Mobile Technologies and Its Advantages with Promoting Healthy Habits amongst Children

Monika Monk[1], D. Scott McCrickard[1], Adil Kadir[1], Brandon Dockery[1], and Kacie Allen[2]

[1] Department of Computer Science
[2] Department of Human Nutrition, Food, and Exercise,
Virginia Tech, Blacksburg, VA 24061, USA
{mmonk90,mccricks,adilk,bsdocke,kaciea1}@vt.edu

Abstract. This paper describes an app suite that consists of mobile games to encourage increased activity and healthier eating by children in fun and motivating ways. The apps include Scavenger Hunt, in which a user can take pictures of objects that match a specific color in a short amount of time; Fish Out of Water, that tracks the number of steps you take to "catch" the fish; Space Rayders, a mobile game similar to tag; and Health Attack, a memory game based off of the food pyramid. The paper describes how the apps help increase awareness of aspects important for living a healthier life for children, highlighting a plan for dissemination through youth clubs and mobile app stores.

Keywords: Mobile technology, interaction design, exergames.

1 Introduction

In today's society, there is an alarming number of people, especially children, who have life-threatening diseases and conditions. Several of these diseases and conditions, such as heart disease and obesity, can be "prevented or lessened with a healthy diet and exercise" [3]. In recent years, there have been several initiatives taken to help society live healthier lifestyles. One popular initiative is First Lady Michelle Obama's campaign to fight against childhood obesity [2,3]. The popularity of video games and mobile phones over the years opens a path to help address this epidemic.

Mobile technologies have become more integrated into today's society than ever before. From elders to young children, mobile technology has a range of users and is used for different purposes. One type of mobile technology that is becoming increasingly popular is called *exergaming*, defined as "video games that also provide exercise" [5]. Examples of popular mobile exergames that have had a positive impact on increasing activity amongst its users include the Wii Fit and the Kinect's Dance Central, both bringing positive attention to incorporating exercise into video games.

This paper describes our app suite, geared towards children, that includes different mobile games. The games increase the motivation to become more active by inspiring students to compete and cooperate at fun activities. The games have been deployed through the United States Boys and Girls Club with encouraging results [1].

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The ongoing effort described here shifts the game focus from a club environment with focused time periods, adult supervision, and a guaranteed multi-player environment to a broader use scenario in which anyone can download the games and will be motivated to use them.

2 Promoting Healthy Habits amongst Children

Each mobile game in the app suite was created from various different motivations, each geared towards healthy habits, including diet and exercise. Color Hunt, Space Rayders, and Fish Out of Water were mobile games for use by children from the local Boys and Girls Club [1]. The initial versions of these apps were used through the Boys and Girls Clubs of America in southwest Virginia. Over 30 young people played the games for 30 minutes a day, four days a week, for five weeks. Results from accelerometer data and student inquiry indicated that many of the games encourage a higher degree of physical activity, and many of the students enjoy the competitive, multimedia aspects of the games.

The versions of the games used by the Boys and Girls Club were targeted for specific session lengths, and they were intended to be used in supervised situations when an adult would configure the game to support multiple players. The games also collected data about game play, with permission from the children and their parents. Because of these complexities, each game was modified and updated so that they would be easy to use upon download in the android market. With several of these games, the initial versions involved very complex setup that wouldn't be suitable in a standalone app—most users who download apps from an app market want downloads that are simple and easy to use. The remainder of this section describes the apps, focusing on how they differ from the previous version.

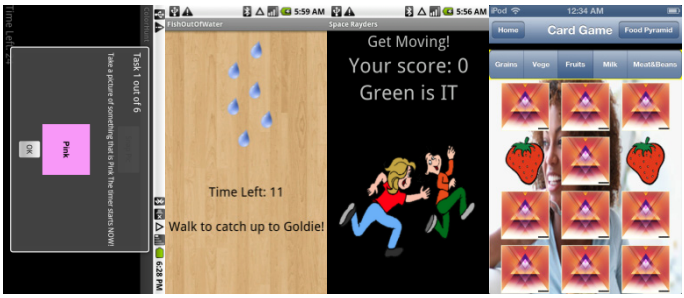

Fig. 1. Action shots of the games in our app suite (from left to right): Color Hunt, Fish Out of Water, Space Rayders and Health Attack

2.1 Color Hunt

Color Hunt (previously known as Scavenger Hunt [1]) is a game where the player's objective is to take a picture matching a target color that will be given in a random order. The user can choose between three different difficulty levels: easy, medium, or

hard. As each level gets harder, the amount of time the user is given to find each color decreases. When the user matches each color correctly, they will be given points; if the user matches a color incorrectly, they will not receive any points. A screenshot of the game can be found in Figure 1.

The initial version of this game, known as Scavenger Hunt, involved the player taking pictures of different objects matching six preset colors. There was no time limit or scoring involved. When we were brainstorming ideas on how to make the game more interactive, we came up with several ideas. One idea involved adding a storyline to the game to make the player more engaged in the game; there would also be an incentive that the player would receive for completing each task correctly. Another idea involved having the picture of the item shown to the user in a pixelated picture to show the user how close he or she was to the target color. By showing the user just how close he or she was to the target color, they would be able to learn the different hex colors that a certain color can appear as. However, this idea was rejected because we felt as though this would confuse our target audience.

2.2 Space Rayders

Space Rayders is a "tag" game—a multiplayer game where each user is assigned a color. When the game begins, the person that is "it" is chosen, and they have to "catch" whoever is not "it". To catch another player, the "it" person comes closer to their target and the phones begin to light up and vibrate warning the target that they are about to be caught.

The current and initial versions of Space Rayders are very similar. The initial version, however, was too complex to distribute on the market: users would have a very difficult time trying to set up the game because they would have to follow a very complicated method so that each phone that was using the game would be connected that was used to track users and collect data. The current version of the game needs to only have the Bluetooth connected and minor user setup, with tracking and data collection removed.

2.3 Fish Out of Water

Fish Out of Water is a game in which the player's objective is to "catch" the fish that has escaped from its bowl. The player has to go a various number of steps in order to return the fish back to the bowl. As each task is completed, the time to "catch" each fish decreases but the number of steps you take increases.

Currently, this game has not been changed. Under consideration are changes to the background pictures to be more aesthetically pleasing to the user audience. This can be solved simply by uploading changes to the game through android market.

2.4 Health Attack

Health Attack is a memory game that incorporates different foods from each food group in the food pyramid. As each food is matched correctly to one another, an

information pop-up will appear and give a fun fact about each food that is matched. This food is placed in a food pyramid diagram, which the user can find more information about the food. We are considering extending the platform set of Health Attack from iPhone to also include Android so that all the games in the app suite are more broadly available. This will allow us to view download data easier and provide updates when necessary.

Health Attack was not part of the game suite used in the Boys and Girls Club. It pre-dated the other games, and it was targeted towards the African-American community because of the increasing rate of obesity issues, particularly for this community [3]. When the design team developed Health Attack, they wanted to make the target audience children from ages 7-11 because of how influential children are around that age. The children would be able to play a video game but also learn about the different foods they were eating at the same time.

3 Dissemination and Analysis

To assess usage, the number of downloads and user feedback will be monitored and documented. A Facebook page -- www.facebook.com/ExergameAppSuite -- is used as the main advertisement source. This page is being publicized through email, Facebook messages, flyers given to elementary school teachers and various after school programs, and through word of mouth. Furthermore, the location of the App Suite in the Android Market will also be provided on all the advertisements. Based on the number of downloads, continual usage, and feedback, we can determine if our approach to using mobile games is effective or not. We will augment the games with "high score" pages to provide insight into the frequency and duration of play of users.

4 Conclusion and Future Work

With the rise in life-threatening diseases, such as obesity and heart disease, and the increased usage of mobile technology, different types of mobile exergames can be formed. Because more children are using the mobile devices, we have come up with a solution to help them become more active, learn about healthy lifestyles, and have fun all at the same time. In our app suite, there will be four games available to download. These games will be free and will be marketed through a Facebook page. The website can be found at www.facebook.com/ExergameAppSuite. For future work, we will expand the App Suite and monitor the Facebook page and App Suite to assess the needs and impacts of our work.

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