

Fitness - There's an App for That: Review of Mobile Fitness Apps

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The world is getting fat.

The World Health Organization coined the term “globesity” to highlight the importance of the epidemic and the impact as a major health problem in many parts of the world (World Health Organization, 2011). Globally, at least 1.3 billion adults and more than 42 million children are overweight or obese (Müller-Riemenschneider et al. 2008). Obesity appears to be responsible for a substantial economic burden in many European countries and the costs identified, in the available studies, presumably reflect conservative estimates (Müller-Riemenschneider et al. 2008).

Early prevention and healthy lifestyles may be the least expensive and best ways to combat the growing prevalence of avoidable diseases associated with a lack of physical activity including obesity (Almeida 2008). If people who lead sedentary lives would adopt a more active lifestyle, there would be enormous benefit to the public's health and to individual well-being. An active lifestyle does not require a regimented, vigorous exercise program. Instead, small changes that increase daily physical activity will enable individuals to reduce their risk of chronic disease and may contribute to enhanced quality of life (Pate et al. 1995).

In a 1995 editorial in the American Journal of Public Health, former U.S. Surgeon General C. Everett Koop stated, “Cutting-edge technology, especially in communication and information transfer, will enable the greatest advances yet in public health. Eventually, we will have access to health information 24 hours a day, 7 days a week, encouraging personal wellness and prevention, and leading to better informed decisions about health care” (Koop 1995). Technologies like miniaturized health sensors, broadband networks and mobile devices, are enhancing and creating new health care capabilities such as remote monitoring and online care (Accenture 2009).

One example of emerging sensor technologies that could help increase physical activity and thus lower the global obesity rate and associated health care costs is the Mobile Fitness App. Mobile Fitness Apps (MFA) allow a user to track their fitness activities via a global positioning satellite (GPS) from their mobile phone, and to then share the workout with the community via the application website, Facebook or Twitter.

This paper will review five mobile fitness applications and discuss their company history and functionality. At the time of this writing, over 13,000 mobile health and fitness apps were available on iTunes. Not every mobile fitness application is covered; however representative examples are considered.

Endomondo

Described as a personal athletics tracker, Endomondo is a free mobile/GPS-powered Sports Tracker app which runs on multiple platforms, including iPhone, Android and Garmin watches (Endomondo 2012).

Figure 1 - Endomondo mobile screen shots



Source: Endomondo website

The alpha version of the application was released in September 2008 in connection with the world's largest running race, the DHL race with 100,000 participants in Copenhagen, Denmark. Enhancements to the application from the feedback provided by the initial users allowed for a beta version of Endomondo.com launch in July 2009 (Endomondo 2012).

In addition to the basic tracking of a workout route, split times, calorie consumption and challenges, Endomondo provides the user with an audio coach. For each mile or kilometer, a voice will inform the user about distance and speed. The app also enables friends to follow the user's run in real-time from their PC, from which they can send messages of encouragement that are converted to audio and played during the workout (Endomondo 2012). A trial of this functionality of the Endomondo app occurred during the 2009 Copenhagen marathon when 50 runners were tracked in real time (Bingham 2010).

Figure 2 - Endomondo social network example

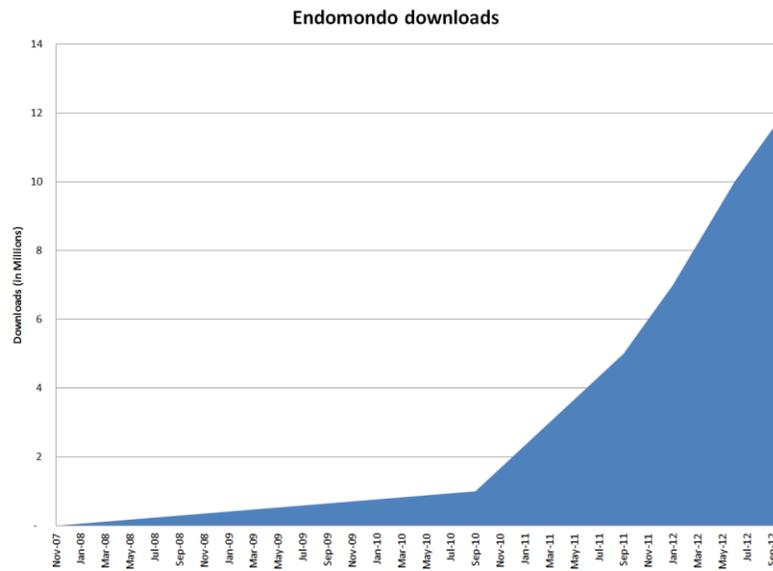
The screenshot displays the Endomondo website interface. At the top, there is a navigation menu with tabs for HOME, WORKOUTS, PEOPLE, CHALLENGES, EVENTS, ROUTES, and GEAR. The main content area is divided into several sections:

- HIGHLIGHTS:** Includes a 'REQUESTS' section with a challenge from 'Endomondo' and 'Jaki M'. Below it is 'MY ONGOING CHALLENGES' for 'Most workouts (Golfing)' and 'THIS MONTH'S PERFORMANCE' with charts for Distance, Calories, and Duration.
- NEWS FEED:** A central section showing a list of workouts from friends, including entries for Ted Vickey and Jaki M with details on time, distance, and activity.
- Right Sidebar:** Features the Endomondo logo, user profile for Ted Vickey, a search bar, a 'GLOBAL CHALLENGE' section with a 'Get it at BlackBerry App World' button, and a 'Calorie Challenge by BlackBerry' with details on type, duration, and prize.

Source: Endomondo website

Endomondo has experienced tremendous growth with more than one million downloads with 500,000 registered users, as of October 2010. Specifically, the application has grown from 40,000 registered users in January 2010 to 100,000 in April 2010, a doubling of its user base every 10 weeks over the past year thus demonstrating the popularity of such applications (O'Hear 2010).

Figure 3 - Downloads of Endomondo



Source: Endomondo website

RunKeeper

RunKeeper makes tracking your workouts fun, social, and easy to understand so that you can improve the quality of your fitness; employing your smartphone's GPS radio to track the distance, time, pace, route, and elevation of your jogs (RunKeeper, 2012). The app allows the user to sync data to the RunKeeper Website and later view a history of activity.” (Chiodo, Hopkins, and Mies 2010).

Figure 4 - RunKeeper mobile screenshots



Source: RunKeeper website

RunKeeper is an app developed by Boston based Fitness Keeper and Founder/CEO Jason Jacobs. Originally designed by Jacobs to help train for his own marathon, the app has expanded to allow for additional fitness tracking including walking, biking, hiking, skiing, rowing, rowing and user defined fitness activities. As of June 2011, RunKeeper has an online community of 6 million fitness enthusiasts. In addition to the iPhone app, RunKeeper is also available on Android and Windows Phone 7 platforms (RunKeeper 2012).

Figure 5 - RunKeeper social network example

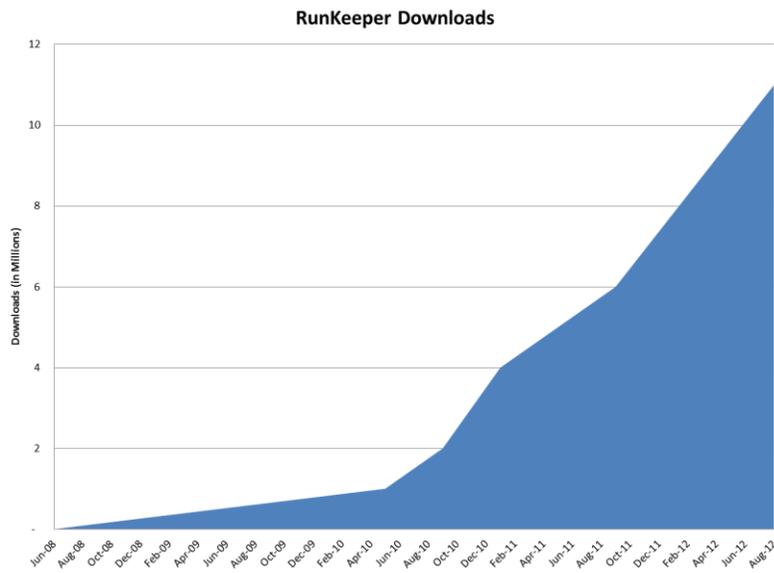
The screenshot displays the RunKeeper website interface for user Ted Vickey. At the top, the RunKeeper logo is on the left, and navigation links for 'Routes', 'Races', 'FitnessClasses', and 'Apps' are in the center. The user's name 'Ted Vickey' and a 'Become RunKeeper ELITE' button are on the right. The left sidebar contains a profile picture and a menu with 'Profile', 'Activities', 'Routes', 'Street Team', 'FitnessReports', 'Races', and 'FitnessClasses', along with a 'Post New Activity' button. The main 'FitnessFeed' section shows four activity posts with details like calories burned, weight measurements, and sleep patterns. The right sidebar features 'Street Teammates' with user avatars and activity counts, and a 'New from RunKeeper This Month!' section with promotional links.

Source: RunKeeper website

Jacobs and RunKeeper continue to market the app through high profile partnerships with other technology companies such as location based Foursquare and through promotions such as Jacobs running the Boston Marathon dressed as an iPhone. These efforts have raised \$1.51 million in funding as of August of 2010 (McDermid 2010). In November 2011, RunKeeper raised \$10 million in Series B financing led by Spark Capital and AOL founder Steve Case's Revolution Ventures (Schonfeld 2011).

In addition to raising funds, in December 2010 RunKeeper changed their business model to allow for the app to be available for free. This type of free promotion strategy is common. Its goal is to increase the total number of downloads which increases the likelihood that the app will appear in the Apple top-selling lists of the App Store, where the increased visibility will allow for long term additional downloads (Ha 2010). On December 30, 2010, the RunKeeper app was downloaded from the Apple App store over 171,000 times, a ten-fold increase from normal distribution (Ha 2010).

Figure 6 - RunKeeper downloads



Source: RunKeeper website

Hoping to become the ‘Facebook of Fitness’, in June 2011, FitnessKeeper (the parent company of RunKeeper) announced the launch of the Health Graph, allowing developers, fitness sensors and websites to tap into the wealth of health and fitness data collected by the RunKeeper community. Jacobs describes the Health Graph as an extension of the social graph. “The social graph has evolved into the Open Graph - a system of connections that includes not just personal relationships, but also your personal 'likes' and interests. Any website, individual or group that you 'like' is eligible for inclusion in your open graph.” (RunKeeper 2012)

Jacobs suggests that the Health Graph is a system of health connections, an ever-changing digital map of one’s personal health recording body measurement statistics or health related actions that impact personal health. This snapshot of health will provide users with a picture of health and how it has changed over time.

Figure 7 - Sample Health Data collected using Health Graph by RunKeeper

Data	Week of May 17	Week of May 24	Week of June 1	Week of June 7
Weight (lbs.)	160	161	153	155
Avg Daily Calories	3600	3450	3000	2700
Avg Daily Sleep (hours)	7	6	8	7
Avg Daily Activity (min)	30	25	47	58
Social Network Motivation	2 comments	3 comments	13 comments	7 comments

The Health Graph will also provide an understanding of how a person's activity and behavior correlate with a change in health and how a person's social interactions influence changes in wellbeing (Jacobs 2012). Since it opened up its Health Graph API, RunKeeper has integrated with over 40 third party services and while data sharing is relatively small, it is doubling every month (Schonfeld 2011).

In the summer of 2011, RunKeeper partnered with global online social networking portal Meetup to organize a worldwide group run to be held on July 9, 2011. More than 1,700 RunKeeper users signed up for runs in 734 cities, with the largest runs to take place in London (45 runners) and Boston (43 runners). Participants met in designated locations throughout the day and recorded their runs using the RunKeeper app. In comparison, Nike hosts similar runs in more than 25 cities worldwide (Indvik 2011).

Nike+

Nike+ iPod Sports Kit is a set of tools designed by global shoe maker Nike. The tools allow a user to measure distance, pace, map runs, track progress and get the motivation needed to go even further.

Figure 8 - Nike+ mobile screenshots



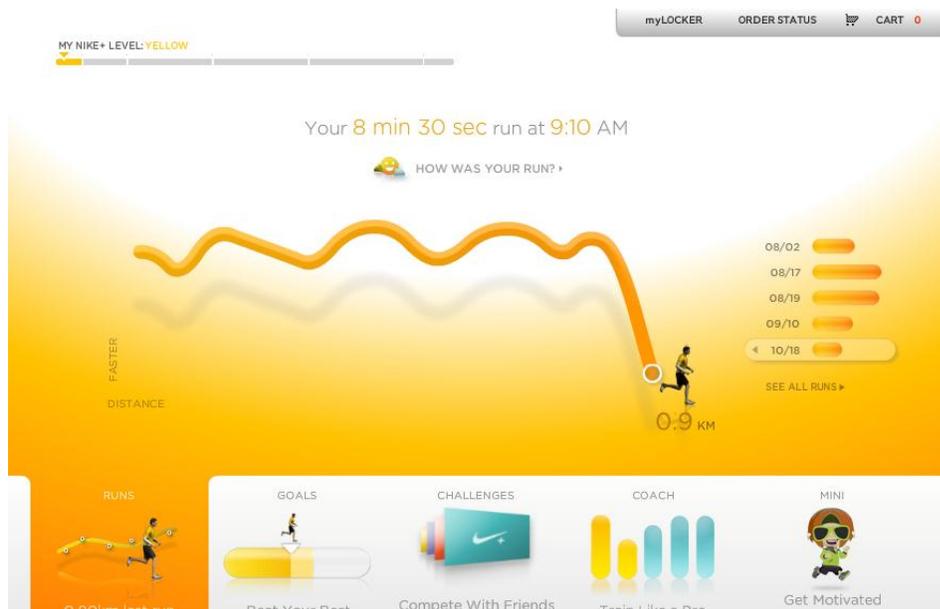
Source: Nike website

The original design of the Nike+ iPod Sports Kit was first introduced in May 2006 and included a small accelerometer that was attached or embedded into a Nike shoe. The accelerometer is designed to communicate with either a Nike+ Sportband, a receiver plugged into an iPod Nano, or directly with a 2nd, 3rd or 4th Generation iPod Touch, iPhone 3GS or iPhone 4 (Wikipedia 2011). As of August 2011, the Nike+ iPod sport kit sells for a retail price of \$29 and can be purchased worldwide from existing distribution channels of Nike.

In September 2010, Nike released the Nike+ GPS App on the Apple platform, which used a tracking engine powered by mobile sensor company MotionX that does not require the separate shoe sensor. This application works using the existing iPhone accelerometer and GPS as well as the accelerometer of the iPod Touch and sells in the iTunes store for \$1.99.

The relationship between Apple and Nike is strong, having first been established in 2001 soon after the release of the first Apple iPod. Nike President and CEO Mark Parker stated that year, "Most runners were running with music, we thought the real opportunity would come if we could combine music and data" (McClusky 2009). Parker had a personal friendship with Apple CEO Steve Jobs and both companies saw profit potential if they could develop the system together, with Apple working on advancement of the Nike sensor prototype by making it smaller and more durable and Nike focused on the shoes, the concept of fitness goal setting and the interface for the Web and the iPod (McClusky 2009).

Figure 9 - Nike website screenshot



Source: Nike website

Nike+ has introduced additional technology called “Cheer Me On” to allow for motivation during runs. A cheer is heard by the runner, which is activated whenever a friend likes or comments on the user’s run status from the Nike+ website or Facebook (Van Grove 2010). Friends can also track real time progress by monitoring a user’s workout via the web. Best runs are celebrated by the Nike+ community with motivational messages from Nike’s top athletes including Tiger Woods and Lance Armstrong. These personal milestones and other accomplishments can also be broadcasted to a user’s social network via Facebook and Twitter integration.

Figure 10 - Nike Cheers



Source: Nike website

By creating a simple way to collect data with tools to use and share it, Nike has created a community of more than 1.2 million runners. Data analysis of these collected runs would suggest that the group has tracked more than 130 million miles and burned more than 13 billion calories. Personal habits have also been surmised such as workout patterns during the winter months (people in the US run more often than those in Europe and Africa, but for shorter distances), the average duration of a run worldwide is 35 minutes, and the most popular Nike+ Powersong, which runners can set to give them extra motivation, is "Pump It" by the Black Eyed Peas (McClusky 2009).

The Nike+ system works in three steps: Capture, Sync and Share (McClusky 2009).

- **Capture** - The shoe sensor's accelerometer (the Nike chip) measures the amount of time a runner's foot is on the ground using the piezoelectric effect, which measures pressure, acceleration, strain or force. This time is inversely proportional to speed and the data is transmitted at 2.4 GHz from the sensor to a receiver that's either attached to an iPod or built into the second-gen iPod touch (Nike 2011).

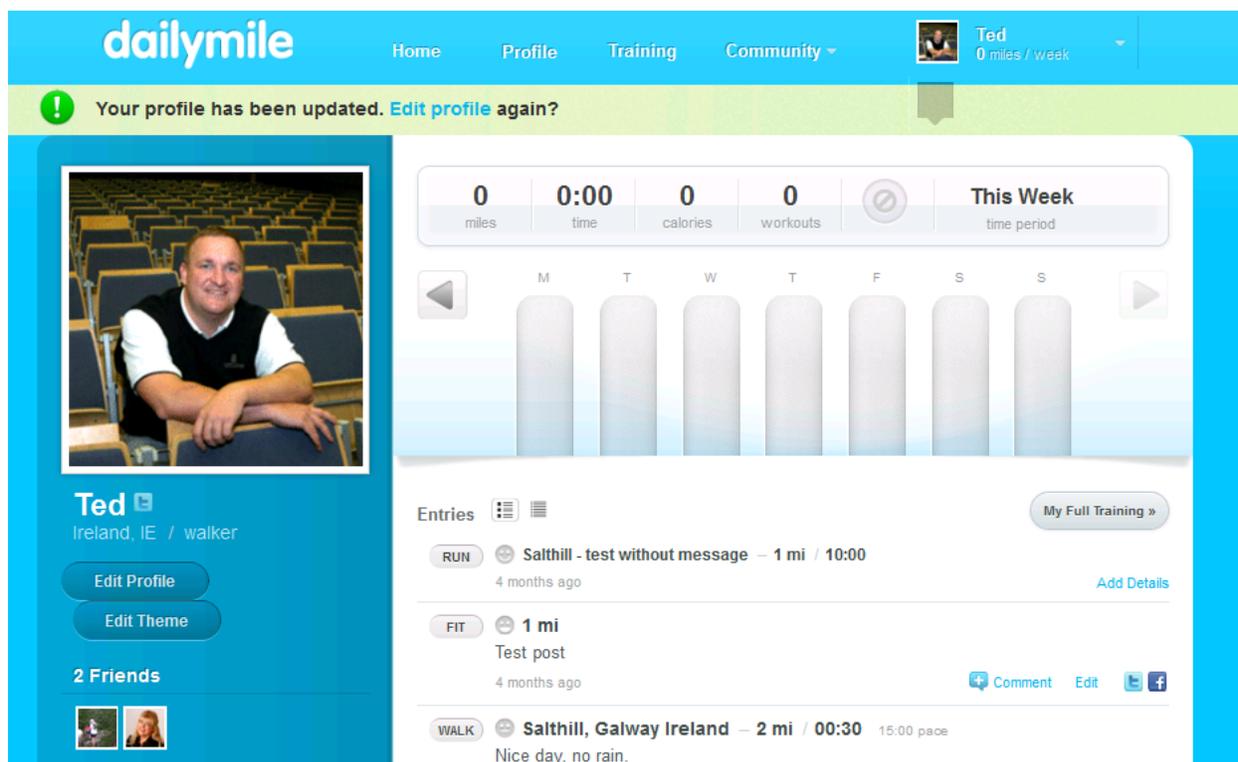
- **Sync** - After the workout, the iPod is synced to a computer running iTunes, which automatically sends the data, including start time, duration, and distance, to the Nike+ servers, formatted in a specially structured XML file that can also be read by third-party applications. For users of the iPhone version, data is streamed in real time from the Nike+ app to the Nike+ servers.
- **Share** - All collected data resides on the Nike+ servers where users can access their run history, share their data via their personal online social networks at Facebook or Twitter, or for those needed extra motivation, users can join one of the many Nike challenges or set individualized goals, like running 50 miles in a month.

DailyMile

DailyMile is a San Francisco based company described by University of Wisconsin alumni founders Kelly Korevec and Ben Weiner as “a social experience for active people, a community of people just off the couch to ultramarathoners alike, who encourage and inspire one another as we achieve our goals (DailyMile, 2012).

Founded in 2008, DailyMile was originally designed to cater to active types such as runners and cyclists that often trained alone while incorporating the sharing of workouts via social media, which allows people to train together virtually. The service is a combination fitness log, motivational tool and social-networking hub aimed at using social media to help people achieve their health and wellness goals such as training for a big race or losing weight, all while connecting with others that are trying to bring fitness and health into their offline lifestyles (Henning 2010).

Figure 11 - DailyMile screenshot



Source: DailyMile website

As of November 2011, DailyMile reported over 10.1 million workouts by members were completed, with over 8.9 million member interactions via comments posted, with total member activity accounting for over 72 million donuts being burned. The site has reached over 200,000 members and adds over 3,000 new members weekly (DailyMile 2012). DailyMile currently interfaces with devices such as Nike+, Garmin, Apple mobile platforms and Android clients. Members can download and embed personalized widgets of code that can be added to their own blog or website that tracks exercise mileage.

The DailyMile website has three areas of focus including profile, training and community sections. Within the community section, a member can interact with other members, participate in challenges and forums, view shared exercise routes and enter local fitness events. Unlike the other mobile fitness applications discussed in this research, DailyMile does not have their own app, but rather uses an API to enable third party developers to build applications on the DailyMile Social Workout Platform. These third party apps include but not limited to Electric Miles, Runmeter, LogYourRun, Kinetic and Jog Log and allow functions such as data entry and deletion, comments, likes, friends, routes and GPS location (DailyMile 2012). DailyMile also uses members to provide crowdsourcing ideas to developers. Members have suggested concepts such as mobile apps, blog integration, Google Health data transfer, nutritional information exchange and workout logging via SMS.

MyFitnessPal

MyFitnessPal is an online health and fitness community that offers useful tools, advice and support to help a person meet their weight loss and fitness goals. The site allows a person to track what they eat and how much exercise they perform in order to give a clear picture of daily/weekly/monthly caloric intake. In addition, the online community offers tips and support to help with motivation along the way. While similar with the other mobile fitness apps discussed in this paper, MyFitnessPal also includes a robust daily food tracking option with a database of over 1.2 million searchable items via a database maintained by the USDA. One feature of the set up process is personalized goal setting with respect to body weight. A user can decide to gain, lose or maintain weight, however the app restricts the user from losing less than 2 pounds (1 kilogram) (Duffy 2011).

Figure 12 - MyFitnessPal screenshot

The screenshot shows the MyFitnessPal website interface for a user named 'tvickey'. At the top, the user is logged in and has 0 messages and 0 friends. The navigation menu includes MY HOME, FOOD, EXERCISE, REPORTS, TOOLS, and COMMUNITY. Below the navigation, there are sub-links for Home, Goals, Check-In, Mail, Profile, My Blog, Friends, and Settings.

Your Diet Tools

- Track Food
- Track Exercise
- Weigh-In
- Message Boards
- Your Profile
- Mobile

Your Daily Summary

776 CALORIES REMAINING

Goal	Food	Exercise	= Net
1670	969	- 75	894

Setup Sharing

Share your updates with friends on Facebook and Twitter.

Recent Forum Topics

- HRM
- Joined yesterday
- Adding new food item to food database
- cups per liter
- Bacon Question

My weight loss progress

0 lbs lost

Add friends - Don't diet alone!

Invite your friends to join or find new friends on MyFitnessPal. Friends can provide you the support and motivation you need to succeed.

News Feed — Summary

What's on your mind?

tvickey burned 75 calories doing 15 minutes of walking.

Source: MyFitnessPal website

Based on the user's fitness profile, MyFitnessPal recommends a daily net calorie target. The tracking of exercise (calories out) and food consumption (calories in) throughout the day adjusts the daily net calorie target. Re-occurring exercises and/or food can be saved as "favorite", thus allowing for quick logging.

In 2011, a Walden University study proposed that positive social change by tracking calories via smart phones using MyFitnessPal could encourage users to make healthy choices and thus reduce the overall prevalence and incidence of obesity and related health conditions (hypertension, diabetes type 2, and cardiovascular diseases) within their communities (Hijazi 2011). The MyFitnessPal website suggests:

"Study after study has confirmed the benefits of keeping track of the food you eat and the activity you do. It's simple - the more consistently you track your food intake, the more likely you are to lose weight. That's why every successful weight management program suggests that you keep a food diary and/or an activity log. But recording everything you eat without the right tools can be tedious at best, or simply impossible at worst". (MyFitnessPal, 2012)

The MyFitnessPal service is a free online service with supplemental apps on iPhone and Android platforms for additional methods of data collection. MyFitnessPal integrates with Facebook and Twitter allowing for customized sharing of activities.

Discussion

Mobile fitness apps have changed the way people plan, collect and share information about their health and fitness goals by combining the power and portability of a mobile phone with the daily activities of life. Tracking of personal health and fitness data was once reserved for elite athletes or those that could afford the hefty price tag, but mobile technology has changed that. Table 1 lists the various devices discussed in this review article and a collective sampling of the features of mobile fitness apps.

The mobile fitness apps such as those discussed in this article highlight the growing trend and acceptance of using health sensor devices by the general public, and in so doing, making their health and fitness more accountable. The role of lifestyle in both understanding and treating diseases seems only to be increasing (Andre and Wolf 2007). As these devices become smaller, more powerful and less draining of mobile phone battery life, a wider acceptance and usage can be expected.

Figure 13 - Analysis of select mobile fitness applications

	Nike+	RunKeeper	MyFitnessPal	DailyMile	Endomondo
Size (iOS version)	18.6 MB	11.1 MB	15.9 MB	n/a	5.3 MB
Native App	Yes	Yes	Yes	No ⁴	Yes
Platform	iOS	iOS, Android	iOS	n/a	iOS, Android, Blackberry, Windows
Cost (iOS version)	\$1.99	Free	Free	n/a	Free (Pro \$3.99)
Live Cheering	Yes	No	No	n/a	Yes
# Activities	2 ¹	14 ²	350 ³	n/a	51 ⁵
Sharing with Twitter and Facebook	Yes	Yes	Yes	On Web	Yes
Real-time Coaching	Yes	Yes	No	n/a	Yes
Real-time Tracking	Yes	No	No	n/a	Yes
Challenge Friends	Yes	Yes	Yes	On Web	Yes
HR integration	Yes	Yes	No	n/a	Yes
GPS	Yes	Yes	No	n/a	Yes
Auto Pause	No	No	No	n/a	Yes
Languages	English, Chinese, French, German, Italian, Japanese, Portuguese, Spanish	English	English	n/a	English, Danish, French, German, Spanish

All data as of April 13, 2012

Footnotes:

1 - Walk, Run

2 - Running, Cycling, Mountain Biking, Walking, Hiking, Downhill Ski, Cross Country Ski, Snowboarding, Skating, Swimming, Wheelchair, Rowing, Elliptical, Other

3 - Activities are manually entered to the app or website

4 - DailyMile is a website portal that uses a number of different mobile apps to enter data

5 - Walking, Cricket, Running, Cycling Transport, Cycling Sport, Mountain Biking, Skating, Roller Skiing, Skiing Downhill, Skiing Cross Country, Snowboarding, Kayaking, Kite Stair Climbing, Cross Training, Dancing, Fencing, Football, Rugby, Soccer, Handball, Hockey, Pilates, Polo, Scuba, Squash, Tennis, Table Tennis, Beach Volleyball, Volleyball, Weight Training, Yoga, Martial Arts, Gymnastics

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