



Mobile Applications for Promoting Fitness Activities: State of the Art and Enrichment

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Abstract— Practicing “fitness activities” is fundamental for having a good health in its all aspects: physical, mental and emotional. Nowadays, smart devices which are getting grip on our company all day long, are, also, helping people in following up with their healthcare. In fact, lots of mobile applications allow their users to monitor certain parameters in their health state (heart rate, time spent in fitness activities, calories burnt during certain types of exercises, etc.) and motivate them to engage in daily fitness activities either indoor or outdoor. This paper reminds of important impact of everyday fitness activities on our health. Then, it presents an overall view of features of most commonly used mobile applications that promote such daily commitment to fitness activities. Finally, it proposes a new mobile application, called MonthRace, as a useful increment for the existing applications which targets giving wider options in social interactions for its users.

Keywords— fitness activities, mobile applications, social interaction pattern, eHealth, mHealth

I. INTRODUCTION

It is undoubtable that regular physical activity is fundamental for keeping healthy and fit ([12-16]).

A physical activity consists in any form of exercise or movement of the body that uses energy [14]. It includes:

- Aerobic activities: such activities make a practitioner’s breath harder and his/her heart and blood vessels healthier. They include walking, dancing, swimming, jogging and running
- Flexibility-enhancing activities: such activities ensure a good range of motion in the joints. They include stretching, yoga, tai Chi, Qi Gong etc.
- Muscle-strengthening activities: These activities work all the different parts of the body—legs, hips, back, chest, stomach, shoulders, and arms— building up its strength. They include push-ups on the floor or against the wall, sit-ups and Pilates.

In the wellbeing wheel (Fig.1 and Fig.2) proposed at the website of Earl E. Bakken Center for Spirituality & Healing of Minnesota University [13], physical activity is a pillar for good health all along with other pillars that include diet and nutrition, sleep, and management of emotions, thoughts and stress.

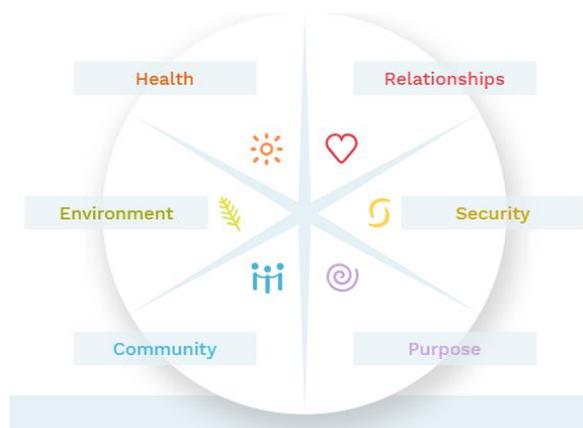


Fig. 1 Wellbeing wheel by Minnesota university’s center for spirituality & healing[13].



Fig. 2 Parameters of health state[13].

In fact, regular physical activity helps in: [13]

- weight control
- promoting better sleep
- combatting health conditions and diseases
- improving mood
- boosting energy

Experts recommend a daily plan of, at least, half an hour of moderate intensity aerobic physical activity. Further, they recommend engaging in short bursts of physical activity for 10 minutes at a time; this is helpful in incorporating physical activity naturally into daily life [17].

Currently we are in an age where there is an extensive usage of mobile devices and smart devices are in our constant company; effortlessly, mobile technologies are transforming our lives from several perspectives including communication, learning [3-5], healthcare [6-9], and almost all our everyday interests.

In the frame of healthcare, it is talked about eHealth and mHealth.

The term eHealth stands for *electronic Health* and describes the use of the Internet and related technologies to deliver health-related services [34]. An example of eHealth applications that promote regular physical activities is Fish'n'Steps [1]. Fish'n'Steps is an interactive computer game that links a player's daily foot step count to the growth and activity of an animated virtual character, a fish in a fish tank. It, also, provides an environment of both cooperation and competition through including other players' fish in some players' fish tanks. In a fourteen-week study with nineteen participants, the game served as a catalyst for promoting exercise and for improving game players' attitudes towards physical activity.

mHealth designates the use of mobile technologies such as cellular phones to support public health and clinical care [8,34].mHealth applications cover a wide range of health aspects: eyesight, smoking cessation , medication adherence, workouts, outdoor physical activities, etc. They help tremendously in the support of good health among their users via raising awareness with the knowledge offered, boosting self-tracking and motivating users through alerts, reminders and, also, through interaction with other users (family members, friends or new acquaintances made through the applications).

In particular, keeping fit and promoting regular fitness activities has been the aim of a mass of mobile applications [7,8,9] having each its specificities despite diffused commonalities in features offered.

People who are highly motivated by being in groups value so much the sociability key feature of a fitness application. A “*sociable fitness application*” gives to its user options like having fitness activities in groups, like competing with each other, announcing best-achievers within groups, rewarding them eventually etc. Social interactions on mobile applications between users have a noticeable influence in raising interest of people in using the application and, consequently, motivating them to have physical activities in a social frame with higher engagement.

This was confirmed by a two-week study of 18 couples who used the application HealthyTogether [10]. HealthyTogether is a mobile game which was developed for the sake of understanding how users interact in different group gamification settings: competition, cooperation, or hybrid. The game involves a pair of users to exercise together and earn badges based on their walking and climbing performance (number of floors climbed). The study of users behaviour compared the active participants in the application to three social settings (competition, collaboration, and hybrid). Results showed that among the three social settings, collaboration and hybrid outperformed competition in motivating users to enhance their physical activities, where collaboration increased by 21%, and competition increased by 8%, while the hybrid between the two increased by 18%. The study has also shown that the increase in physical activity is strongly related to the number of messages exchanged among the users' of HealthyTogether.

In addition, existing applications implement the sociability feature in different degrees and procedures as it will be confirmed by the related works in next section. The mobile application this paper proposes (called *MonthRace*) attempts to give an advanced sociability feature through giving its users different options in connecting with other users and through targeting fitness activities that are more enjoyable when taken outdoor (walking, running, biking and alike).

In what follows, the paper makes a quick inventory of main featuring mobile applications that promote outdoor fitness activities showing the functionalities offered. Then, it draws a visualization of *MonthRace* application. Finally, it concludes by a conclusion and future work.

II. RELATED WORK

Currently, many developers are interested in developing applications that help users engage in different healthy habits by using the applications on daily basis.

Here's a collection of widely-used mobile applications that promote regular fitness activities. We focus in this sample on applications that promote outdoor activities (walking, biking, running, etc.) with social features. In fact there are plenty of applications that target indoor activities (basically workouts of different types and goals) with interesting features (*virtual* audio coach during workouts, plans for healthy diets, suggestions of daily routines, healthy recipes ...). But, these apps have limited sociability (featured examples include: 7Minute Workout, Lose Belly Fat, Fitster, Nike Training Club - Workouts & Fitness Plans ...). Also, there other applications that target outdoor activities but do not include sociability feature; they focus on motivating users to take fitness activities and achieve goals with no cooperation or interaction with others (like Google Fit [18], MyFitnessPal, Couch to 5k, Zombies, Run! ...).

Based on feedbacks of users, the apps reported hereafter have variable echoes of satisfaction among their users. Overall, claims are often related to accuracy in evaluating users' performance, to saving battery load of mobile devices, to the way social interactions are implemented or to the way some other functionalities are offered.

TABLE I
MAIN FEATURING MOBILE APPLICATIONS PROMOTING FITNESS ACTIVITIES

	Mobile app.	How does it work?
1.	Bewell+ [2]	BeWell is an application that uses smartphone sensing and persuasive feedback to promote wellbeing, more specifically, it is monitoring three health dimensions (also labelled wellbeing indicators or key behavioral patterns): sleep, physical activities and social interactions. The app. promotes improved behavioral patterns via feedback rendered as an ambient display on the smartphone's wallpaper. This mechanism has a positive effect on increasing health awareness of users through making their lifestyle choices more beneficial.
2.	Runtastic [17]	Runtastic tracks users' workouts in real time with the built in GPS. It tracks fitness activities such as running, jogging, biking, hiking, skiing and walking by keeping records of (distance, time, speed, elevation, calories burned). It offers groups feature, where users can create groups with their friends whether they're near or far. Also, there's a leaderboard where friends can engage in a little friendly competition. The running leaderboard helps users to see who of their friends has ran the furthest

		<p>this/last week or this month. The app allows for live tracking where a user can be followed by his/her friends on a running map. So, users can receive messages and cheers from their friends on their run. The app is fully optimized for Android Wear 2.0.</p>
3.	Stepz [20]	<p>Stepz is an iOS step counter app that automatically uses Apple motion coprocessor to collect motion data in the background to save user's device battery. Stepz supports its user in managing daily steps goal. It offers visualization of daily, weekly, monthly and yearly step charts as history view... The application allows a user to connect with his/her friends and see who makes the most steps per day.</p>
4.	Pacer [21]	<p>This app records users' steps, calories and distance using GPS. Helps them stay motivated with their family and friends by creating walking groups and compare daily steps in real-time. Pacer helps its users achieve their goals and stay motivated by providing a day-by-day goal. That feature allows users to get involved and support and motivate other users who share similar goals.</p>
5.	Fitbit App[23]	<p>The free Fitbit app is designed to work with Fitbit activity trackers and smart scales. It uses GPS to track users' runs, walks and hikes for steps, distance and calories burned. It logs activities and workouts to keep users on track, logs food to how many calories a user consumed and manages his/her weight over time and offers an all-day heart rate tracking and competition with friends with daily or weekly challenges and compares statistics. It also, wirelessly synchronizes trackers with smart devices of different platforms (android, iOS or windows mobile).</p>
6.	Human- activity tracker[22]	<p>Human app Human is a free all-day activity tracker that inspires users to be more active and helps them to move at least 30 minutes, every day knowing that 30 minutes of daily fitness activity are the best form of preventive medicine. Human allows a user to compare him/herself to people nearby (people in the same city).</p>
7.	Runkeeper [25]	<p>This app tracks its users' exercises, helps them in setting goals and keeping up with their progress. It, also, allows them to celebrate progress and compare statistics with Runkeeper friends.</p>
8.	Fitness Against Friends[24]	<p>The app. challenges friends against each other to see who can earn more points during a 7-day fitness challenge. Each exercise (workout, push-up, running, hard cardio, swimming) is assigned a points value and the app automatically calculates points, for each user, based on exercises completed. It enables the users to send each other messages or praise via notifications. Users can invite each other through Facebook or via email, they can also post their statistics to Facebook.</p>
9.	Fitocracy [26]	<p>It allows a user to track his/her workouts, to view progress with Fitocracy's performance graphs, to earn points that unlock badges, to invite friends or join a Fitocracy group of like-minded people (like joggers, weightlifters, etc.).</p>
10.	Yog [27]	<p>Yog connects users from anywhere in the world to run together in real time. The user can create his/her own run session or join an already existing run, the sessions can be public for any user to join or private where they can invite certain friends to join the session which is defined not by location, but by start time and distance. During the session, Yog will track your pace and burned calories. You'll also get audio and on-screen alerts letting you know your progress relatively to other "yoggers" on the run.</p>

11.	Gym Buddy [28]	The application connects you with people near you that are compatible to you based on the information you entered on your profile such as your gender, fitness goals and fitness level it also allows you to write a mini biography like most social media platform, except this biography is about your fitness journey. User can create their own workout session by entering the time, day and location and other nearby users can join in (or vice versa). The app also allows users to log the workouts they did each time they log in. The app has a collection of workouts/exercises, recipes and a workout plan for men and women to accommodate the user fitness goals.
12.	MapMyRun[29]	This app enables a user to track his/her fitness goals and plan running routes with the GPS of a mobile device. All details about a run are recorded including speed, distance and so on. It has also a health tracking feature that records users' heart rate, and it shows the running movement on the map. A user can get motivated through feedback of friends on his/her activity feed, get social through sharing workouts on Facebook and Twitter or joining challenges to compete with others.
13.	Strava[30]	Strava aims at offering good tracking of fitness activities and motivating users to do more and more. It collects and uses health data from paired devices, like a heart rate monitor, to give users interesting and useful performance analysis. It allows users to set goals, keep up with them, build or join fitness communities and challenge others.
14.	Runtopia [31]	The app is a marathon training running app that provides such as running distance and mileage/heart rate tracker that records user's fitness activities as running, jogging, cardio workouts and wellness exercises. This application allows users to set their own goals, keep up with them and share their progress with their friends.
15.	Nike Run Club[32]	The Nike Run Club app aims at making its users reach their goals of running more and better in funny ambience through the motivation of millions of runners and expert guidance. The app supports: <ul style="list-style-type: none"> • Tracking and storage of all runs and records for a user • Audio guided running workouts with Nike coaches and athletes • Personalized coaching plans adapted to a user's schedule and progress • Assignment of trophies and badges to celebrate a user's achievements • Comparison and competition with friends on leaderboards • In-Run cheers from friends • Customizable post-run sharing with friends

III. PROPOSITION OF MONTH RACE APP FOR PROMOTING OUTDOOR PHYSICAL ACTIVITY

This section introduces *MonthRace* application through an overall view of the app, a brief listing of functional and non-functional requirements and screenshots of a basic prototype that has been developed.

A. Overall view

In continuity of all of the efforts reported above, I propose an application which promotes outdoor physical activity through a mobile application called *MonthRace*. Mainly, the application is intended to enhance the sociability feature by gathering different procedures implemented separately in several existing applications. So it comes as an increment for the existing applications which targets giving wider options in social interactions for its users.

Overall, through *MonthRace*, a race is launched monthly among application subscribers for several activities (walk, run, bike, skiing or alike). At the end of each month, best-achievers are rewarded for each type of activity. The reward consists in fictive medals through the app, otherwise, individuals or organizations using the app can make the rewards real.

The app wants to offer its users diverse contexts of gathering with others around outdoor physical activities while keeping their right to choose whom to interact with.

It offers a large range of choices for joining or creating groups that satisfies both introvert and extrovert people. When registering through the app, a user can decide to make his profile public or private (knowing that this choice can be unlimitedly changed later). When a profile is public, it is searchable by other users those with public profile, so they can interact with (see their profiles, send invitations to join specific groups or send messages, send cheers about achievements or reminders about fitness goals to be achieved). When a profile is private, it is not searchable through the app but the user can see his/her own performance and rankings in standard groups of the application.

In fact, the application offers standard grouping of users: user city, age range, age range coupled with gender, age range coupled with gender and city. Users with public profiles can create their own personalized groups and invite others to join the group; in-app messages are sent to other users of the app and email messages are sent to friends not using the app.

Users with public profiles which are members of a group can see their rankings in that group, participate in putting group goals and achieving them, can share photos related to their physical activities including places of activities and paths followed. Consequently, the app helps users to get connected around fitness activities with people throughout the world and discover places and habits related to outdoor physical activities.

Competition is a feature which is not pronounced as long as members of the team are willing to pronounce it through personalized goals and rewards. Rather, the app is more focusing on gathering people around fitness activities in teams of their choices, ... but it, also, allows them to be alone if they want it through private profiles. The app is more about a hybrid model of cooperation and competition than a pure model of social interaction; competition is not spoken until members of the team want it.

Users can visualize their performances and rankings in pertinent groups of interest daily, weekly, or monthly. Top –achievers (first three or the number may be an adjustable parameter) are announced on the race board for the running day, the running week, the running month and for the last month in a global view.

B. Functional Requirements

MonthRace users are individuals or groups of users interested in outdoor physical activities. They are grouped based on three parameters: age, gender and city. The application offers a by-default grouping of its users as follows:

- The age groups, which are defined on intervals of 5 years, in this way we will have groups ranging from 10 to 15 years, from 16 to 20 years etc.
- Age and gender: age groups are categorized into female groups and male groups
- The city of the user
- City coupled to age or gender

Users of *MonthRace* are able to:

- Register
 - A user's profile will be created and the user will be able to access the application features.
 - Enter the following information: User name*, first name, last name, email*, password*, gender*, date of birth*, city*, favorite places, profile picture, profile privacy (private or public) (* mandatory information)
- Log in
 - The user will need to log in through his/her mobile device at least once after creation of the profile. Then, the logged-in state may be kept by the user so he/she does not need to log in again for a new usage of the app.
- View, edit/update profile
- Manage Fitness Activities Sessions: start, pause, and end up an activity session of type: run, bike, walk or alike.
 - The app records achievements either in steps or miles in addition to the path followed using GPS

- Share :
 - achievements via third-party applications like twitter, Facebook and Instagram
 - maps of their favorite routes on their social media accounts.
- Follow up with their individual achievements or achievements within groups they are member of.
- Find and contact other users having public profiles to build friendships
- Create or terminate groups of users (functionality available for users having public profiles)
- Search for users or groups with public profiles.
- Join public groups: a user with public profile can submit a request to join any public group of users including groups of the same age range from other cities.
- Invite people among app users and from outside to join a group.
- Leave a group.

C. Non-functional Requirements

Non-functional requirements for the *MonthRace* app include:

- Performance requirements: the app has to run fast while supporting concurrent access from numerous users
- Safety and security requirements: source code has to be secure and trustable. Database has to be secured too.

D. Software Interfaces of a prototype

The visualization of *MonthRace* app I made above has been partially implemented by my students at the Saudi Electronic University. The prototype did not cover all functionalities. Here few screenshots follow:

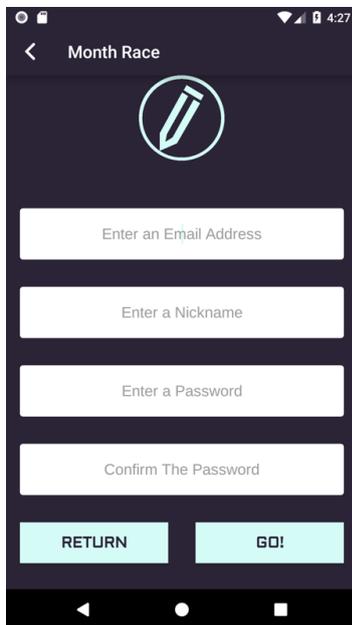


Fig. 3 Register

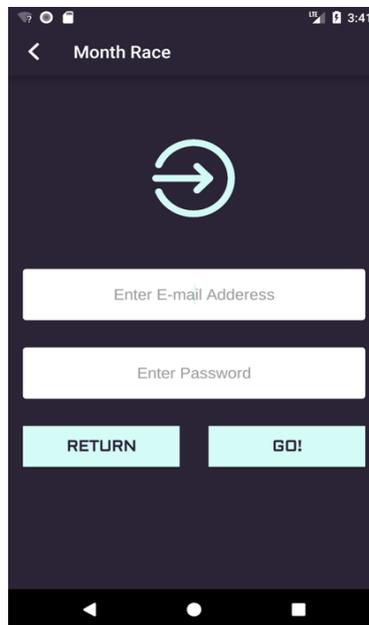


Fig. 4 Login



Fig. 5 View, edit/update profile GUI screenshot

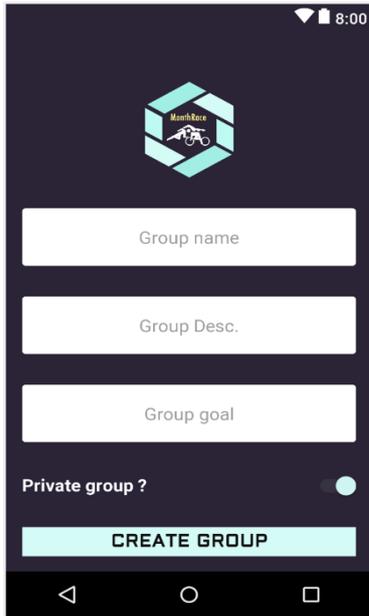


Fig. 6 Create a group

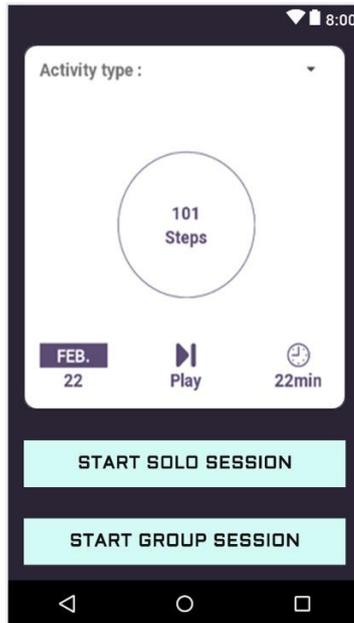


Fig. 7 Manage fitness activities session GUI screenshot

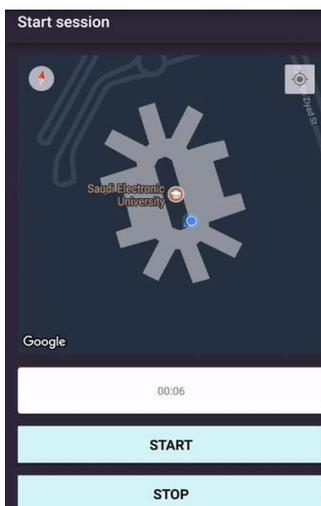


Fig. 8 Starting a walking activity session at the campus entry

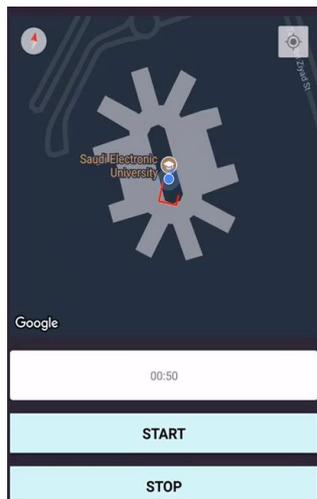


Fig. 9 Walking session continuing towards my office.

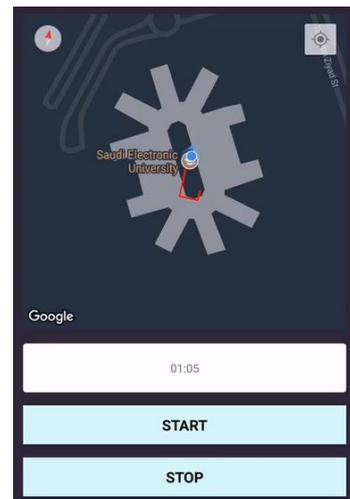


Fig. 10 Walking session ending at my office.

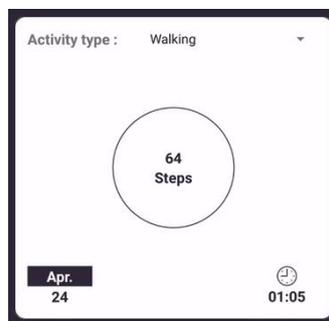


Fig. 11

Achievement during the walk session in terms of number of steps and time elapsed.

IV. CONCLUSIONS

Good health is priceless for humans. Developing applications that help people on achieving that goal of good health is very worthy and very valuable. Applications that motivate people to have regular fitness activities in a social frame, widely help in getting healthy habits of activity and in satisfying the need to connect with others. Influence of such applications has tremendously increased with advances in mobile technologies and smart activity trackers.

The paper made a reminder of importance of regular fitness activities for having a healthy lifestyle and showed usefulness of mobile applications in achieving such a goal. It, also, gave an overview of main featuring mobile applications promoting regular outdoor fitness activities prone to higher sociability. Then it introduced a visualization of a new application, *MonthRace*. The app is an increment for the existing applications which targets giving wider options in social interactions for its users. The paper presented a thorough visualization of the functionalities supported by the app. It also showed screenshots of a preliminary prototype of the application. Developing a complete prototype of this visualization and assessing echoes of its usage among users is one direct perspective of continuity for this paper.

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