Encouraging and Facilitating Social Support on Acquiring Healthier Behaviors through Mobile Applications

Zenobia Liendo
Fairfax, Virginia, USA
zenobiosky@yahoo.com

ABSTRACT

This paper describes the design and field evaluation of the Happy Healthy application that supports Health Intervention Programs in schools seeking to change behaviors regarding physical activity and nutrition. The main component in this application is a social mobile application that let students to share their progress, by sharing stories through photos, and encourage participants to provide feedback to each other. The Field Evaluation confirmed that these features can create a flow of social support in the group which, according to previous related research, leads to more effective results in this type of Intervention Programs.

Author Keywords

Health Interventions, Obesity, Mobile, Physical Activity, Nutrition, Social Support, Social Networks.

ACM Classification Keywords

H.4.3 Communications Applications
H.5.1 Multimedia Information Systems
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous

INTRODUCTION AND MOTIVATION

Overweight in youth have increased dramatically which leads to several types of chronic diseases. This is the time when teenagers can change their habits to healthier ones and it can change the rest of their life regarding wellness and health. Health Intervention programs promote healthier behaviors regarding nutrition and physical activity. Schools have been locations where this type of Health Interventions has been implemented. The social environment of students ('peer pressure') plays a very important factor in the effectiveness of these programs, and that is why methods to support positive social influence are important.

This project scope is to design an Integrated Application that supports Healthy Intervention Programs at Schools and Implement one of its main modules, a mobile application to engage students in a social network where they receive and provide social support toward the new healthy behaviors being acquired during a Health Intervention Program. This Mobile application receives and feeds information to the other components of the Integrated Application.

Teenagers already make heavy use of their mobile devices and social networks; they carry their mobile devices all the time. Young adolescents love to tell stories by taking photos; 'Instagram' is very popular among teenagers due to being photos the center of the conversation. The HappyHealthy mobile app seeks to make use of this type of channels and turn the "peer pressure" to a positive one toward healthier behaviors regarding physical activity and nutrition.

GENERATIVE RESEARCH AND AFFINITY ANALYSIS

The project started by conducting a Generative Research and Affinity Analysis, to identify potential mobile applications in a field of interest chosen.

The Domain of interest chosen for this project was: "Clinical Trials and Participant engagement". The initial research questions were:

(1) When collecting information from participants in forms, during their visit to the clinic, what are the challenges? is there some information that would be more accurate if the participant would had recorded close to the 'event' being reported? close in time and location.

(2) Beside collecting information, what type of reminders or information would be beneficial to send to the participant during their daily routine? (e.g. taking medications, doing some type of exercise ?)

(3) How would participants record daily or weekly information? (before going to their scheduled visit to the clinic) it would be mainly textual descriptions? photos of labels in food? reading numbers from medical devices? what tools do they use?

Due to privacy constraints I was not allowed to interview directly clinical-trial's participants in order to learn how they participate in these clinical trials. Instead I interviewed principal investigators and members of the study who actually specify and coordinate how the clinical trials would work (including participant's involvement). I consulted on the EDX's discussion forums if this approach would be acceptable and it was approved, here I'm quoting the reply: "Yes, I think that's a great alternative. There are two

potential end-users for such an app: the clinicians and the participants. Interviewing the clinicians might help you learn more about their needs and concerns, and help you think up ideas for an app that addresses them"

Methods chosen:

1. Interviews to two principal investigator and 2 members of the center who specify and manage clinical trials (P1, P2, P3, P4 and P7)
2. A type of 'conversation analysis'. People being interviewed directed me to the main document in the clinical trial where it is described, in detail, how the clinical trial will work, including the type of interactions with the clinical-trial participants (e.g: how they are contacted, lifestyle intervention program, collecting information, etc); this document is called the 'Clinical Trial Protocol' and clinics and other members of the study follow this protocol. I read two of them, I am considering each study's protocol a source of information (a 'user') regarding on how clinical-trial's participants are engaged :

   • P5: study targeting middle school students (from 11 to 14 years old) on changing their lifestyle toward healthier diet/nutrition and physical activity

   • P6: study targeting adults, comparing lifestyle interventions programs vs pharmaceutical treatments (prevention of serious phases on diabetes)

As a result, 80 quotes (virtual 'note cards') were collected from the 7 sources and stored in an Excel file. These quotes were used for an Affinity Analysis, where the quotes were grouped in themes, and then the themes were grouped in 'groups' (see Figure 1)

Figure 1. 80 quotes were collected during the Generative Research Study

Based on this information, 10 potential applications were identified and one of them chosen for this project, which is described in this document.

The following problems were encountered during the generative research study:

- some users were not willing to be recorded.
- lots of information to read that was not relevant to this project, looking for the relevant information

Study Findings:

The following groups and themes were identified during the Affinity Analysis (TN = Theme #N)

Group #1: pharmacological intervention tracking and monitoring

T1	I (study coordinator) am concern that participants may forget to take their medications and reminders would be helpful.
T2	I (study coordinator) need participants to report when they did actually took their medication, and problems encountered.

Group #2: tracking and monitoring the lifestyle intervention program.

T3	I (study coordinator) need participants to record, as accurate as possible their diet/nutrition.
T15	I (study coordinator) need participants to record, as accurate as possible their physical activities and sedentary behavior
T16	I (study coordinator) need participants to record their self-assessment scores
T9	I (study coordinator) think that sending reminders to participants to check their vitals (blood pressure, blood sugar) will benefit the monitoring of the treatment
T6	I (study coordinator) need to setup reminders for adherence to physical activities intervention programs
T8	I (study coordinator) consider collecting information from medical devices automatically without asking the participant to copy information.
T10	I (study coordinator) think that pictures will help on collecting nutritional information from food labels
T18	collecting information with just multiple choice and limited text data

Group #3 recording of unexpected events

T4	I (study coordinator) need participants to record unexpected symptoms/events as close as possible to the event itself, for accuracy
T7	I (study coordinator) wish to have more accurate information regarding non-scheduled visits to a doctor, from their medical records

Group #4 participant visits monitoring

T5	I (study coordinator) believe that sending reminders to participants for scheduled 'clinic visits' will improve assistance and retention of participants

Group #5 participant privacy/security of identity

T11	I (study coordinator) am concern about participant's identification privacy. It should remain hidden even if they use mobile applications with a direct login mechanism to our systems.

Group #6: lifestyle intervention toward healthier behaviors regarding diet and physical activity, using a set of strategies and programs.

T12	I (study coordinator) pursue to change the lifestyle, diet and physical activity of participants (1) middle school students, both in and out of school (2) adults
T13	I (study coordinator) look to use students social networks and make them a positive influence to change their lifestyle toward healthier behaviors
T14	I (study coordinator) implement strategies to maximize the attractiveness of the healthier behaviors and decrease the attractiveness of less healthy choices.
T17	I (study coordinator) implement programs to increase students self knowledge and enhance their decision making skills regarding a healthier diet and physical activity

Application Concept:

From reading the Affinity Analysis results, and looking at **Group #6**, it was evident that this set of needs could be supported by using a mobile application for social networks, especially for participants that are young adolescents, where peer feedback is very important. The purpose is to provide positive peer feedback that supports the new healthier behaviors, which will balance and replace the usual negative influences that are found in the environment regarding diet and exercise.

This mobile application would be a component of an Integrated Application that supports all the other groups of needs identified during the Affinity Analysis. The Mobile app will also gather information from the other modules, information that can be used to encourage feedback among members of the health intervention program. The Mobile application can also gather information that can be used by the other modules in the integrated application.

RELATED WORK

Mobile applications had been an important tool for the implementation of Health Interventions, its usage range from sending reminders through text messages, tracking health information, involving the health care team, remote coaching, remote symptom monitoring, leveraging social influence, among others [1]

The patient's social environment is a key factor for an effective health intervention program and mobile applications have already been used to promote social networks where this social support is provided [1].

The results of using applications to support social networks are mixed. Some projects were successful while others not. Some of the reasons why projects of this nature were not successful are:

•Member of the group don't know each other, and don't know what to say as a feedback

•Participants didn't know what to comment, how to give feedback. [2]

•It was time consuming to have to login and review participants progress to be able to give feedback [2]

•The comments provided were not constructive [2]

One of the most successful studies is one that encouraged physical activity and recorded progress by using a pedometer. They use a Facebook application, called "StepMatron", to provide the social component. The participants worked for the same hospital, they already knew each other and the social support and feedback flowed easily in a friendly environment. A significant increase in the number of steps was observed in the group that used the social feedback component [3]. When the social support is achieved, it does positively impact the Health Intervention Program.

Another successful project was a study that broadcasted real-time biometric data from runner to an application called 'HeartLink' where followers can expressed a simple feedback by pressing the 'Cheers' button. For every 5 clicks, the runner would receive a real-time vibration on her

phone. The study found that runners felt more motivated due to the 'feeling' of being followed.[5]

"Houston" [7] is an application that collected the daily steps taken by the participants and shared among 'fitness buddies', who would send messages of encouragement. The results of this study indicated that social support messages were very motivating and that friendly competition among friends was seen as helpful.

Therefore, it has been documented that when social support takes place, the results of intervention programs are more effective; they attained significant better results in comparison to groups of participants that didn't have any tool for social networking and support.

There were some studies that, even though they did have the social tools, social support didn't happen and the results of the intervention program was not different than the group without these tools. The key is that even though the tools were there, social support did not happen. Related work does mention some recommendations to make this social feedback to happen.

- "Provide additional context to aid people logging progress and giving feedback."[2]
- "Provide constructive recommendations early on" as examples [2]
- Easier social interaction will happen among members of a group that already know each other.

Mobile Notifications could also be an effective way to remind and encourage people to comment in other peers posts. Based on previous studies regarding notifications and wellbeing logging behavior [8], silent notifications are effective to remind people to perform an activity regarding health programs.

Another type of previous related application is games. When participant are young, games can be taken advantage in order to gain student's interest. Computer games can be helpful to encourage cooperation, competition, social support and positive peer pressure. For example, "the American Horsepower Challenge (AHPC)" [4] is a multi-user health game created by Humana's Games for Health that was used for a school based competition. Each student has a small pedometer attached to their sneakers and this data was collected and consolidated at the school level, the computer game showed school buses in a race, the participants can see their avatars inside the bus and they can customized the look of the avatar by using rewards earned [4].

The HEALTHY study [6] was a primary prevention trial with the objective to moderate risk factors for type 2 diabetes of middle school students, it was finished in 2009. The study implemented Health Intervention programs regarding nutrition, physical activity and behavior. One component delivered classroom activities and family outreach programs to increase knowledge and enhance decision-making skills.

Once new healthier behavior activities are acquired in this type of Health Intervention programs, and kept for a determined period of time, then it is possible that participants will keep them after the programs finishes.[9]

Young adolescents are very much attached to their phones for socializing. Then a mobile phone is an excellent mechanism to deliver the positive social support that is needed, the channel of delivery is already active. Most teens (85% of those aged 14 to 17) have cell phones. So do 69% of 11-14 year olds, according to a 2010 survey by the Kaiser Family Foundation. This percentage most likely has increased since then. If the student doesn't have a Smartphone, the study could provide one with the desired parental control setting to comply with family rules.

Based on the results of the Affinity analysis and previous related work (research and applications), this project is designing an integrated application to provides different features that a Health Intervention Program. The mobile application component will be implemented in order to perform a Field Evaluation Study to test its concept.

This new application is not only integrating different features, but some of these features have not been implemented in any previous application regarding Health Intervention Programs. The application will gather information regarding the progress of students and it will display results in a way that encourage group review and feedback. The information gathered will not only be text, or data captured from sensor devices, but also photos and posts regarding healthier activities they are performing in and out of the school, for example: what they ordered in a restaurant and about to eat or a panoramic view when they are hiking. The student's location will also be used for context information that can help encourage social feedback and retrieve related posts. Some additional features will allow moderators to perform their tasks, like posting polls or information for students to respond and encourage conversation regarding the topics.

APPLICATION DESIGN

From the Affinity Analysis and reviewing previous research work as well as similar applications implemented, we can see that an Application that integrates different features to support Health Intervention Programs would be very helpful.

We will describe here what these features are and how they would be integrated. Then we will focus in the component related to encouraging social support among members of the group, and the relation of this component with other features of the application.

Application Modules:

(1) Management of user Accounts. Management of a hierarchical organization of groups in schools (e.g.: schools, classes, groups).
(2) Providing information to students regarding healthier behaviors about physical activity and nutrition. The information is distributed virtually via different type of media like articles, videos, interviews, etc.
(3) Collecting automatically data regarding physical activity, by using sensing exercise devices like pedometers. This information is for tracking the progress of students.
(4) Hosting Message boards where participants can share posts regarding their progress. The message boards are moderated
(5) Web content pages to store students generated material like media campaigns. This information is shared within and across schools. Option to add comments.
(6) A directory of healthy restaurants in the neighborhood, with sample of menu items in each restaurant.
(7) A Module that creates a view of the tables ranking scores (daily, weekly, etc), by groups and schools (by individuals is optional). For young adolescents, this data is sent to a 'health game' application where schools are in competition.

The **mobile application** will capture and present many of the information mentioned in the other modules:

Social feed:

(1) View group's feeds of posts, with the option to add new posts and comments to other posts.
(2) Posting pictures of food about to be eaten at home or in a restaurant, and entering data like which ingredients are part of it (e.g: salad, fruit, yougurt, etc) points are scored the more healthier the food is.. the picture indicates location and name of restaurant (if it is a restaurant).
(3) Posting picture of physical activity (e.g: views from hiking). Assigning tags describing type of sport. Posting information about the physical activity (e.g: duration of the game).. For some activities, this information is collected automatically.
(4) For some of the physical activities, an automatic post may be created automatically in the group's feed, based on the data collected by the sensor exercise devices. For example posts regarding bicycle rides
(5) Display of group ranking tables with the option to add comments by the members of the group. This encourage conversation among members.
(6) Responding to polls posted by moderators (e.g: regarding taste-test events)
(7) Family posting their own healthy receipts. Posting videos or photos of family preparing one of the healthy receipts in the site (this will encourage family participant, important influence in the student)

Private Individual progress reports

(1) Display of scores at the individual level (option to present it graphically, appealing to middle school students). Use of glance able displays of progress (possible image to do as a wallpaper)

Encouraging social support and feedback

(1) When a photo is posted with a location, a notification is sent to members of the class that had uploaded pictures in the same location, this will suggest them to add a comment related to that location and starts a conversation or feedback supporting the activity being reported.
(2) Posts can be tagged by the author or the post. Whenever somebody makes a new post, a notification is sent to all users who had posted with similar tags. This can bring a common interest into awareness and encourage interaction among the members of the groups and social support.
(3) Students earn virtual points for every supportive comments added to a peer. These points are collected and accumulated for later group rewards.
(4) more options than 'I like' to encourage more personalized feedback

Search by Location and Tags:

(1) Lists of healthy stores nearby, showing comments entered by students. List of posts and photos by peers related to that location.
(2) Once a restaurant is located, brings list of food that students have ordered in the past and made a post about it. This feedback will trigger ideas of healthy orders.
(3) Look for posts related to common interests, like swimming. This can encourage students having the same interest to get together and go out and exercise.

The implementation of this application will be incremental (Agile development), and the first 'sprint' was implemented during the duration of this class. The scope of this first sprint was the functionality regarding the mobile application and its handling of posts (displaying recent posts in the group, adding new posts and search)

Use Cases

1. UseCase 1: Student is in a restaurant and is proud of have ordered a meal that is considered 'healthy' based on what he has learned in the Health Intervention Program. He/She opens the HAPPYHEALTHY application, takes a photo of the meal, maybe with a "Selfie", and posts it to his/her group's feed of news. When posting, the application asked few ''multiple choice'' questions to tag the photo efficiently for later searches. The mobile app captures the location and

attached it to the post. The application sends notifications to students who had been in the same location to suggest entering some feedback, fostering social interaction about the topic of healthy foods in that place.

2. Use Case 2: An Student and a couple of peers are spending a day in the mall, and are about to have a snack, they wonder where to go.. the student takes his/her smartphone and opens HAPPYHEALTHY app. The Application, using the location provided, brings a list of recommended restaurants nearby, based on entries by the school's coaches or peers.

3. Use Case 3: A Student and his family are in a restaurant and he/she takes the menu to order, unsure of what to order. It opens his/her HAPPYHEALTHY app and based on the location (restaurant is located), the app brings posts from different peers related to food they ordered in that restaurant. The posts include photos of the meal they ordered with comments and feedback.

4. Use Case 4: A student and his family are taking a hike. He/She opens the HAPPYHEALTHY application and takes pictures of the panoramic view, 'selfies', family photos. When posting the photo, the application will ask few multiple choice questions to help tagging it efficiently. The location is also captured. Later the application assigns a score based on the type of activity and it is posted into the student's individual progress (which is private, the competition is among groups, not among students)

5. Use Case 5: An student receive a notification that his friend is having a fruit salad at restaurant B. He/She has been there 2 weeks ago, it opens the HAPPYHEALTHY app and makes a comment to this just added post.

USABILITY ANALYSIS

Before implementing the mobile application, a paper prototype was designed in order to gather information from users regarding the usability of the screens.

Each piece of paper has the size of a mobile phone and simulated a screen (see Figure 2.)

When meeting with a participant in the usability test, I explained first the task to accomplish and then ask him/her to speak out loud thoughts going through their mind while using the paper prototype. When they made a selection from the paper screen, I responded like if I were the computer and presented the next paper screen. This process was expected to uncover usability issues and it did.

I asked each participant to do 3 tasks :

   (1) Adding a new post regarding something they are about to eat.
   (2) Searching for posts regarding where to go to have lunch.
   (3) Responding to a notification received

Figure 2. List of paper prototype screens created for the usability test.

The usability Test was done with 5 participants. Two of them were middle school kids and 3 of them adults. As predicted, the teenager participants navigated through the paper prototype with no issues at all, they clicked immediately the options to accomplish the tasks provided.

One of the participants doesn't have a facebook account or any other similar application, she used to have a facebook account some time ago but she dropped it. She took the most time to figure it out what link or button to press, but she eventually did.

Some of the adults gave a lot of feedback on how to re-design the application itself. Kids were more focus on accomplishing the task and move forward.

Usability issues on how they were addressed

The first 'usability tests' brought to the light issues with the flow of screens. Based on this feedback, 40% of the flow was re-designed. Some issues solved were:

   (1) The screens about location and tagging were mixing purpose, not clear
   (2) The location should be assigned as a default
   (3) The tagging process was too long. It was simplified

The following 4 'usability tests' moved more smoothly, here is a list of the ideas that will be incorporated:

   (1) Once the user finds a place they want to go, add an option to get directions
   (2) Make the 'Post' button more clear, 3 users were not sure about pressing an icon.. I added a button with the word 'Post'.
   (3) Reposition the 'check' button in the comment screen.

Ideas provided to implement in future releases (not in the prototype)

   (1) Tagging meal components in the photo directly

(2) Integrate systems with restaurants to pull their menu and choose from there in the app
(3) Change terminology to more teenager friendly (however teenagers didn't have a problem at all on finding they way through the application)
(4) Add more options to describing meals.
(5) Add option to rank meals in restaurants
(6) Flag which menu options are good for certain conditions, eg: diabetes.
(7) Flag which meals are vegetarian.. for searching purposes

HAPPY HEALTHY MOBILE APP

As mentioned before, the Implementation of this application will follow an Agile incremental approach. We will start by implementing a subset of functionality required, choosing features that are considered the core of the application to test the 'concept' itself. This section will describe what features were implemented in this version of the mobile application.

Since the main purpose of this application is to encourage and facilitate peers social support during a health intervention program, then it was mandatory to have a server as the repository where all this information is captured, shared and accessible from any point.

I used Liferay[8] as the social server for this application. Liferay is an open source Portal with capabilities for content and document management, blogs, message boards, wikis, calendars, among other features. The features that I made use for the Happy Healthy application were:

- Management of user accounts
- Management and hierarchical organization of groups
- Document Library to store images
- Message boards to store posts and its comments (see Figure 3)
- Tags management
- Search capabilities.

I didn't use a Facebook application since many middle school students are younger than 13 years old and they are not allowed to have a facebook account. Moreover, many parents don't allow their children to have facebook accounts even if they are older than 13 years old, because the account is public and they could receive messages and 'friend requests' from strangers. We then were looking for a more 'closed' social network for students in a school.

The Android platform was chosen for the implementation of the first version of this mobile application.

Figure 3. Screenshot of one of the screens from Liferay, server chosen to host the information gathered during the Health Intervention Program.

Mobile App Main Features.

Login. The application asks the user to authenticate (see Figure4). The application connects to the Server and validates the user account and password is correct. Only users that are member of the Health Improvement Group are allowed to access the information posted in the Group and post information.
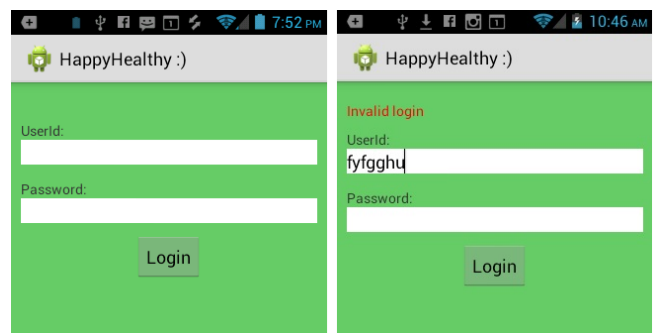

Figure 4. Happy Healthy Login Screen

News. Displays list of posts added previously by members of the group, ordered chronologically, showing the most recent posts first. The list is vertically scrollable and the text related to all recent posts is displayed first and its images next. Images are only downloaded for the posts that are actually displayed on the screen, this is to improve the performance on showing a list of this nature with all its images.

Each post displays the following information (see Figure 5):

1. Name of the person who made the post
2. User avatar image.
3. Date of the post
4. Location
5. Photo of the activity being reported (healthy food or exercise)

6. Number of comments from other members of the group in relation to this post
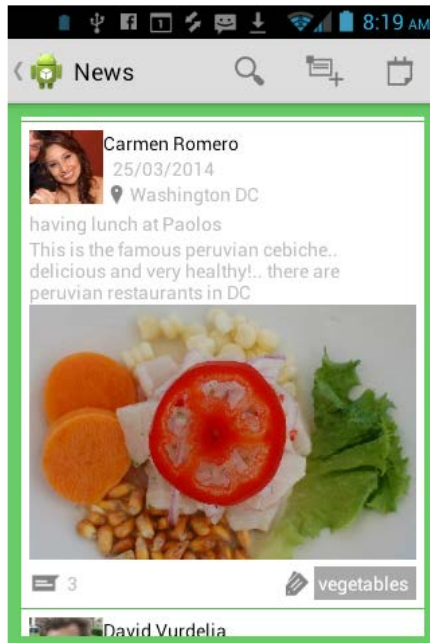7. Tags added by who made the post.

Figure 5. Sample of a Happy Healthy Post and its components

Posting activities. Posting photos of meals to eat, or physical activity like swimming, yoga, etc. When the user clicks the option to add a post, the first screen that shows is the phone's camera application (see Figure 6).

Figure 6. Mobile App Camera

This is the default application to take photos. Once the user is happy with the photo taken, they can choose the 'check' option which will take them to the screen where they can add descriptions, tags and confirm location (see Figure 7).

Posts can tag by participants. The application guides users on tagging their post in two main categories: Nutrition or Physical activity. Then they can choose a particular tag for each category or enter one of their own. When the user starts to type, the application will suggest a tag for them based on the characters entered by the user so far, this is to make this task easier and faster. If the user enters a new tag, this is also added to the list of possible tags for future posts. The post is also automatically tagged with a Location.
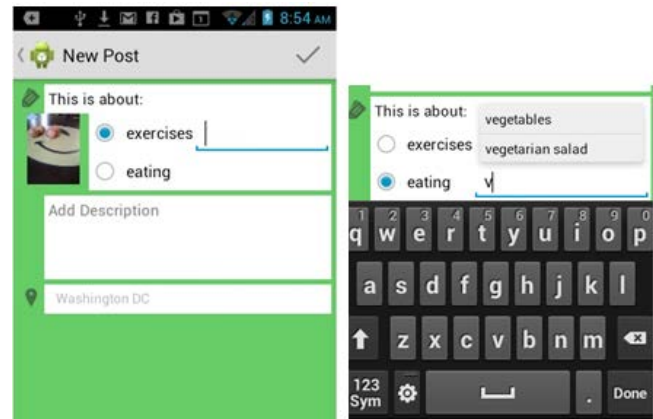

Figure 7. Adding a new post to the group's feed of posts.

Notifications. Whenever a new post is added, the application looks for similar posts in the past, based on the location and tags, and send notifications to peers who made this post. The purpose of this notification is to encourage interaction and support among the members of the group.

Adding Comments. The application allows users to add comments to a post. The person who added the original post also receives notifications. The application server keeps track of who is making comments. Members of a group receive 'points' for supporting other members of the group and eventually receive virtual rewards.

Search. The user can search posts from peers based on location and tags (see Figure 8). The purpose could be to gather information like: places where they can order a delicious chicken salad, who shares same type of exercise interests, interesting places nearby to exercise, etc.

The options for Location are two: nearby to the current location or any location. If the user chooses nearby, the default location is the current location but the user can also choose a different location.

The option for searching by tags is in two levels, first by category: exercises (physical activity) or eating (nutrition). For each category, the application shows a list of possible tags, based on the tags that members of the group have used to tag their posts. For example in the screenshot above, the user selected to search by exercises and the application is displaying the list of tags regarding to this category. The user can choose one of this tags or just leave the default option of All (which means to pull all posts regarding exercises).
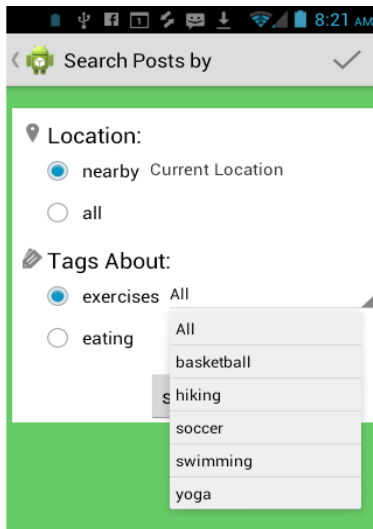
Figure 8. Searching Posts by Location and Tags

As a result of the search, the application displays the list of posts that match the searching criteria.

FIELD EVALUATION

It was important to do the field evaluation with a group of people who already knew each other, to simulate Health Intervention groups in schools or other institutions. A group of 12 people was selected, 8 of them were people from work and knew each other very well, and 5 of them were friends of mine who also knew each other (1 of them belongs to both groups). People at work was very interested on testing my application to see what I had developed and because the topic of interest chosen in this project is also of their interest.

Field Evaluation Methods.

The main methods were:

- Contextual Inquiry. I invited people for lunch, or we had lunch at the office and during this activity, I brought the mobile application for them to use and post. Meanwhile I was watching carefully how they were interacting with the application and I was taking notes. There is a group who practice yoga at work, then that was an opportunity to bring the mobile app also, interesting results from these situations.
- Instrumentation - Logging
- Semi structured Interview after each of the 'contextual inquiry' episodes.

The field study was conducted for a little more than 2 weeks but with gaps in between. These gaps were due to time taken in order to tune the application to continue with the Field Evaluation. The tuned was done based on the feedback gathered, it was an iterative process.

Not all participants of the Field Evaluation had an Android mobile device but since the main method used was 'Contextual Inquiry', where I was present taking observations, I provided my phone for them to login to the application and made used of the mobile app.

Field Evaluation Results.

After the first set of experiences during the field evaluation, several usability issues showed up that needed to be addressed. The logs created by the application were very helpful on identifying why some issues were happening, and gave a clue on how they can be fixed. For example: when a user tried to make a post, the camera showed up twice; the reason was because the user changed the orientation of the phone, from landscape to vertical, after taking a photo; this triggered a new android activity to start which called the camera app again. This was fixed by calling the camera app from its own activity and not from the one that makes a new post.

It was very important to resolve the usability issues that showed up during the field evaluation as soon as possible, the application needed to be very easy to use and have a smooth navigation in order to be actually used in the middle of social events (e.g: having lunch with friends) or exercise routines.

Once theses usability issues were solved, the interaction with the application was smother and users were enthusiast about the application.

Here is a list of usability issues that were identified during the field evaluation.

New Post. This was the most challenging screen for the user.

(1) Users frequently took several pictures until the photo they took was of their approval. Initially the navigation to go back to the camera and re-do the photo was not smooth, an intermediate blank screen was displayed (due to the way activities were calling each other). This was fixed by modifying the way activities were calling each other.
(2) The keyboard handling was difficult, in several occasions users didn't know how to make the keyboard disappear in order to go to the next field (one of the first fields to enter was a multiline and there was no 'next' button). I also noticed that users preferred to tag first their post and then enter a description. Based on these interactions with the app, I changed the position of the fields and added the option to scroll the screen to let them navigate through the fields even if the keyboard was up (see Figure 9)
(3) Initially the application had two fields for describing the post: a Title and a paragraph. When users started to type, it was obvious that two were not necessary. I removed the Title.
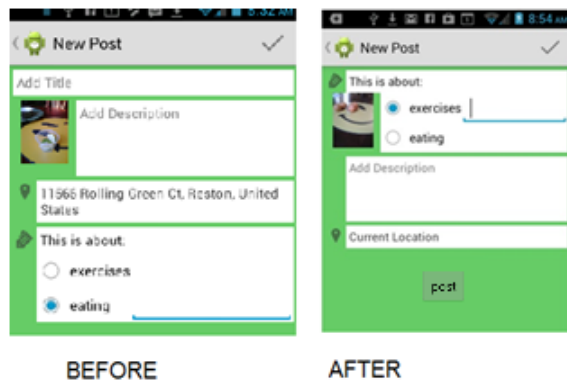
Figure 9. Changes made to the screen that let's users add a new post, as a result of the Field Evaluation Process.

(4) In several occasions, users didn't care on tagging further the post, they just chose between 'exercises' and 'eating' but they didn't enter a specific tag. Only when I mentioned, some of them did tag them further. During the interview, I asked them and some of them say it was not clear and few of them said they don't like labeling pictures.

(5) Many users had a hard time finding what to click to add their newly composed post, they were not familiar with the 'check' icon in the upper menu. I added the 'post' button at the end of the screen, which they can find when scrolling the screen when the keyboard was up. Surprisingly this was the most used option to add the post (instead of the 'check' icon)

Once the application was better tuned, the navigation was smoother and it was easily used for its purpose.

Search

1. The application had not only the tags entered by users but also some initial set of tags. This was confused during searching since users will choose one of these tags with will bring an empty list of posts. Following the feedback from one of the users, the search screen only displays the list of tags that have at least one post related.

Response time on areas with slow 3G connection. The application was tested in a wifi environment, but the field evaluation happened in places where there was no wifi connections, like restaurants or outdoors (exercises). After the first set of 'contextual inquiry' experiences, it was obvious that using the application in a slow connection environment brought several issues that didn't happen when there was a fast wifi connection. The following issues were identified during the 'contextual inquiry' episodes.

1. Since the response was slow, users pressed several times the same icons or try to go to other screen. I

added 'progress' messages for every single possible action (icon pressed, button pressed).

2. The download of images was very slow. I added images with an animation of 'in progress' while the images were being download

3. To avoid the user to submit a post several times and get as a result duplicate posts (which happened during one of the 'contextual inquiry' events), I disable the submit option after it was clicked.

Here is one of the posts collected during the Field Evaluation (see Figure 10)
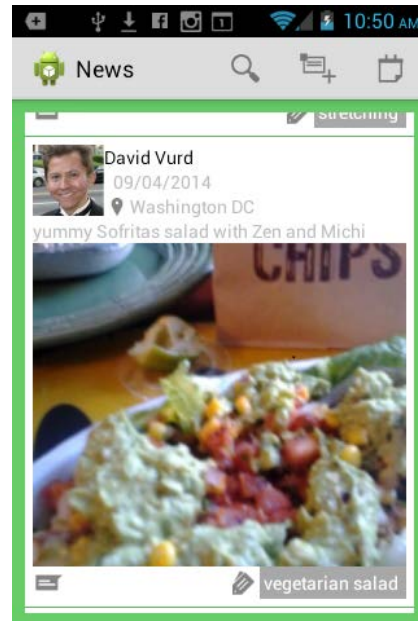

Figure 10. Sample of a post gathered during the Field Evaluation.

Suggestions for new features. Users suggested the following list of features for the application (please see list below). I didn't implement this features during the Field Evaluation but they would be considered for the final application development:

- Adding like button for giving support
- Give the option to choose to subscribe to notifications or not.
- Search posts by user.
- Allow posting also short videos of activities

"People already knowing each other" factor.

When users saw posts of people they knew, their reaction was of interest and enthusiasm, with big smiles on their face. One of the users even literally said: "it is fun to read the posts of people you know". This confirms what has already being reported by previous studies, which is that social support is easily attainable in groups of people who already know each other.

Application's uses not expected.

One of the surprises was when people choose to take picture of peers doing exercises and reporting about them beside reporting about themselves doing exercises. This was possible because they knew each other and knew the group was closed and there were no privacy issues.

DISCUSSION

I found out that the usability of the mobile application is very important for a Field Evaluation Study, even more important for this mobile app since it is a social app that is used in the middle of social activities, and its smoothness regarding navigation is a must. Due to my lack of experience on building mobile applications (zero, before starting this class), there were several issues regarding usability of the application that didn't allow users to make use of the mobile app smoothly. I noticed that these issues didn't encourage them to keep posting about their physical or eating activities. Therefore the Field Evaluation had gaps of time where I was tuning the application. The application is tuned now and the last episodes of 'contextual inquiry' went very smoothly and users were very pleased with the application. However I feel I didn't have a full real two weeks of Field Evaluation, and I would have preferred to have more time available in order to collect more quantitative data and reach more sound conclusions.

Results from 'Contextual Inquiry' episodes confirm that social feedback and support is easier to happen in groups of users that already know each other. Then having a pleasant mobile application, that lets members of the group learn of what their peers are doing, is effective in encouraging social support and creates a synergy among the members of the group regarding a shared goal. It is not a duty but fun and rewarding to comment in each other's posts.

If there is a health intervention program where the members of the group do not know each other, then I recommend to first arrange activities (life or virtual) where they get to know each other. Some features that helps is to identify common interests among the members of the group.

Users were more mindful of what they were having for lunch in order to make a post on the mobile application, which was interesting to watch.

Sharing images and looking at them was a very attractive feature. Textual descriptions without images don't get that much attention comparing to sharing a photo. Tags help them search for common interests.

Once the application was tuned to perform clearly in environments with slow connections, then the application was available in most places and the information was able to be shared in real time (information being stored in a central server). This was also very important for participants, they were excited to see new posts in their news feeds as soon as a post was added.

My next design iteration would focus more in the notifications feature and adding the feature of 'liking' and commenting posts. After these improvements I would move from a 'contextual inquiry' method to installing the application on the group member's phone (for the ones that have android) and collect more quantitative data regarding usability instead of mostly qualitative data.

Since the application is supposed to be used in a Health Intervention Program, it is important that posts and comments are categorized and counted to grant rewards and encourage the continuity and frequency of such posts. Therefore the module that collects this information and informs of potential rewards should be included in the next iteration. It is true that the synergy of the group is already a reward for the group and that could be enough to keep the flow of social support, but tracking rewards can ensure this flow continues during the length of the intervention program and also it would collect data for the more quantitative part of a Field Evaluation Study.

CONCLUSION

The initial findings confirm that social support in a group will encourage participants to engage in healthier activities as part of a health intervention program. These initial findings also confirm that social networking applications can encourage the flow of this desired social support.

Something that didn't work during the Field Evaluation Study is that the application encountered several usability issues and it needed further tuning, which interrupted the study. It is recommended to do an initial beta field evaluation study to identify these issues before going to a more massive Field Evaluation.

REFERENCES

[1]Predrag Klasnja, Wanda Pratt Methodological Review: Healthcare in the pocket: Mapping the space of mobile-phone health interventions, Journal of Biomedical Informatics, Volume 45 Issue 1 (2012)

[2]Zachary Porges, Xi Yang, Apurva Desai, Catherine Ho, Ruwan Pallegedara, Raisa Razzaque, Dan Cosley Achieve: Evaluating the Impact of Progress Logging and Social Feedback on Goal Achievement, CSCW Companion '14: Proceedings of the companion publication of the **17th ACM conference** on Computer supported cooperative work & social computing, (2014)

[3] Derek Foster, Conor Linehan, Ben Kirman, Shaun Lawson, Gary James, Motivating physical activity at work: using persuasive social media for competitive step counting, MindTrek '10: Proceedings of the 14th International Academic MindTrek Conference: Envisioning Future Media Environments, (2010)

[4] Yan Xu, Erika Shehan Poole, Andrew D. Miller, Elsa Eiriksdottir, Dan Kestranek, Richard Catrambone, Elizabeth D. Mynatt., This is, not a one-horse race: understanding player types in multiplayer pervasive health games for youth, CSCW '12: **Proceedings of the ACM** 2012 conference on Computer Supported Cooperative Work, (2012)

[5] Franco Curmi, Maria Angela Ferrario, Jen Southern, Jon Whittle, HeartLink: open broadcast of live biometric data to social networks, **SIGCHI ACM** Special Interest Group on Computer-Human Interaction , CHI '13: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (2013).

[6] HEALTHY study rationale, design and methods: moderating risk of type 2 diabetes in multi-ethnic middle school students. International Journal of Obesity; 33:S(2009).

[7] Consolvo S, Everitt KM, Smith I, Landay JA. Design requirements for technologies that encourage physical activity. **SIGCHI ACM** Special Interest Group on Computer-Human Interaction . In: Proc CHI 2006. **ACM Press**;(2006).

[8] Frank Bentley (Motorola Mobility), Konrad Tollmar (Royal Institute of Technology), The power of mobile notifications to increase wellbeing logging behavior, **SIGCHI ACM** Special Interest Group on Computer-Human Interaction, CHI '13 Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (2013).

[9] Prochaska, J., et al. "In Search of How People Change: Applications to Addictive Behaviors."*American Psychologist* 47, no. 9 (1992): 1102-1114.