG games, to "utilize the guild resources" but not contributing to the group growth or providing help to others [1]. Similarly, in the AHPC, freeloaders are those who do not contribute to group achievement but still stay enrolled, often at the cost of the group's performance.

Motivations and Behaviors

Freeloaders were drawn by the buzz generated around the AHPC as a new and interesting program at the beginning of the deployment, but they quickly lost interest and stopped wearing their pedometers regularly. They typically did not quit or ask to be replaced, but hung around to see what personal benefits they could get, for example, free t-shirts and stickers. Although we did not have much chance to talk to them (because they usually did not volunteer to participate in the interview), in focus groups we heard other participants criticizing freeloaders as forces that "drag the team down" in multiple schools. The existence of freeloaders is triangulated by step log analysis. We found that a fraction of the participants have exceedingly low average daily steps; 10% of the participants had less than 1,300 average daily steps (0.5 miles¹), which was one third of the median (1.50 miles). One explanation for this low step count is that these participants failed to wear their pedometers regularly during the challenge.

Influence

In the AHPC, freeloaders' influence is very different from those in online communities who are typically invisible to the rest of the participants. Instead, freeloaders have real social presence at the school. Moreover, unlike the freeloaders in online communities in which the resources they enjoy do not cost extra efforts of the providers, in the AHPC, the less the freeloaders get steps, the more others have to make it up for the group. Unsurprisingly, other students in the group commented negatively about them. However, surprisingly, nobody suggested or reported specifically that they actively tried to change the freeloaders' behavior. The following quote showed what others thought of freeloaders in their team, and how they harmed "team spirit":

SE_Boy_1: Can I say something? I disagree about that building the team spirit little thing, because some people just got the little ped thing (referring to the pedometer) just so they can be in something, and they don't want to feel left out because they just wanted to free load and get that shirt and stuff.

This negative comment shows that freeloaders might demotivate other players. The design challenge here is not only to try to motivate freeloaders, but also to minimize their

¹ The step-to-mile conversion rate is 2643:1 (from AHPC website)

negative effect on other players in the group. Although freeloader's influence is not positive, designers cannot simply ignore or exclude this group—in the end, freeloaders might be a population that behavior change programs intend to reach.

In summary, freeloaders do not care for the game activities or physical activities. They cause frustration among other players because their low participation drags down group performance.

Summary

We presented five types of players that emerged from our evaluation of a group-based competition for promoting physical activity participation in youth. We discussed a tension between *individual* and *group rewards*, and between *behavior change* and *enjoying the online game itself*. Players may be more interested in group achievements (*team players*), interacting with a clique of friends (*social experience seekers* and *active buddies*), or personal improvement (*achievers*). Players may also care more for physical activities (*active buddies*, *achievers*), online interactions with the game, and offline socialization (*social experience seekers*).

DESIGN IMPLICATIONS

We found a diversity of players in the schools enrolled in this study. Based on our findings, we provide concrete design suggestions about how designers can integrate group-based mechanisms more carefully and effectively in health games for youth.

Group Scale Matters

The AHPC was deployed to groups of approximately twenty participants. Except for the student-teacher interaction, the majority of influence we found is limited to the scope of a small group of friends, at most. There exist boundaries between cliques and gender that constrain the scope of social influence. The effect of peer groups on adolescent's physical activity is paramount. The influence can go both ways as stated by Sallis [32], "If a given adolescent identifies with a peer group that values and participates in physical activity, the group creates a supportive environment for its members. If the main peer group devalues physical activity, this is an effective deterrent." We argue that there may be a benefit to tailoring health interventions to smaller sub-groups within a large competition. We have three main reasons for this suggestion. First, it is easier for players to coordinate and self-organize fun physical activities within smaller groups that have existing social bonds extending beyond the competition. To organize activities for a large group (e.g. all 20 participants in a school) requires shared time, space, and resources that may not be accessible to the students. Second, small groups provide a trusted, safe environment. For example, the achievers had the risk of being teased and isolated because of bullying behavior from other kids in the school. But if grouped with friends they trust, they may become active buddies, who are probably supportive and more likely to enjoy physical activities together. Third, our suggestion is also based on the scale of self-organized social

groups observed in online games. For example, the median size of guilds in World of Warcraft is 9 [10]; a survey shows that the cliques among middle school students typically range in size from 3-12 children [13].

When designing for small groups, we note that friends might also *demotivate* each other from being active. For instance, we found that the social experience seeker does not seem to encourage others to be more active even though their interaction with peers makes the online game experience more fun. These social experience seekers sought dress-up play, not physical activity, and focused on decorating the avatars. A simple change in game economics might have helped this group; although outfits cost points, the in-game store had a free returns policy. Creating an in-game cost for the activities social experience seekers like most—such as charging for virtual closet space or for swapping outfits—might increase these players' motivation and that of others in their small group as well.

Online Representations of Self in a Group

Within the AHPC website, the players themselves, other players, and the group were represented independently. Although they simultaneously appear on the same web page (Figure 3), the relations among players and their group cohesion were not represented. We suggest visualizing 'online representations of self in a group' to support the group identity and to create a shared online place. Through this design, the health game creates a *stage* where players can express themselves through the *impression* they give and receive reactions from other players [18]. This stage is clearly wanted by social experience seekers, who are interested in showing off their new looks to friends and classmates. It is also important for team players, who identify themselves with the group strongly. From this representation, team players can view all the members being together, matching with the group identity that team players believe in. This is a first step towards scaffolding team players to think on a higher level of group, and potentially inspire them to try out some social roles in the group (e.g., group leaders).

We also found some players showed interest in portraying an "ideal image" of self by using their online avatars. This tendency was also found in Ducheneaut et al.'s research in which they found that participants with weight issues tended to create idealized avatars [11]. Moreover, Yee et al.'s research showed the "Proteus effect," in which a player's online game avatar changes digital or even offline behaviors [35]; in their study, the researchers found that participants given taller avatars negotiated more aggressively in subsequent offline, face-to-face interactions than those given shorter avatars [35]. It seems promising to leverage players' online avatar creation and customization for health behavior change, especially for social experience seekers who like to talk about their customization with others but lack of interest in being active. However, when players and their avatars are not anonymized in co-located group interactions, it raises concern about privacy and possible bullying issues that may appear in the context of the school setting. In the current

design of the AHPC, players have little agency on the physical features of the avatar; they cannot change weight or height, for example. More work is needed to understand how to leverage players' interest in ideal self-image for health behavior change.

Support Play Style Transition

In a long-term deployment such as the AHPC, it would be unreasonable to expect all players to pick a particular style of play and never change. For example, a player may start as an *achiever*, then later her friends join in, and they become *active buddies*. In a health game encouraging players to transition away from less productive player types like *freeloaders* may be critical. Health games that support play style transition must address this dual challenge: allowing players the agency to pick and change their play style while explicitly encouraging less healthy player types to adjust their style of play. This means discerning player types throughout the deployment, encouraging those in less desirable play styles to try a different style of play, and recognizing the period when such transition occurs. Health games need to support players in transitioning to socially engaging and physically active types.

Customizable Privacy

Privacy is an important dimension for any application that shares health information [7], and adolescents might be particularly sensitive to unwanted sharing of their weight or physical activity, especially with peers [33]. Group fitness applications have the potential to leverage positive affirmation, but conversely might contribute to unnecessary taunting, fat-shaming, or body image disorders. As pointed out by O'Dea [29], the most important principle for prevention of child obesity is "*first, do no harm.*" Simply making the step counts viewable to all participants without allowing for customizable privacy could create too intense and destructive competition. To prevent this from happening, the AHPC designers made the step counts private; a player can view only other player's horse images and text status, but not individual step information.

However, in some cases, players reported being willing and eager to share their step counts. The important design implication here is to give players control to decide when to share, what information, and with whom. Fixed privacy settings do not allow different player types to share with their ideal level of comfort.

Privacy for Achievers and Freeloaders

For example, achievers might gain many steps but cannot prove it to others easily. Including announcing functions would allow the students to leverage social affirmation but also maintain the control of self-image. Similarly, keeping steps private when not announced protects the well being of freeloaders. We believe this control of self-image is especially important based on our observations at the site visits; during the focus groups we conducted, we observed some instances of bullying and negative remarks toward kids who were overweight, less athletic, or deemed unpopular. When designing multiplayer health applications where social

pressure is involved, it is important to minimize the potential for bullying behaviors.

Privacy for Social Experience Seekers and Active Buddies

Another option could be to share step count and in-game activity with a subgroup that a player chooses. For both the active buddies and social experience seekers, the interactions with a small clique of friends provide the main source of enjoyment. Players have tried different ways of sharing game state and activities with their friends, such as betting on step numbers and giving their usernames and passwords to others. These behaviors suggest a desire to share activities within the small cliques.

In summary, we recommend the inclusion of customizable privacy settings that empower players to decide with whom and when to share their physical activity level and progress.

CONCLUSIONS

This long-term, large-scale health game deployment opens a window for researchers to explore the opportunities and challenges associated with group-based health interventions for middle school children. We found that deploying a group-based competition does not automatically lead to cooperative behavior. Instead, it creates a myriad of behaviors based on the players' motivation, existing athletic skills, interest, social relationships, and social status. These players also have different social influences on others in the groups. In summary, we identified five player types in group-based health games for school children, and provide concrete design suggestions for scaffolding health interventions for youth, in ways that maximize player enjoyment while simultaneously providing health benefits.

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REFERENCES

1. Ang, C.S. and Zaphiris, P. Social Roles of Players in MMORPG Guilds. *Information Communication Society* 13, 4 (2010), 592–614.
2. Bartle, R. Hearts, clubs, diamonds, spades: Players who suit MUDs. *Journal of MUD research*, (1996).
3. Bateman, C. and Boon, R. *21st Century Game Design*. Charles River Media, 2005.
4. Bell, M., Chalmers, M., Barkhuus, L., et al. Interweaving mobile games with everyday life. *Proc. ACM CHI 2006*, 417-426.
5. Berkovsky, S., Coombe, M., Freyne, J., Bhandari, D., and Baghaei, N. Physical activity motivating games: virtual rewards for real activity. *Proc. ACM CHI 2010*, 243-252.
6. Caillois, R. and Barash, M. *Man, play, and games*. The Free Press of Glencoe, 1961.

7. Consolvo, S., Everitt, K., Smith, I., and Landay, J. Design requirements for technologies that encourage physical activity. *Proc. ACM CHI 2006*, 457-466.
8. Consolvo, S., McDonald, D.W., and Landay, J.A. Theory-driven design strategies for technologies that support behavior change in everyday life. *Proc. ACM CHI 2009*, 405-414.
9. Driskell, J. and Goodwin, G. What makes a good team player? Personality and team effectiveness. *Group Dynamics*, 10, 4 (2006), 249-271.
10. Ducheneaut, N. and Yee, N. The life and death of online gaming communities: a look at guilds in world of warcraft. *Proc. ACM CHI 2007*, 839-848.
11. Ducheneaut, N., Wen, M.H., Yee, N., and Wadley, G. Body and mind: a study of avatar personalization in three virtual worlds. *Proc. ACM CHI 2009*, 1151-1160.
12. Eiriksdottir, E., Poole, E.S., Miller, A.D., Xu, Y., Kestranek, D., Catrambone, R., and Mynatt, E.D. Assessing health games in secondary schools: an investigation of the american horsepower challenge 2009-2010. *GVU Center Technical Report, Georgia Institute of Technology*, 2010.
13. Espelage, D.L., Holt, M.K., and Henkel, R.R. Examination of Peer-Group contextual effects on aggression during early adolescence. *Child Development*, 74, 1 (2003), 205-220.
14. Fisher, W.A., Fisher, J.D., and Harman, J. The Information-Motivation-Behavioral Skills Model: A General Social Psychological Approach to Understanding and Promoting Health Behavior. *Social psychological foundations of health and illness*, (2003), 82-106.
15. Foster, D. and Linehan, C. Motivating physical activity at work: using persuasive social media for competitive step counting. *Proc. ACM MindTrek, 2010* 111-116.
16. Fron, J. and Fullerton, T. Playing dress-up: Costumes, roleplay and imagination. *Philosophy of Computer Games*, (2007).
17. Gasser, R., Brodbeck, D., Degen, M., Luthiger, J., Wyss, R., and Reichlin, S. Persuasiveness of a mobile lifestyle coaching application using social facilitation. *Persuasive Technology*, (2006), 27-38.
18. Goffman, E. *The presentation of self in everyday life*. Anchor, 1959.
19. Hsu, C.L. and Lu, H.P. Why do people play on-line games? An extended TAM with social influences and flow experience. *Information & Management*, 41, 7 (2004), 853-868.
20. Hunicke, R., LeBlanc, M., and Zubek, R. MDA: A formal approach to game design and game research. *Proceedings of the AAAI-04 Workshop on Challenges in Game AI*, (2004), 1-5.
21. Lazzaro, N. Why we play games: Four keys to more emotion without story. *Talk presented at Game Developers Conference 2004*.
22. Lin, J., Mamykina, L., Lindtner, S., Delajoux, G., and Strub, H. Fish'n'Steps: encouraging physical activity with an interactive computer game. *Proc. ACM UbiComp 2006*, 261-278.
23. Maitland, J. and Chalmers, M. Designing for peer involvement in weight management. *Proc. ACM CHI 2011*, 315-324.
24. Malone, T.W. *What makes things fun to learn? heuristics for designing instructional computer games*. *Proc. ACM CHI 1980*, 162-169.
25. Miller, K. Dress: Private and secret self-expression. *Clothing and Textiles Research Journal*, 15, 4, (1997), 223-234.
26. Montola, M., Stenros, J., and Waern, A. *Pervasive games: Theory and design*. Morgan Kaufmann, 2009.
27. Mueller, F., Agamanolis, S., Vetere, F., and Gibbs, M.R. A framework for exertion interactions over a distance. *Proc. of ACM Siggraph Game symposium 2009*, 143-150.
28. Olson, C. Children's motivations for video game play in the context of normal development. *Review of General Psychology*, 14, 2, (2010), 180-187.
29. O'Dea, J.A., Prevention of child obesity: 'First, do no harm'. *Health Education Research*, 20, 2 (2005), 259-265.
30. Rosenberg, M. *Society and the adolescent self-image*. Wesleyan, 1989.
31. Rotwein-Pivnick, R. Getting Kids & Adolescents Excited About Exercise. *IDEA Fitness Journal*, (2006), 1-5.
32. Sallis, J.F. Influences on Physical Activity of Children, Adolescents, and Adults. *PCPFS RESEARCH DIGEST* 1, 7 (1994).
33. Toscos, T., Faber, A., Connelly, K., and Upoma, A.M. Encouraging physical activity in teens: Can technology help reduce barriers to physical activity in adolescent girls? *Proc. of PervasiveHealthcare 2008*, 218-221.
34. Volda, A., Carpendale, S., and Greenberg, S. The individual and the group in console gaming. *Proc. ACM CSCW 2010*, 371-380.
35. Yee, N., Bailenson, J.N., and Ducheneaut, N. The Proteus Effect. *Communication Research* 36, 2 (2009), 285-312.
36. Yee, N. Motivations for play in online games. *CyberPsychology & Behavior*, 9, 6 (2006), 772-775.