

# Ubiquitous Computing on the Run: Motivating Fitness by Computing Technology

Louise Barkhuus  
Department of Computing Science  
University of Glasgow  
17 Lilybanks Gardens  
Glasgow, G12 8QQ, UK  
barkhuus@dcs.gla.ac.uk

## ABSTRACT

This paper introduces fitness technologies and describes how research mostly looks at the ‘fanciness’ of certain cardio-based technologies rather than how they motivate users. From the view that exercise should ideally be fun, but most often needs basic motivation, we suggest studying how technology can help motivating people to exercise. Finally, the motivation for attending the workshop on ‘Monitoring, measuring and motivating exercise’ is given.

## Categories and Subject Descriptors

J.4 [Social and Behavioral Science]: Human Factors

## General Terms

Physical fitness, ubiquitous computing

## 1. INTRODUCTION

The positive aspects of a physically fit body are not a recent discovery. Sport and exercise has been highlighted for centuries as a good way of staying healthy, avoid common illnesses and feeling good [3]. Another benefit of exercise is the potential weight loss among overweight people, an increasing problem especially in the US [9]. With the media attention nutrition and exercise receives, no one should doubt that working out regularly is a good idea, and the fitness industry - private gyms, work-out videos, fitness magazines etc - is consequently blooming. New or re-innovated fads are continually emerging, such as Pilates and Yoga and are recently being taught in the same gyms where Jane Fonda’s aerobic lessons were held in the eighties. Similarly, new exercise assisting technologies are constantly introduced; no gym is now without the large ‘body balls’ that are used for several types of strength exercises. In the gym old-fashioned dumbbells are exchanged (or at least supplemented) with muscle strength equipment and in the cardio studio the training equipment is seeing a high level of programmable treadmills, elliptical trainers etc.

All these technical enhancements are due to the computing possibilities that smaller and more powerful computers offer. Despite the continually popularity of new types of exercises and

fitness routines, and much ‘research’<sup>1</sup> into what types of exercises are efficient, it seems as little research has looked at exercise technologies and their position in *motivating* fitness. That the most successful technology integrated into fitness routines has been the iPod suggest the value of studying how people are *motivated* by the state-of-art exercise technologies used in the common fitness center. Where much research, as will be elaborated on further down, focus on computerizing sports and making exercise fun by such means as virtual reality, we are taking a more pragmatic view. Although many people like to play sports and get their exercise this way, there are also a great number of people who exercise with the sole purpose of staying healthy. The latter are the people we address in our research. Before introducing the proposed study, however, we review fitness and exercise equipment as it inhabits the 21<sup>st</sup> century.

## 2. FITNESS EQUIPMENT IN THE 21<sup>ST</sup> CENTURY

When describing fitness and exercise equipment of present time, it is useful to first look at it in historical perspective. The present state of equipment and people’s fitness behavior and attitude are part of a long development of both visions by pioneers and technology development. Fitness and exercise is ancient, although historically often related to sports and military training; however, exercise technologies are newer [3]. Besides resistance components such as dumbbells, actual ‘machines’ or advanced equipment was only introduced in the late 18<sup>th</sup> century Germany [3]. Figure 1 shows a later illustration of such type of equipment. Larger pieces of cardio focused equipment were introduced in the early 1950s, where treadmills and later stationary bikes were developed for medical purposes [4]. The first computerized exercise bike was marketed in 1968 and today the most common cardio training systems in addition to these two include the stair master® (imitating a staircase), the rowing machine and the new elliptical trainer (simulating running without lifting the feet of the steps) [4].

Today, most computing power in cardio equipment is used for measuring factors such as heart rate, calorie burning and distance of running/cycling. Most cardio equipment supports different programs such as for example interval training (shifting between fast and slow) or different types of runs (running up and downhill). From a brief glance over equipment manufacture’s websites, it seems that the more computing power, the more

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<sup>1</sup> ‘Research’ here refers to both medically based research overseen by scientists and the more or less experience-based claims from self-made fitness gurus.

different programs, settings and measurements, the better the equipment is. But then again, price goes up with complexity and it is likely the manufacture's goal to sell expensive equipment. From personal experience with numerous gyms, the complex computer powered cardio equipment is widespread and often offers more settings and measurements than a common attendee can comprehend and operate without the assistance of a personal trainer. The fitness center today offers a multitude of services besides access to cardio equipment which brings on the next issue in relation to fitness today: the fitness center as the place for combining pleasure and sanctuary with necessary exercise in today's Western World, in other words 'the Temple'.

**The Whiteley Pattern Exercisers.**

No. 6K6873 Made of elastic cord with wood pulleys, plain handles and foot attachment.  
 Price ..... \$ 1.25  
 If by mail, postage extra, 22 cents.

No. 6 K 6 8 7 7 Whiteley Pattern Special Exercisers, for adults or children, full size, OO grade, made of elastic cable with plain wood pulleys and wood handles, nickel plated trimmings, complete with hinge attachments, screw eyes, also chart of exercising. Packed in neat paper box. Price.. 35c  
 If by mail, postage extra, 20 cents.

**Exercising or Swinging Rings.**

No. 6K6879 Wooden Rings, three pieces, made of walnut and maple glued together, 6 inches in diameter.  
 Price, per pair ..... 48c  
 If by mail, postage extra, 5 cents.



Figure 1. Advertisement, Sears catalogue 1908

## 2.1 The Temple

Today's fitness center or gym as it is more traditionally referred to in the US, is very different from the gymnastics halls of the 1950s and even the bodybuilding centers of the 1980s. A couple of decades ago, the stereotypical gym mostly had male members who worked to perfect their bodies for esthetic reasons. Women turned to aerobics and jazzercise, exercise routines that did not require much equipment but which borrowed and innovated movements from dance and gymnastics. Slowly, however, fitness centers transformed, perhaps in unison with a greater interest from the general masses, and attracted a greater diversity of people, who combined cardio training with equipment-based weight training. Today, fitness centers do not only have cardio-based equipment and weight training machines; they are often a base for spas, swimming pools, Jacuzzis and numerous types of exercise classes. The atmosphere is commonly one of solitary action because the majority of gym attendees work out alone. Many people wear earphones, either connected to their own music device or the often provided sound system that cardio machines have (these are often based on radio and if the gym has TVs, each channel is broadcasted over a specific frequency, instead of out loud). 'The temple' is therefore a good analogy for the present fitness center with users' secluded behavior and their focus on well-being. One question this metaphor provokes is how people perceive the

fitness center as a place to increase well-being and how the technologies available there improve this feeling.

## 3. UBIQUITOUS COMPUTING INITIATIVES

Many researchers, who focus and are trained in the computing technology possibilities rather than the medical aspects of fitness and exercise, have proposed and developed computing systems for training. One example is the Shadow Boxer which is a game developed as a method of exercising. The method was based on the observation that many fitness centers offer fitness boxing, a physical activity where the goal is to exercise rather than beat someone else up. The researchers showed that users find it enjoyable for the purpose of exercising [5]. Another suggestion proposed to make stationary cardio exercise more exciting is the virtual reality biking interface Virku. Here a stationary biker views a computer animated landscape as she bikes along the roads of Finland [7].



Figure 2. The Temple

There are several approaches to facilitate sports with technology; Mueller et al. for example reason their exertion interface from the perspective of exercise as well as interacting with someone over a distance [8]. Their 'Breakout for Two' game is a ball game possible to play over an internet connection; they found that it was good for socializing but they did not infer to the users' satisfaction for exercise. In addition to this there are several commercial games that require stamina; a popular example is Dance Dance revolution [6]. Most focus, however, has been on making exercise fun and although that is a great argument for developing exercise technologies, there is another side of the coin which we aim to explore. How can we motivate present and future fitness center attendees seen from present state-of-art perspective? In order to approach this question, we take a look at possible motivation or aversions in the Temple today.

## 4. CHALLENGES TO MOTIVATING EXERCISE

Research within exercise has focused on how much and what types of exercise is optimal for improving people's well-being and health; from a technological perspective, cardio trainers have been developed with the aim of making the exercise simple and

flexible. Although it is difficult to study the level of motivation for exercising among people, it is hard not to address this as a problem. According to statistics, over 65 percent of the US population is overweight [9]; this even though the media and schools are loudly promoting exercise as one way to help weight loss. For many people (no necessarily overweight) it is difficult to fit exercise into their busy everyday life and for some the fitness center might seem as an expensive option. Outdoor exercise often requires access to a green area and to some they might just express that they simply 'never get around to exercise'.

The characteristics of cardio exercise machines is that they have a multitude of functions available, the more functions, the more advanced and exclusive the equipment seems to be. But common sense tells us that in essence, a treadmill is still a treadmill and a bike is still a bike; the benefit of the exercise depends on the individual's performance, not the internals of the equipment. When a person steps up on a Stairmaster or a stationary bike, the vast majority of equipment asks for some basic information and if the user wants to use a program (for example 'interval training'). It is necessary to input information such as time of exercise, pace (sometimes this is defined in a level between 1 and 12), weight and often age. This information is used to calculate values such as calorie burning (weight is needed for this) and optimal heart rate level (age is needed for this); however, it is not necessary to know for the equipment's basic functioning. Imagine an unfit or overweight person who wants to start exercising. Going to the gym is already a big step but facing such information request from basic equipment can be very frustrating. The equipment is often placed close to each other, has large read digital numbers, so the information can easily be read by other fitness attendees while it is being input. Being overweight and having to 'broadcast' your weight (and age) to others in the process of trying to do basic exercise can be very humiliating. The only function that needs to know the weight is the calculation of calorie consumption, which even cardio equipment makers admit are not very precise [10]. Our suggestion is that this excessive information request is a very un-motivating factor for exercising.

Another characteristic of the fitness center is its 'glamour' stereotyping. Websites and the actual centers are often covered with pictures such as figure 3. This might be motivating for users who feel they can live up to those stereotypes or who are strong enough to not care but being overweight is often related to low self-esteem and viewing a website full of glamorous (skinny) people on bikes, is not motivating for real-life people. Well-knowing that this is touching on a much bigger issue in our Western society and media, we as technology researchers should address these problem in relation to users' motivation. By looking into possibilities for new or innovated technologies it should be possible to motivate more people to exercise and thereby become healthier individuals.

Another challenge is simply the exercise itself. Very few people agree that running on a treadmill for half an hour is exciting and a quick informal inquiry suggests that people tend to 'compete' with themselves in order to stay motivated. Meaning, telling oneself that 'if I finish this 20 minute run, I get to go to the Jacuzzi afterwards' or 'I want to be able to run this distance by next month'. The previous initiatives to facilitating cardio exercise, such as the Finish virtual reality exercise bike, show interesting ways to help motivation but are also quite unrealistic



**Figure 3. A stereotype, healthy, happy woman**

in the foreseeable future. Present ways of entertaining fitness center attendees include TV screens, either large or individual screens on the cardio equipment itself, and radio, as mentioned in the introduction. But other types of technologies motivating exercise can be implemented just as easily. One example is implementing a program that enables fellow attendees to compete for a short time and another example is coaching audio connected to the equipment, constantly praising and pushing the attendee in her earphones.

Motivation for exercise is naturally a complex issue which cannot be solved by outside means. Where people have many considerations in relation to time and energy, we can merely provide them with limited sets of assistive technologies. But besides motivation, it is important that technologies provide a comfort and challenge in exerciser's lives, something that makes it worth exercising on a regular basis.

## 5. FUTURE WORK

In our future work we plan to study present use of fitness technologies to find how they can assist motivation better in people's exercise. By tracing actual use of fitness technologies in the users' fitness routine, we aim to provide a description of how people are motivated to work out presently. This should offer a basis for further investigation. One type of analysis which we would like to use is 'defamiliarization' of the domain of fitness technologies, for example as used by Bell et al. in relation to domestic technologies [2]. This approach focuses on making the well-known strange in order to provide new insights into use and design. This approach provides a useful framework for our domain, in that fitness technologies and their design are easily taken for granted by users, similarly to home technologies. One example is to portray exercise in a historical perspective such as comparing a fitness center to the woods where pre-historic men and women ran around to hunt and hide from animals and thereby got their exercise covered. Building a fake forest such as the fitness center seems odd, but that is essentially what we do in a thoroughly structured way with treadmills for running (away from

wild animals), lifting weights instead of heavy stones used to build dwellings and swimming pools to swim in instead of swimming to catch fish. This is only one example of defamiliarization and more detailed descriptions will be provided from empirical research that we plan to conduct. Ethnographic studies are one way of defamiliarizing an area, which is the approach we suggest for this project. We plan to take an active (in the most literal sense) part in studying use and motivation among fitness attendees by observing and interviewing attendees, as well as having participants fill in a one month journal.

We also plan to develop new fitness applications and test them in a real environment. Emphasis will be on how users change between different type of exercise equipment and type of work out, as well as which ones keep them motivated and why. The development will be based on the first ethnographic study and will therefore be specified as research progresses. An example of a potential application is a dynamic fitness program developed for mobile phones where users can adjust their fitness plans according to their daily life. If for example, the user misses a day of exercise, he/she can simply adjust the program to fit reality, rather than having to try and catch up with the exercise program and thereby feel guilty about the missed exercise.

Finally, the research should bring forward a set of design guidelines for exercise equipment and fitness facilities. The design guidelines will be based on the empirical studies of users and fitness technologies and the testing of applications. They should inform designers of both fitness equipment and ubiquitous computing designers of issues relating to motivating exercise in itself, rather than competitive sports exercise. 22

## 6. MOTIVATION FOR ATTENDING WORKSHOP

My interests are widely distributed within health technologies and are not limited to exercise technologies. The possibilities for monitoring diets in relation to illnesses, such as heart conditions and diabetes are promising and specific dietary restrictions will in the near future be assisted by handheld computers and scanners that 'knows' the ingredients of food. Ubiquitous computing is expected to have positive impact on this type of assistance and support. I therefore find it interesting to discuss the future perspectives on other technologies as well. My background is within HCI and I have looked at both mobile technologies and the use of mobile games. Relevant studies include the study of Treasure, a mobile game played out on a lawn, utilizing the uncertainty of GPS as a feature when playing two teams against each other [1].

By participating in the workshop I hope to gain insight into other possible research within health and fitness technologies as well as receive constructive feedback to my own proposed research. Finally, I hope to participate in the discussion of the future health technology paradigm, which we as researchers envision.

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