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ORIGINAL ARTICLE

DEVELOPING MOBILE APPS FOR PHYSICAL ACTIVITY IN LOW SOCIOECONOMIC STATUS YOUTH

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Objective: The objective of the study was to implement a user-centred approach in the design and development of smartphone game-based applications (SGA) prototypes for PA promotion in adolescents, specifically from low SES families.

Aims: (1) Describe the development of smartphone game-based applications to promote physical activity in adolescents from primarily low socioeconomic status households. (2) Determine acceptability of initial prototypes.

Methods: This study implemented a user-centred approach including adolescent focus groups (n = 3; 14 adolescents), parent interviews (n = 7), and idea generation sessions (n = 5; 80 participants) to develop and design smartphone applications as a persuasive technology for adolescents.

Results: Qualitative data demonstrated that adolescents identified smartphone features that would have the ability to have frequent opportunities for social networking and competition. The majority of parents had favourable perceptions of smartphone games for physical activity promotion. Furthermore, idea generating centred around sports and recreational games. A final set of games were developed into hand drawn and computer generated prototypes.

Conclusions: The study provides a framework for how to incorporate a user-centred approach in the design and prototype development of smartphone game-based applications, and indicates the feasibility of continued smartphone game-based applications development and effectiveness testing for promoting physical activity among low socioeconomic adolescents.

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Introduction

Adolescents in the US are engaging in less physical activity (PA) which contributes to increased risk of chronic diseases.[1,2] Further, low socioeconomic status (SES) and racial/ethnic minority adolescents, when compared to their middle-high SES or white counterparts, are known to be less physically active and may be at a higher risk for chronic diseases.[1,3] This PA decline provides an opportunity to intervene.

Mobile technology is a promising strategy that may be able to assist in facilitating access and availability of PA[4] among adolescents. Recent statistics show that, 78% of 12–17 year olds owned a mobile phone and 37% owned a smartphone.[5] Furthermore, 69% of adolescents from household incomes of less than $30,000 owned a mobile phone (any kind) and 39% owned a smartphone compared with adolescents from household incomes of $75,000 where 86% owned a mobile phone (any kind) and 43% owned a smartphone.[5] Similar ownership rates exist between Whites, Blacks, and Hispanics.[5]

Three recent reviews have demonstrated that mobile health (mhealth) interventions can be effective in promoting PA in adults.[6–8] However, the findings on how well these approaches work to improve PA for children[9] and adolescents[10,11] has been equivocal. This may be the result of investigators applying similar strategies that have demonstrated effectiveness in adults (e.g. text messaging prompts and feedback), but that may be less motivational or effective for children/adolescents. There needs to be more emphasis on focusing mhealth PA studies on children/adolescents that applies a user-centred approach to guide development of the technology in an attempt to tailor the intervention to this audience.[6,7]

In contrast, some mhealth studies that have examined non-PA health behaviour outcomes, have noted the value of including participants in development phases.[4,12–16] One study[16] in young adults showed that they have interest in smartphone applications facilitating behaviour change and support which includes tracking behaviours and goals and getting advice and information. As evidenced in the literature, adolescents are capable of providing valuable feedback related to avatars/characters, social interaction, frequency, duration, timing, and mode of delivery (e.g. multimedia messaging service, gaming) of mhealth interventions.[13–17] However, few studies have focused on PA promotion or primarily included low SES adolescents in smartphone game-based application design.

The overall objective of the study was to implement a user-centred approach in the design and development of smartphone game-based applications (SGA) prototypes for PA promotion in adolescents, specifically from low SES families. The objective of this paper was to describe a formative planning and development process guided by a user-centred approach,[18] which has been widely used and validated in human computer interaction studies.[19,20]

Methods

Study Design

An exploratory qualitative study design was used to meet the study objective. Figure 1 shows the timeline of study activities. Focus groups and interviews were conducted to gain initial reactions to beta-versions of SGA for PA promotion. Next, idea generation sessions were executed to understand users' opinions and to promote culturally relevant, enjoyable, and motivational SGA for PA promotion. These data were then utilised to create scenarios, storyboards and paper prototypes that could be developed and tested in future projects. The study design and all study activities were approved by the Virginia Tech Institutional Review Board.

Recruitment

A purposeful sampling strategy was used to identify and recruit potential participants attending programming at a Boys & Girls Club in a low SES urban area in southwest Virginia. Adolescent eligibility criteria included English speaking, between the ages of 11 and 15, and attending the Boys & Girls Club summer program. Adult eligibility criteria included English speaking and a parent of an adolescent attending the summer program at the study site. During pick-up or drop-off of adolescents, flyers were distributed to the Boys & Girls Club families and each parent was informed about the study. Interested parents signed a consent form prior to participation. Adolescents with parental consent were required to sign an assent form and have a signed parent permission form prior to participation. Interested adolescents were invited to a focus group and interested parents invited to an interview and received a $10 and $20 gift card, respectively, and a meal at the focus group or interview in appreciation for their participation.

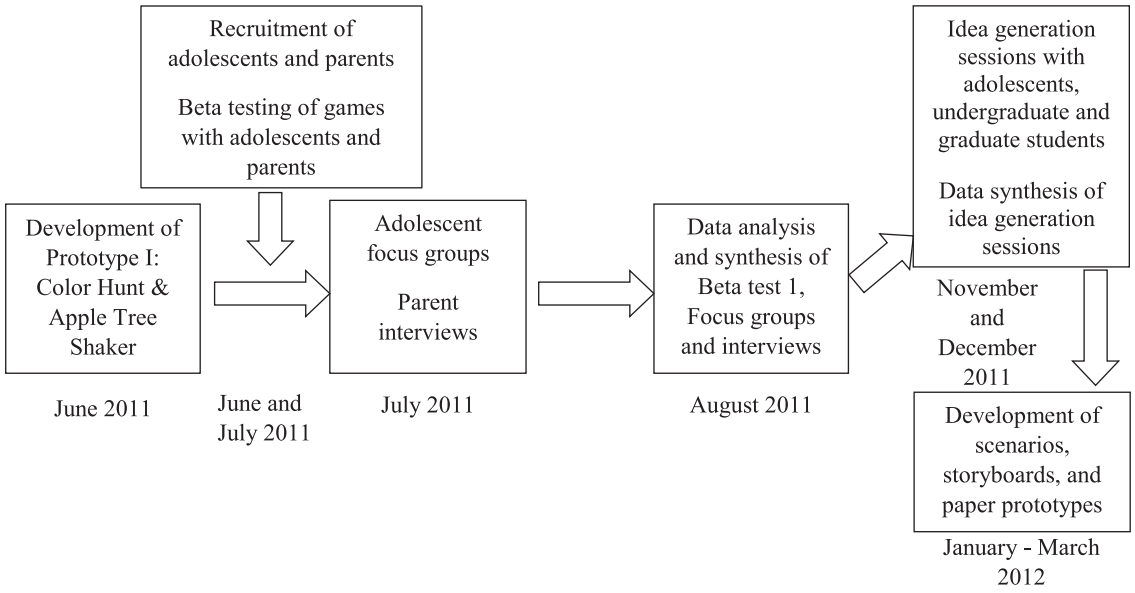

Figure 1: Timeline of Study Activities

Research Team and Beta Smartphone Game Applications for Physical Activity Promotion

To initiate the user-centred approach, a SGA team was developed that would reflect expertise in technology, behavioural theory, and perspective of older adolescents. This team comprised of two graduate students, three undergraduates, and faculty experts in the following domains—industrial systems and engineering, computer science human computer interaction, health economics, and health promotion via interactive technology. The SGA team planned and developed two initial prototypes called Color Hunt and Apple Tree Shaker (see Clark et al.[21] for more detail). In Color Hunt, participants chose a colour between red, green, and blue and then used the camera on the smartphone to take pictures of objects of the chosen colour. Level progression was based on if the player completed the amount of tasks within the specified time period. In Apple Tree Shaker, which used the phone-based accelerometer, participants shook the smartphone to make apples fall off the apple tree. Points were awarded based on how fast players shook the phone within the designated time length.

Focus Groups and Interviews

Focus groups were conducted using the methods suggested by Kreuger and Casey[22] and interviews were conducted using the methods suggested by Seidman[23]. Three focus groups (n = 14; 45–60 minutes per group) and seven parent interviews (approximately 30 minutes each) were conducted at one Boys & Girls Club. Two trained graduate students moderated the focus groups. A semi-structured script was developed for the focus groups and interviews. The script included questions about the participants' general perceptions and experiences with gaming, music, online social networking, maps, GPS, camera, and text messaging on mobile phones, as well as their perceptions on smartphone features for PA and the type of PA reinforcement feedback desired from the SGA. To promote clarity and accuracy of responses, follow-up probes were asked based on interviewee responses.

At the beginning of the focus groups and interviews, Color Hunt and Apple Tree Shaker were briefly described to the adolescents and parents and they had an opportunity to play the games. This was done so that adolescents and parents could understand what it would be like to play SGA and to assess if this type of intervention would be enjoyable or engaging. Also initial likes and dislikes with games were identified. Data saturation was sufficiently achieved after conducting three focus groups and seven interviews. Sessions were audio recorded and transcribed verbatim. Two graduate students and one senior researcher reviewed the transcripts to identify meaning units and emerging themes. This group then met to review assigned codes and reconcile disagreements. The process was recursive, as it guided decisions for further exploration and analysis. Coding occurred at multiple steps which led to major themes and meaning units (MU) shared in the *Results* section.

Idea Generation Sessions

Design team members conducted five game idea generation sessions, each lasting approximately 30 minutes. Sessions were held to get a range of perspectives, SGA ideas and identify desirable features. Sessions were with the target audience (i.e. adolescents), young adults, and graduate students with a focus on behavioural science and interactive technologies. At each session, participants were informed of smartphone features and their functions. Participants were instructed to think of games that could be played on a smartphone while promoting PA. Due to the number of participants (~20–40 people), the Crawford slip method[24] was employed. It is an approach used for obtaining ideas from a large group and organizing those ideas promptly into categories. It comprises of pieces of paper as a data generating and organizing tool. For the first ten minutes, participants individually brainstormed and drew game ideas on paper. Then for five minutes, they were split into groups of five where they explained their game idea(s). The next ten minutes involved thinking of collective game ideas. Participants were instructed that games could be a modification or extension of an individually created game or a completely new game that the group invented together.

Participants included the name and rules of the game, phone and game features, and description of levels and rewards. Each group illustrated hand drawn screenshots of their game by using poster-size paper. Next, each group presented their game ideas to the other groups. Other groups provided feedback and asked questions related to game ideas.

Scenarios and Paper Prototypes

Based on information gathered from the focus groups, parent interviews, and idea generation sessions, the research team designed scenarios and paper prototypes of the potential games. When considering which ideas to move forward for prototype development, the top factors guiding the decision making process included concepts that: 1) were mentioned most frequently across the idea generation sessions, 2) had the best potential of engaging adolescents in movement and increasing their PA, 3) could be reasonably developed into a SGA prototype by the research team programmers, and 4) did not overtly duplicate similar games already available and readily accessible by youth (e.g. Dance Dance Revolution™, Michael Jackson Experience™).

Scenarios are used regularly in the study of human computer interaction and are stories that consist of a setting, or situation state, one or more actors, with personal motivations, knowledge, capabilities and various tools and objects that the actors encounter and manipulate.[25] Scenarios were designed based on different types of children who may interact with the games (e.g. those who prefer to play competitive games, cooperative games, or games by themselves). Hand drawn and computer generated prototypes (pictorial representations–rough sketches) were developed. These are visualization tools for presenting proposed functions, structure and content of a smartphone application.[26] Using OmniGraffle[27] software, computer generated prototypes were created for each game and displayed in a screenshot layout.

Results

All adolescents (n = 19; 53% male; 58% Black) were eligible, of which 15 consented and 14 participated in focus groups (n = 1 absent on day of scheduled focus group). Adolescent participants ranged from ages 11–16 ($\underline{m}_{age}$ = 13.4 years; 57% male; 57% Black). Seven parents (86% Black) including six females and one male participated in the interviews.

Adolescent Focus Groups

Table 1 displays data from focus groups. Numerous comments were related to attractive phone qualities (n = 65 MU). Within this theme, the four most frequently mentioned categories were downloading applications/games (n = 15 MU), online social networking (n = 11 MU), ease of use (n = 11 MU), and portability of smartphones (n = 11 MU). Remaining categories included music, GPS, and texting. A statement pertaining to the most discussed category was, the application "gives you something new to do. It's like a new toy that you get for Christmas." In terms of portability: games, music and social network applications were highlighted. Texting was the most mentioned code under ease of use. Adolescents mostly used online social networks for social interaction/flirting and communication.

Many comments were connected to points that could be generated through game play (n = 37 MU). A participant stated, "Points would make me feel healthier." Additionally, negative points were identified as being potentially motivating. An example

Theme	Category (MU)	Sub-Categories and Sample Meaning Units
Attractive phone qualities (n = 65)	Downloading applications/games (n = 15)	Fun – "I'd like them. They can be fun." Variety-"Gives you something new to do. It's like a new toy that you get for Christmas." Cost-"I like that I get everything for free." Family time – "Something that me and my parents can do."
	Portable (n = 11)	"Games can be portable." Music-"Could listen to it anywhere." "Social Networks are portable."
	Ease of use (n = 11)	Texting-"If you had a problem with your speech than they'd be able to understand you better texting." GPS-"Type in the address and show me where it is."
	Online social network likes (n = 11)	Stay in touch –"To keep track of my friends and stuff" "Keeps you up to date" "It's so popular" Ease of communication-"If I get a (Facebook) message or an alert, then I can, it just comes straight to my phone as a text message." Family connection-"To talk to my other family members that I never met"
	Music likes (n = 8)	Sleep-"Music helps me go to sleep" Relaxing-"Music is relaxing" "Music calms me down" "I love music" Multipurpose-"You can still get calls [when listening to music] so you don't have to worry about carrying two things around" "To rock out!"
	GPS likes (n = 5)	Voice capability-"You can get any voice that you want" "It's convenient"
	Texting likes (n = 4)	"Texting is fun" Quiet-"Talk privately in public"
Type of Points (n = 46)	Points (n = 37)	Positive-"Points would make me feel healthier" Negative-"When you get that negative feedback, it makes you want to work harder"
	Competitive feedback (n = 9)	Competitive feedback-"I'd be bragging. Ooh, I'm beating you! I'd beat everybody."

Table 1: Themes, categories, and sample meaning units related to smartphone games to promote physical activity among adolescent participating in focus groups

statement was, "When you get that negative feedback it makes you want to work harder." Lastly, competitive feedback against others (n = 9 MU) was the least discussed category. One participant in reference to this category, exclaimed, "I'd be bragging. Ooh, I'm beating you! I'd beat everybody."

In response to games developed for focus group sessions, participants generally liked Color Hunt more than Apple Tree Shaker. Participants found Color Hunt relatively easy to play, regardless of variations in amount of participant movement and adolescents primarily had positive responses about it. When asked what they thought about playing Color Hunt regularly, one sample meaning unit from a male was, "That'd be awesome" and from a female was, "That'd be really cool". Females, in particular, did not like Apple Tree Shaker because male scores were consistently higher than female scores.

Parent Interviews

Many comments were related to feedback desired from the adolescents playing with SGA (n = 27

MU). One parent stated that "...give me feedback and let me know what game they're playing..." Another parent suggested, "They [adolescents] can earn points based on how they play the games that they play." Another theme that was identified under parental perception of SGA was perception of prototype (n = 20 MU). Overall, most comments were positive (n = 18 MU). For example, one parent indicated, "I think they [adolescents] should use it...I don't see anything wrong with them [adolescents] using it." Though unintended consequences for using the smartphones were not assessed, one parent noted her concern, "...have to monitor him [adolescent] because he [adolescent] will get on the wrong websites."

Additionally, family PA context was a theme. Parents perceived that their families were most active on weekends. The activities that parents and adolescents did the most together were walking and playing hide and seek/tag. The main barriers for parents included lack of motivation and feeling tired after work. Parents perceived that the biggest motivator for their children engaging in PA, was seeing other children being active.

Another theme from parent focus groups was parent experience with mhealth applications and thoughts of effective components for adults. The majority of parents had never downloaded a mhealth application (n = 5). Of the two that had experience with downloading, they did not use it because it was difficult or boring. Parents perceived that having music, visual displays of PA data, and a PA tracker that provided feedback would be features that would enhance a mhealth application for adults. One parent stated, "Well I would like to see how much movement I do...How much walking you did that day...How many steps you made in an hour. How many steps you made that day."

Lastly, parents discussed child phone applications usage. All parents wanted to be informed of what activities their children were playing, the duration/frequency, and how their children were progressing while playing the mhealth applications. For example, one parent desired to know, "Are they really interested in the game? How long did they play it? And um are they mastering the game to where they can go onto another game." They suggested that their children receive feedback from the application in terms of how well they were doing in being physically active. Parents liked the idea of receiving text message feedback on their child's mhealth application usage and wanted to use the information to help their children stay on track by discussing the information with them. One parent noted, "I think it [application] would be good...It would help both of us...They [children] could keep track of what they're doing and maybe add to it if they wanted to up it. And then I could at least see that they're doing something.... It would let you know if nothing had been logged for that day...Maybe it could send you an instant message that your daughter hasn't, you know, checked in today."

Idea Generation Sessions

In the idea generation sessions, there were a total of 30 adolescents who were in the sessions at the Boys & Girls Clubs (one-third of which had participated in the focus groups), 30 older adolescents and young adults in the Virginia Tech undergraduate course and 20 adults of varying ages in the graduate student group. Participants came up with various game ideas (Table 2) that fell within the categories of recreation (e.g. Dancing Game, Cheer Mania) and sports (e.g. Softball Mania, Basketball for Dummies). Both of these categories had the same amount of game ideas. The most frequently identified sport was basketball (n = 3) and for recreation was tag (n = 2). Some groups explicitly reported how points were rewarded. For example, The "Whack-a-mole" group stated that "you get points when you whack your selected mole". Participants came up with simple rules and the majority of games used the GPS, Bluetooth, and the camera.

Design and Adaptation: Scenarios and Paper Prototypes

Based on the previously described factors guiding decision making, the top five games selected for prototype development were Dancing, Tag, Whack-a-mole, Color Hunt, and Basketball for Dummies. The SGA team came up with two additional games Fish Out of Water and Sharks and Minnows by identifying characteristics from game descriptions from the idea generation sessions that would be potentially motivating. Fish Out of Water involves a player to follow directions (e.g., turn right, run forward) given by the phone, so that he/she can save the fish and return it back to its fish bowl before time runs out. Sharks and Minnows is similar to Tag but multiple people are "it" at the same time. The "it" persons try to tag as many players who are not "it" as they can before time runs out.

Type	Game	Description
Recreation (n = 10)	- Cheer Mania	- Similar to a dance AVG but cheerleading moves instead
	- Deer Hunter	- Simulates deer hunting
	- Musical Freeze Tag	- Run around and hide while music plays from the phone and when it stops, everyone has to freeze or stop where they are. The ''it'' person can see on the phone where the ''un-it'' persons are and tag them.
	- Obstacle Course	- Virtual obstacle course where the player jumps, runs and dodges obstacles
	- ZADAT Tag (Musical/flashlight tag)	- Team or Individual tag. Music plays when person is tagged or if in the dark, phone lights up.
	- Funky Chicken	- You can be different coloured chickens and you do the funky chicken dance to the funky chicken song.
	- Exercise Twister & Dance	- Different types of music are played. The faster you move, the faster the tempo of the music is, the more points you get.
	- Dancing Game	- A series of dance moves are displayed and the player has to recreate the moves. Scores are given in points or a letter grade based on accuracy of the dance moves.
	- Color Hunt	- Pick a colour. Use the camera phone to take pictures of the things that are the same colour as the selected colour.
	- Whack-a-mole	- Select a mole. Different moles stick their head out of the ground hole. You get points when you whack your selected mole.
Sports (n = 6)	- Track/Field	- Simulates events done during track like hurdles, discus, running
	- Volleyball	- Simulates a volleyball game
	- Basketball for Dummies	- Move around and shoot baskets. More than one basket; Baskets move further away or side to side
	- Softball Mania	- Play softball by pitching or if on offense hit the ball and run around bases.
	- Football/Basketball/NASCAR	- Simulates real-life conditions of these activities
	- Basketball	- 5-on-5 game

Note. AVG = active video game

Table 2: Idea Generation Sessions Results

Example scenarios are in Table 3 and corresponding hand drawn and computer generated paper prototypes are in Figures 2 and 3. The basic rules for Tag included that everyone was ''it'' for the same amount of time but at different times. A player can only get points when he/she was ''it''. The more players the ''it'' person tagged, the more points he/she received that round. Each round was approximately 4–5 minutes long. We developed scenarios to ensure that the game could be motivation for children who enjoyed competitive, cooperative, or individual play.

Discussion

The objective of this study was to develop SGA grounded in design components through a user-centred approach that involved adolescents throughout all phases of development for PA promotion. This study explored user preferences from low SES adolescents and parents for SGA development for PA promotion. The adolescents identified attractive qualities of smartphones (e.g. ability to download applications/games) and that different features were easy to use and enjoyable (e.g. texting, GPS, and music). Moreover, they wanted a positive/negative reward system and appeared to be motivated by earning points. The data suggested that they had a strong desire to compete against peers. Additionally, parents wanted to receive as much feedback as possible in regards to their child's progress. Overall, both adolescents and parents had positive perceptions towards the Color Hunt game and welcomed the idea of more SGA. In terms of idea generation sessions, adolescents

Type of Scenario	Example
Competitive	John and his friends each grab a phone. Today, John really wants to play the Tag application because yesterday, he had the high score. So John urges his friends to play Tag. After playing Tag for about 15 minutes, he is excited because he has gotten the most points. John brags to the other adolescents, ''Yes, a new high score!''
Solo	Jimmy is the first person ''it''. While all of the kids are running around, Devion is far in the distance playing Tag but more so playing by himself. He has discovered the precise distance that he can go so that he won't be ''it'' by default. Devion has to make sure to stay within the specified game parameter and to continually move. Jimmy has a decision to make. Does he want to go for a person that is closer so that he will get some points or does he want to go for Devion who is very far away so that he can get lots of points?
Cooperative	Maji and her friends each grab a phone. They decide to play Tag in group mode. Maji and Jennifer are the first group ''it''. Standing side by side, they come up with a quick strategy on how they will tag others to get points. Maji runs left and Jennifer runs right. Maji enjoys playing Tag because she can play this with her friend Jennifer and earn points tagging others.

Table 3: Scenarios for Tag

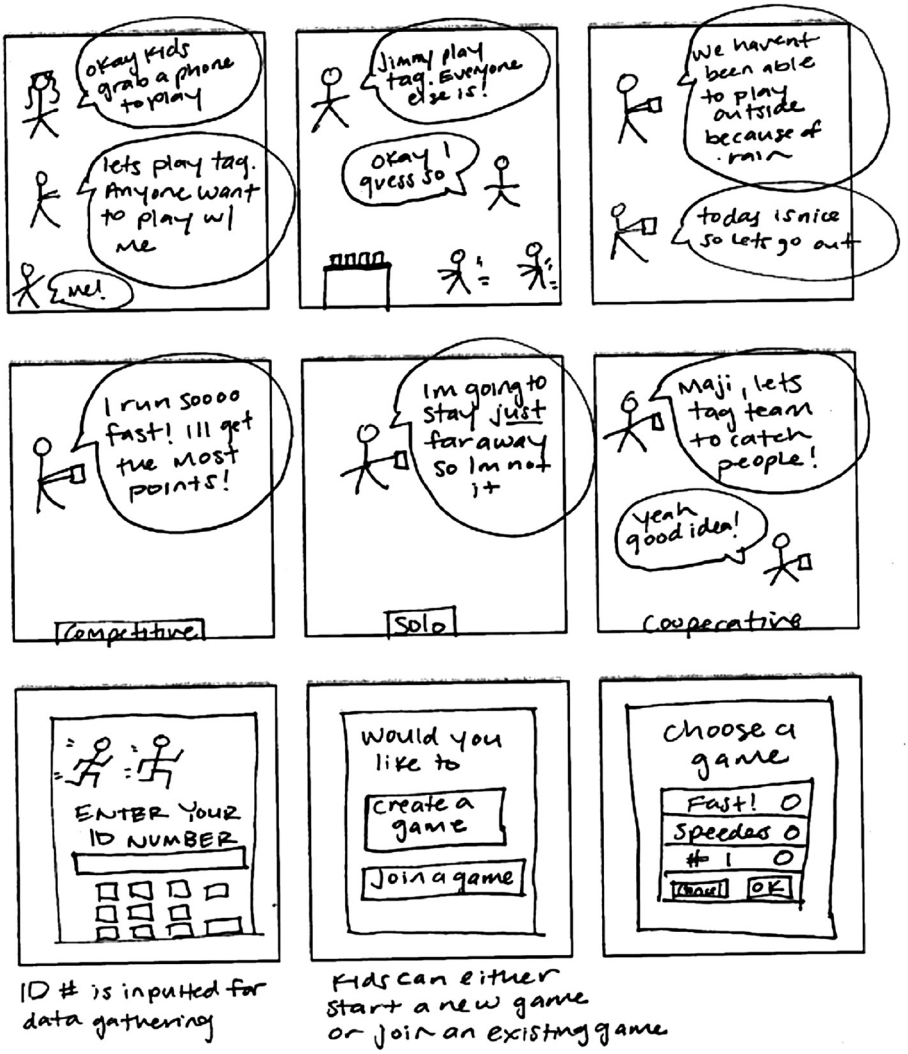

Figure 2: Hand-drawn paper prototypes of Tag

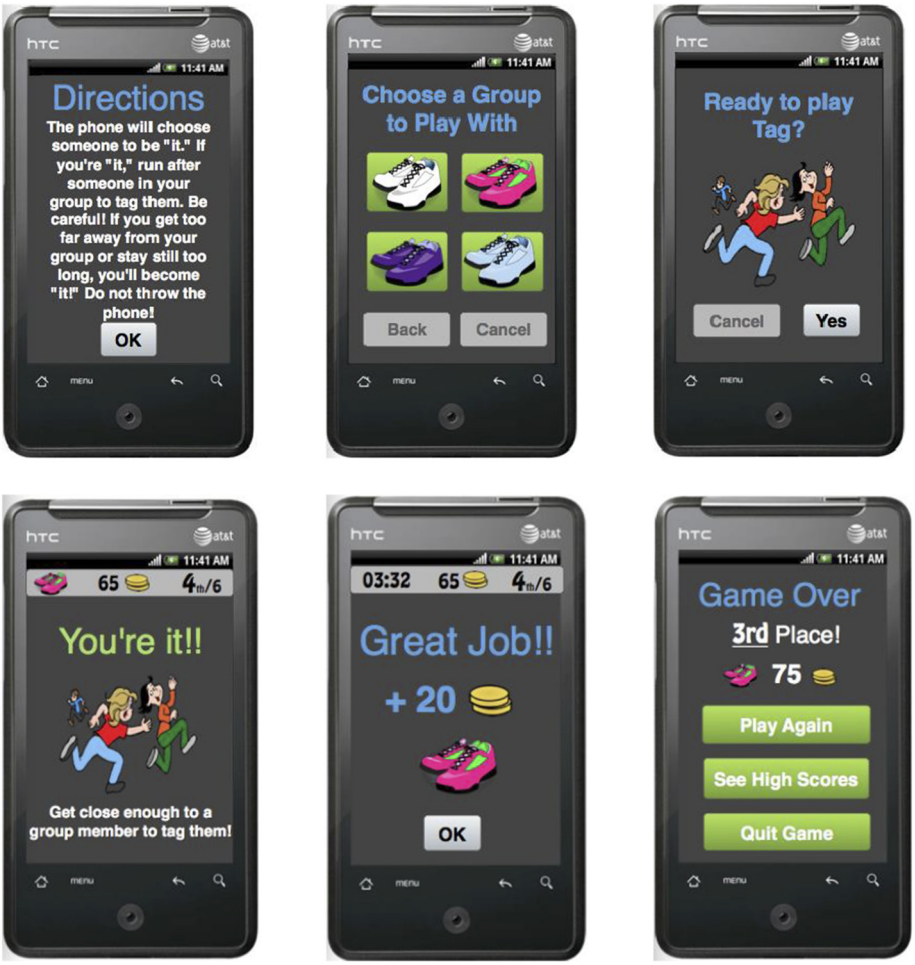

Figure 3: Computer generated paper prototypes of Tag

described recreation and sports games that they created. Findings highlight the importance of adolescent engagement throughout all phases of game application development.

Adolescents vary on their motivation or incentives for playing games. For example, in one study where prototypes were developed for PA promotion, adolescents that participated in focus groups articulated that they favoured receiving motivational phrases from a friendly female animated agent as they interacted with the prototype.[12] In contrast, adolescents in the current study did not desire motivational phrases nor an animated agent. Instead, they were satisfied with having quantitative feedback/reward through negative and positive points. This suggests that perhaps the adolescents in the present study may have high motivation or ability for PA and/or for playing the games.

Findings from the present study also reveal some similarities with other studies. For example, in the development of one study,[12] characteristics of the games that were desired included social, competitive, outdoor, simple to learn, and with large variations. This information will guide the future development of multiple SGA for testing, such as developing more competitive games that can be played outdoors.

Parents wanted to receive feedback from the games that their child played. This is important because though parents may not be present during game play, they could help with reinforcing the importance of PA and discuss game progression with their child. In essence, parents could act as another external motivator for PA promotion. During game testing, the impact of having a parent as a motivator could be tracked by asking the adolescents, how often their parent asked about game usage or PA. Since most parents had minimal experience with smartphone applications, it was surprising that these parents were supportive of their children using SGA for PA. It was encouraging that parents were willing to learn how to use their phones to obtain their children's PA and SGA usage information.

Adolescents described the desire to play games that included activities (e.g. basketball, tag) that they were comfortable doing. During idea generation sessions, this was inferred when each group presented to the other groups. This also implies that novelty or unfamiliarity of a game could be a barrier for PA. Therefore, as games are created, familiar concepts of games will be included. Our emphasis on tailoring mobile technology to user preferences is also supported by other studies.[28,29] For example, one previous study found the impact of an electronic system designed to help children and their parents was minimal because desires of the children/parents were not investigated.[29] These findings highlight that the impact of technology can be diminished when designers make their own assumptions about the desires/needs for technology, without engaging the end user in the process.

Additionally, from a design perspective, adolescents identified that they were comfortable with various phone features. GPS will be incorporated into games, whereby the games will interact with the adolescents' real-time environment. For example, if the adolescent is playing on an open field versus on a playground, the GPS could detect that and then adjust the game accordingly. Background music and sound effects can be integrated into the games. Further, the type of music and sound effects that are suitable for adolescents will be explored. Text messaging can be enabled during game play so that adolescents can communicate through texts for people who may be playing the same game at the same time but in a different location.

The current study had several strengths. It used adolescent and parent engagement throughout the design and development process. Perceptions and experiences were assessed and idea generation sessions for potential prototypes were held. Specifically, engaging youth throughout phases of health promotion technology-based program development and design has been noted as viable in past literature.[15] Though, this process may take longer than other approaches (e.g. researcher-centred), it may increase adherence and prolong engagement in health promotion technology programs and health behaviours.

This study is not without limitations. Perception was only assessed and thus it is unknown if SGA will be utilised once the adolescents have access to it. Also, the sample size for the focus groups and interviews was relatively small. However, qualitative data saturation was achieved. Indicating that the sample size was appropriate. Moreover these participants were mainly of low SES, so results may not be generalizable to other populations.

After reviewing past literature and analyzing the information from this study, the following activities are recommended. Adolescents and their parents should be engaged early on in the development of health promotion technology-based programs. Since the adolescents in the current sample were familiar with using different phone features it is suggested that future designers integrate more phone features into health promotion applications. Easy to understand instructions should be provided in words, images, sounds, and tactile sensations. Games should have a competitive element but not too competitive so that certain individuals are not deterred from playing. Moreover, a social networking feature should be incorporated which consists of a established online social networking sites (e.g. Facebook®, Twitter®, Instagram®) or one just for that particular application. There should be variations within the game (e.g. different levels of difficulty, rewards) and a number of games to play with. Lastly, it is recommended that parents be provided feedback on their child's behavior change progress.

Conclusions

The current study results suggest that it would be acceptable and promising to continue development of SGA and test their feasibility and effectiveness in this population. It is also implied that SGA could promote PA in this population. The aforementioned approach provides a guide as to how to design and develop SGA.

Ongoing work focuses on continued development and deployment of SGA. Availability and cost of sensor-based devices enables youth groups and families to invest in the technologies necessary to put SGA into the hands of adolescents. In so doing, that will make possible longitudinal, real-world tracking of the use and impact of SGA—toward better understanding their effectiveness and promise.

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