

Combating Obesity Trends in Teenagers Through Persuasive Mobile Technology

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Throughout the last decade, there has been an alarming increase in obesity prevalence among adults and teens throughout the world. Obesity has been found to increase the risk of developing diabetes, cardiovascular diseases, and some cancers. Due to the many health risks associated with obesity, an increase in prevalence has also pressured health care systems and the finances of the individual. Our research proposes to decrease obesity prevalence in adults by motivating teens to become or continue being physically active so that they can continue these healthy lifestyles as adults. Our goal is to encourage long-term adoption of physically active behaviors by introducing a motivating application running on a mobile device. We use the Technology Acceptance Model, the Theory of Planned Behavior, the Theory of Meaning Behavior, and the Big 5 Personality Theory to guide our design.

Introduction

Fitness and physical activity teen programs face problems such as a low number of participants and inconsistent attendance by those who do sign up. One of the major obstacles for teenagers is that they must rely on their parents for transportation to the facilities where these programs are held. By developing our application on a mobile device we have eliminated the transportation issue. For our pilot work, we focused on motivation and making exercise fun. We accomplish this by asking teenagers to play games that are location or accelerometer based and that require physical activity. Our system also uses personality information as determined by the Big 5 personality theory to recommend games for the user and motivational phrases to play.

The main theories used to shape this design were the Technology Acceptance Model (TAM), the Theory of Planned Behavior (TPB), the Theory of Meaning Behavior (TMB), and the Big 5 Personality Theory. The technology acceptance model tries to predict if a technology will be accepted and adopted by users. This model says that in order for a system or technology to be accepted it must address two key components: perceived usefulness and perceived ease of use. Perceived usefulness is a reference to how much the user thinks this technology will be useful and helpful to get the task done. The user must also believe that it will be easy or straightforward to accomplish the task with this new technology

(perceived ease of use). TAM is used to shape the whole system design, i.e. the system is designed to perform and provide useful information for the user and the interface is designed in a way familiar to the user group.

The theory of meaning behavior accounts for how both external and internal incentives promote behavior change. External incentives can be thought of as rewards for behaviors, such as getting a treat if you get good grades or a medal if you participate in sports. Internal incentives are incentives which we have internalized and associated to personal rewards such as 'personal enjoyment'. Our design begins by using external motivators such as the motivational agent and phrases. We hope the internalized motivator will be an association of physical activity to a fun and 'easy' behavior.

The theory of planned behavior says that there are key components that affect behavior. These components are perceived control, subjective norms and attitudes, and behavioral intention. In TPB, perceived control is based on how easy or difficult the individual believes performing the behavior will be. Subjective norms and attitudes refer to the influences that other people whom the individual likes or considers important affects his or her behaviors. Finally, 'behavioral intention' refers to whether or not the person wants and plans to do the behavior. Our system encourages intention and perceived behavioral control through the motivational phrases spoken by the motivational agent. Likewise, we believe using games will increase perceived behavior control and will also adhere to the social norm of playing games for this target group.

The Big 5 personality theory is then used to personalize the system to each user. Personality codes are determined for each user and used to decide which games to suggest to the user and what motivational phrases to play. We believe doing so will enhance the user's experience and it will improve the likelihood that interaction with the system will be found to be more enjoyable and motivating as a result.

Implementation

We created our prototype using the iPhone SDK, which is coded in the Objective-C language. Our system motivates teenagers to do physical activity by suggesting a list of iPhone / iPod Touch games that require motion – either walking around (GPS-based games) or arm movement (accelerometer-based games). First, the user takes a short ten-question personality quiz to determine their personality code, which gets saved to a database in order to be used later. The personality test is a shortened version of the Big Five Personality Test that has been proven to provide comparable results to the full forty-question test. After the user's personality score has been determined, the system selects an agent. Short videos featuring the agent play at different times as the user browses the application. The agent says motivational phrases designed to encourage the user to keep playing. Two agents have been created for this

application to cater to different personality types: a polite and encouraging female agent and an agent more akin to a drill sergeant. In a focus group, the participants reacted very positively to the polite agent, saying, “She seemed really nice” and “I would keep playing if she would tell me nice things”.

The agent condones physical activity levels when the user has obtained the goal of more than sixty minutes of activity on a given day, by having the agent say a phrase such as, “Great job! You are really on top of things!” If the activity level has not reached sixty minutes, the agent will say a phrase such as, “Why don’t we try playing for another thirty minutes?” or “Let’s try more activities tomorrow!” The phrases have also been tailored to match certain personalities; for users with a high extroversion factor an example phrase would be, “Tomorrow, invite a friend to play!” For users with a high introversion or antagonism factor, an example phrase would be, “Why don’t we try playing a game? It will be fun!”

Conclusion & Future Work

We gathered questionnaire data from over 25 teenagers, and have completed a focus group with 6 teenagers, four female, two male. We are currently moving towards applying what we learned from our focus group and survey data to improve and move forward with our design. Analyzing interviews we conducted with the participants, we found that they most enjoyed playing the games that were simplest to understand, and that they thought the agent videos were motivating and not intrusive. They also thought that it wouldn’t be weird to use the system around their friends or family. In fact, they thought that their families would be very interested in using the system. In the immediate future, we will begin a long-term study to test the effects of this system on long-term behavior change.

In the pilot study, we have chosen to develop our system for the iPhone and use existing iPhone games involving physical activity, rather than creating our own. Using existing games has allowed us to create a quick prototype so that we could get feedback from our focus group about what games the teens did and didn’t like, and which they would be interested in continuing to play. For the long-term study, we will use this feedback as a basis to actually create our own games that teens would find fun, and integrate them as part of the application.

Although the ability to use existing games was an advantage in our pilot study, the iPhone platform is limiting in that developers cannot run their applications in the background. This means we cannot gather accelerometer data or GPS data while the 3rd party game applications are running, and must rely on the user to log their play the next time they open our application. While the teens in our study didn’t think the idea of logging their play times was intrusive or annoying, in reality, having to leave our application to use an outside application sometimes meant that the user would forget to come back to log their data. In an integrated game system all logging would be done automatically, in order to make the

interface as unobtrusive as possible, and having games within our application will make everything much more stream-lined for the user.

Other future plans include artificially intelligent agents, instead of pre-recorded videos, and a wider variety of motivational phrases that are more specifically tailored to each personality trait. Another possibility is to develop the application for other mobile platforms. I am currently working on implementing our own version of a kung-fu game for the iPhone that was very popular with users during testing, incorporating the teens' suggestions to make the game an even better fit for our system.