Does Social User Experience Improve Motivation for Runners?

A Diary Study Comparing Mobile Health Applications

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Abstract. In efforts to enhance the user experience (UX), mobile fitness applications are beginning to incorporate gameplay mechanics and social elements in their design. Unlike the more traditional health applications, m-health applications can provide a richer social user experience that caters to mobile usage contexts, such as fitness. In this paper we discuss to what extent *gamification* and *social elements* improve user motivation and lead to *short-term* positive behavior change. We examine the efficacy of social features in three different m-health running applications with varying levels of social and gamification functionality, each supporting the core task of tracking a user's running activity. Data was collected over a week from 15 mobile app users and runners based in the USA with an online diary study followed by short interviews. The analysis of the diary entries indicates that apps can provide motivation to maintain or increase physical activity, but that the usability, design and feature richness of social and gamification elements negatively impacted user adoption. Moreover, the adoption of social elements, was impacted by interface usability, integration with new music services like Spotify, accuracy of the GPS and so on. The results show that *intrinsic motivation* and *individual goals* can enhance short-term positive behavior change, an important dimension for the design of m-health apps. In addition, many users were comfortable with social UX elements, but social elements in and of themselves did not contribute to motivation in running due to the design and usability of each apps social UX strategy. The results from this study will be useful for designers of m-health apps in formulating appropriate design strategies for incorporating social and game mechanics into mobile UX strategy.

Keywords: Social user experience, Ramification, Mobile usability, Intrinsic motivation, Behavior change, mHealth.

A. Marcus (Ed.): DUXU 2014, Part IV, LNCS 8520, pp. 358–369, 2014.

1 Introduction

As mobile health (m-health) applications become more prevalent, it is imperative that they work for their users. The relationship between user motivations and social behavior in the context of m-health applications is important, since access to fitness and behavior change is on the rise [1, 2, 3, 4]. [5] report that half of adults in the United States do not engage in recommended levels of physical activity, despite established health benefits. Recent research by [6] found that mobile users favor mobile tracking tools, as evidenced by the rapidly increasing number of m-health apps in Apple's App Store. Several guidelines exist for designing technological apps that engage, motivate, and support behavior and attitude changes [7, 8, 9]. The guidelines that are more closely related to mental wellness apps include [10] 7 guidelines for behavior change: (1) remind people who they want to be, (2) foster an alliance (empathy, coinvestigation, joint problem solving), (3) apply social influence, (4) show people what they could lose, (5) put the message where the action is, (6) raise emotional awareness, and (7) reframe challenges. Gamification, that is, using game-like elements has also been proposed in the domain of wellness apps to increase adherence and engagement [11, 12, 13]. However, the guidelines are mostly based on apps promoting physical health and thus they may not be directly applicable to m-health running applications. Moreover, despite the increasing amount of work published on the technological side and adoption of m-health [2, 4], research on the usage and social user experience (UX) strategies of m-health applications remains limited. For example, [4] found that the most common technology-enhanced features in weight loss mobile apps were barcode scanners (56.7%) and a social network (46.7%) and that behavioral strategies that help users improve motivation, reduce stress, and assist with problem solving were generally missing across apps.

Several observations can be made about existing studies on m-health adoption. Firstly, studies of m-health usage and usability among users have been limited [14]. Secondly, most of these studies have developed their adoption models based on general guidelines [10] and have mainly studied the adoption of m-health based on users' intention to adopt or not adopt m-health applications. Lastly, most existing m-health adoption studies have neglected using motivation variables and social elements and their influence on m-health usage activities. Therefore this study aims to investigate the relationship between motivation and social UX variables with m-health usage activities among users of applications used for fitness purposes, specifically running.

1.1 Mobile Applications User Adoption

For mobile fitness applications to achieve some degree of success in today's market they must appeal to as many users as feasibly possible. So designing applications in a manner that provides the same UX (e.g. useful, social, and entertaining) to all users

irrespective of user motivation, experience or skill is becoming the focus of modern day m-health research. Traditional design is well suited to covering particular clusters of users' fitness goals (e.g. hardcore, casual) as an app developer's perception of what makes a good application is sure to appeal to someone. However, users who do not fall within these designer perceptions are likely to be excluded; they may initially be interested in the fitness concept but are turned off by its execution (e.g. too easy, too hard), confusing game mechanics or particular design choices (e.g. easy, medium and hard difficulty settings). The designer will try to envisage such changes in the application and adapt the design to reflect them so to ensure the application remains appealing throughout its usage.

1.2 Motivation in Mobile Fitness: Dynamic and Social

Preferably m-health applications for fitness should be capable of dynamically adjusting to usage given that mobile interactions are situated in fluid social and physical environments. Past literature suggests that user motivations can influence their decisions to adopt a particular technology. Motivations can be categorized as intrinsic or extrinsic motivations [15]. Extrinsic motivation is defined as "the performance of an activity due to it being perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself" [16]. Intrinsic motivation "refers to the performance of an activity for no apparent reinforcement, other than the process of performing the activity per se". Examples of intrinsic motivations include perceived fun, ease of use, enjoyment and playfulness. Extrinsic motivations include the perceived benefits gained from using the technology. [16] and [17] found that motivation variables have a positive and significant relationship with Internet usage. Similarly, studies have found that extrinsic and intrinsic motivations can influence the adoption of technologies such as mobile chat services [18], electronic service [15] and mobile internet [19]. Although past studies have focused on these motivation variables in Internet usage activities, literature on the relationships between user motivation variables, social UX and m-health activities remains sparse. Why does the user want to use a mobile application for fitness? Is it for the challenge, the fun of it all, to lose weight, track performance or perhaps to leverage social dynamics to influence performance? In order for m-health applications to design changes that are positively motivating for the user, we need to understand the primary psychological motivators and social needs of that user.

2 Research Questions and Study Methodology

The results of our diary study cover the largely neglected issue [20, 2] of user motivation with social UX on m-health applications. User motivational goals represent a key 'lens' for understanding the impact of social patterns and behavior, and for developing a social UX strategy designed to achieve positive behavior change. We compared

social effects of three widely used m-health applications for tracking fitness user behavior via a diary study as a means of framing motivational goals, and critically, as a vehicle for bringing about behavioral change. The main research questions are as follows: (a) Do social features add value to mobile UX? (b) Does gamification add value to mobile UX?, and (c) Does intrinsic motivation impact the use of social UX features?.

2.1 Sample and Procedure

Three groups of five experienced iphone app users (15 participants in total) based in the USA used the following applications, in order to determine if the apps social elements improved motivation: Digifit (little or very light social features), Endomondo (social features with light gamification), and Runno (social features with heavy gamification). Data were collected from 3 sources: (1) online questionnaires completed at baseline, after one week's use, (2) interviews conducted at the end of the week's use, and (3) the usage log of the three apps. Participants completed a 7-day online diary study [21] and the Stanford Brief Physical Activity Survey [SBAS, 22] followed by short individual interviews. Participants were purposefully recruited from different US regions (West coast, Midwest and East coast) with a mean age of 29 years (8 males and 7 females). Study inclusion criteria were: (1) use mobile applications for their fitness needs, and (2) interested to improve their general fitness goals. Exclusion criteria were: (1) known medical conditions or other physical problems requiring special attention in an exercise program, (2) severe hearing or speech problems, and (3) current participation in lifestyle modification programs or research studies. Participants were self-described runners or included running as part of their work-out (e.g. weight training, cycling) on average 5 days a week. Listening to music while exercising and tracking their performance/fitness levels has been mainly reported to be the main use of users' apps, whereas 40% of them regularly use gadgets. Moreover, all participants are using Facebook and the majority (75%) of them is comfortable sharing their fitness activities on Facebook or other social media platforms. Participants were screened by phone and email and given information about the study, including the requirements of installing the applications in their mobile, daily use of the fitness applications as well as the diary notes for the 7-days study period. A survey questionnaire and short interview guide was developed to test the research questions in this research. The diary was designed such that participants had to log data; even if it was a non-exercise day (SurveyMonkey logic-branching technology was used). Daily goals based on self-reported steps were relayed by the application, along with immediate and motivational feedback. The interviews focused on prompts and questions regarding the benefit of physical activity, barriers to increasing physical activity, usefulness of the game included in the applications, and social support for physical activity. SBAS was used to obtain a quick assessment of the usual amount and intensity of physical activity that a person currently performs throughout the day. The SBAS contains two items. The first item describes different kinds of on-the-job activity, while

the second item describes various leisure-time activities. The participants did not differ significantly in terms of leisure and on-the-job activities. At the end of the study, each participant was compensated with a $100 incentive.

2.2 Analysis and Results

Our analysis of results show that mobile fitness applications can help: increase confidence, achieve specific goals (e.g. lose weight), and improve wellbeing. All users reported the need to track and view results details easily and accurately (duration, distance, calories, pace, time frame), while multi-mode interaction (e.g. voice feedback, music library) increase motivation. Social UX features, including gamification features, in the apps were not necessarily helpful to users in achieving their fitness goals. Specifically, Digifit users were motivated by general tracking features of the app as well as features such as auditory milestone feedback eg "1 mile reached" (see Table 1).

Table 1. Digifit users' quotes summary

Issues	User quotes
Motivation/Social	*"Don't share workout, more personal thing"* *"Share a really good run with friends (share something proud of)"* *"Want app i want to do 115 lbs, what exercises and for how long and give me suggestions for what do"* *"Share: useful to support other folks (would) - done it more informal (not used an app- some friends have an app they use)"* *"Metrics helps motivate you- something to compare it to"* *"would share if pretty run on beach (something nice) or if decent time (achievement) if slow i wouldn't share"*
Usability	*"When tracking wasn't sure how to pause the app; needs stop and resume (didn't know- hear beating, didn't know had to slide over to pause or stop). Better if said pause and stop."* *"I tried to restart half way through- manually entered... (recorded MayMyRun and used that data)"* *"A bit leery of some of the quoted nutrition facts -- seem unrealistic/incorrect"*

Digifit users, without social UX, exhibited positive behavior change, as the following user extract illustrates:

"I ate light meals throughout the day. Everything was fresh and healthy. I did not snack on junk food, I decided I will try to increase my workouts my increasing the amount of time per workout by about 15-20 minutes."

Usability or technical issues such as "wasn't sure how to pause the app" or "missed speed per mile initially" were as important to the overall experience, regardless of social UX-- across all apps in our study. Endomondo users indicated that sharing to Facebook (a key social feature on the app) was most relevant if they could share something they were proud of, like a milestone. Endomondo's UX strategy does not account for this social effect (see Table 2).

Table 2. Edmodondo users' quotes summary

Issues	User quotes
Motivation/Social	*"Challenge helpful- push your goal"* *"Friend joined same gym- good to keep track of each other (friend attempted to download not sure if successful- they use SMS to keep track)- motivational tool, goals very good to stay on track"* *"Yes. Having friends within the app provides the opportunity to compare and compete"* *"Challenges seemed like advertisements- never participated in those before- people at 96 miles"* *"Duration and history Fitbit doesnt have; never seen option to share"* *"No one seemed interested- everyone bombarded sharing these days"* *"If had a group- i could see if motivated- -- depends what want to share (Routes and GPS not share with strangers)"* *"Wanted more customization- run intervals- would love to tell me when ready (music in ears can't hear)"* *"Doesn't share- sharing feels braggy (feels like bragging)"* *"It has increase my motivation because I am able to compare my workouts with others"* *"Good to compare to other people- other motivation"* *"Would be more inclined to share a specific goal than every work out- - some gold, elite status (level reached)- that would be motivational"* *"Challenge- wasn't connected to it- wasn't relevant"* *"I like the community aspect and the prizes being offered, but I think the potential for cheating is huge"* *"Badges for how many steps taken (milestone)-- share more being proud of myself- not to show off"*
Usability	*"Also if had band on arm to hold it (if lighter weight or band would be good tool overall)"* *"General fitness; Running workout- if did it separately it helped"* *"I like it for mapping the run, tracking the time- no hiccups- not into Calorie counting"* *"If get feedback pushes you harder-the fitness test pushes me to run a faster mile"* *"I would like to be able to track an indoor run with possibly a foot pod or other device attached to my shoe"* *"Gym chart has been my favorite because it is customizable and has a very simple interface for tracking weightlifting gains and exercises"* *"There are no annoying ads or push notifications prompting me to do things I dont want to do. It simply replaces carrying around a note-book, plus I can export a graph of my progress"*

We conclude that connecting a mobile app to Facebook is not enough, whereas balancing goal setting with a strong privacy and sharing experience can provide a better user experience, as evidenced by this user concern:

"I was horrified to see the awful privacy settings on my profile! It was like Facebook - and that is not a compliment - with each of many settings NOT private by default! Bad, bad, bad. I had to reset them all manually."

Runno users on the whole understood the gamification aspects of the application, but felt it was boring, irrelevant or misplaced (see Table 3). This does not mean gami-

fication is not valuable in health applications, but that how it is experienced is highly relevant. [23], for example, found gamification to be extremely valuable in stress reduction and increasing wellbeing.

Table 3. Runno users' quotes summary

Issues	User quotes
Motivation/Social	*"Games and minigames part didnt quite get it. Video seemed really interesting... (points and path tried to do it didn't do anything)."* *"Played it once and it's not for me- on Fuel band they had it- i played it once that was it. Like idea, need more interactive aspect (Fuelband reach 75,000 goal) want to see some kind of graphical interface to motivate you."* *"Virtual tokens don't mean anything to me!"* *"Like Hitman: Absolution (you can create your own challenge- kill someone in 4 minutes)- for group motivation to achieve a goal... use for group motivation - use competition as motivation...."* *"Main thing want from app: Timing, Interval training"* *"Didn't see gamification at all!!"* *"Doesn't connect to Spotify (use that all time now- more variety)"* *"They should strengthen the social aspects and the minigame- make it more motivational so it's worth doing it... good to play against friends would be good."* *"Dont share- none of my friends using app- dont feel like broadcasting to FB-- but if friends were in-app would do it. Would be motivating- would be competing."* *"Invited friends- a lot of fun (motivating each other- sharing progress with each other)"*
Usability	*"Few labels off- meters change read as Kilometers"* *"Didn't feel it was that accurate (Calorie) was going regardless of vigor of activity- questioning whether accurate"* *"More complicated than needed to be."* *"Got message said enough time to record- after 40 minutes-- what??!* *"Graphics were too simple and plain, looked cheap."* *"No shortcut from main menu."* *"I am game player but i have never combined fitness and games together- too much time, felt like i was wasting time.."* *"Music player- couldnt play custom list- big disadvantage"* *"GPS- not able to track location.."*

However, for Runno users in addition to poor game design, usability and technical issues overshadowed any benefits of social UX.Users found the relevancy of game mechanics at issues as well as the intuitiveness of the design. Runno required considerable time and effort to comprehend, users complained:

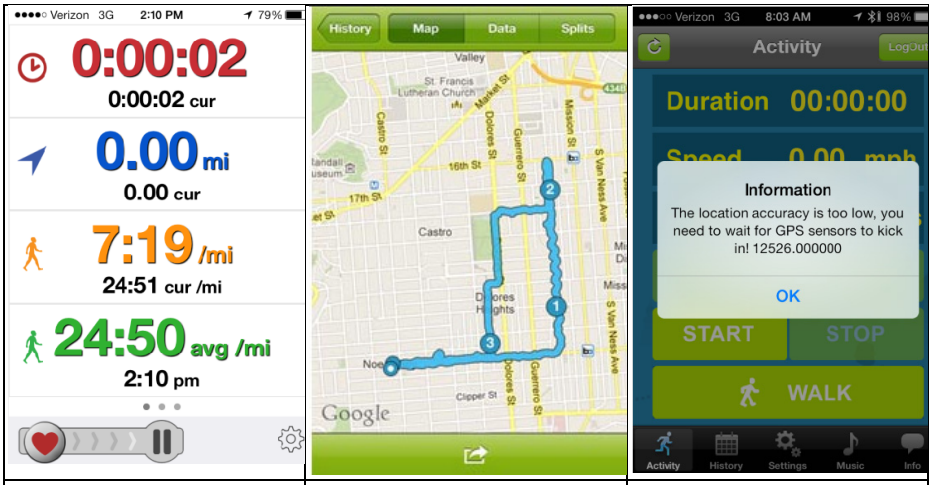
"I am busy in the morning when using fitness apps...I am a game player but I have never combined fitness and games together- this took too much time, felt like I was wasting time."

Runno users reported confusion with the gamification features in the application and complained that the features were not compelling, or were designed for children. In particular, users experienced frustration arising from a failure to know how a game

challenge is to be completed as well as the complexity of the game dialogue and terminology used.

"No, it did not do anything better than my current app. It also looks worse and the music playing aspect is horribly designed. I want to be able to play a playlist I have, not just play one song or create my own playlist from within the app. The interface seems outdated!"

Usability and technical issues combined with a poorly designed social UX, can lead to a negative impact on users' motivation. Inaccuracy of statistics (feet/miles) or inability of the app to locate GPS signal, crashes or freezing also caused users to become discouraged.



Digifit: Example usability issue-heart icon as start was confusing.	*Endomondo: Example of route mapping (privacy concern among female users).*	*Runno: Example of technical issue blocking usage.*

Fig. 1. Example of issues impacting UX of the fitness apps used in the study

Our results indicate that social UX does not lead to social user behavior per se, but rather is linked with relevant fitness and healthcare goals: performance, progress, reduced stress, calories burned and accomplishments. Social features users found missing in the social apps (Endomondo and Runno) include: progress-based advice; selective group suggestions for improvement; comparing performance with selective friends and peers; creating your own fitness challenge to share selectively.

3 Discussion

This study reveals that running apps designed to track a runner's activity can influence intrinsic motivation regardless of social or gamification elements. It is our belief that social UX if designed with a high degree of usability, can only improve upon motivating aspects of an app. For example many users were excited by game play and

social features outside of the usage of the apps in the study. Several users suggested that the apps should behave like popular games they play (eg. a feature to create your own goals). It is clear that, if designed poorly, social UX might even detract from the value of the app entirely, as in the case of the Runno app.

Our study showed that users are more likely to engage in m-health activities if they perceive them to be motivating. The results highlight the potential for m-health apps assisting users in mobile contexts. New advances in technology enabling biofeedback devices that do the tracking ambiently for users are promising. Many of our users reported that automatic tracking from devices like Nike Fuelband were positive over existing 'self-tracking' apps [1]. Designing social experiences for m-health apps requires a more robust approach to social behavior that may include connecting with existing social networks, like Facebook, but can not necessarily be defined by those existing models of what it means to share-- if a mobile app is to provide a unique experience to its users.

The study further demonstrates that 'behavioral change' may occur with social UX, but cannot exclusively rely on social features to save an app from relevancy, user adoption, usability or privacy design issues. Social UX as a context-dependent strategy is highly associated with different user motivations (e.g. reflection, goals attainment) rather than an implicit user motivation for sharing content and information. Mobile fitness applications evaluation could also benefit, for example if the users' motivation level can be assessed in order to identify problematic designs before the app is released. The role of game and social technologies will play in the fitness industry is certain to create some new and exciting user experiences, such as the therapeutic (i.e. biofeedback), where games are designed to promote a healthier mental well being. However m-health applications have a tendency to deal with 'ideal' situations, where the environment experiments are conducted in is devoid of the usual factors that would distort the results. It is therefore important that the next tentative steps towards fitness applications based on the users' motivational and social state are taken with care.

4 Conclusions and Future Enhancements

This research demonstrates that gamification and social UX variables in general do not have significant relationships with m-health fitness usage activities. This is one of the first known studies that examine the relationships between social and motivation variables with m-health activities among experienced users. The results from this study also contribute to existing studies by highlighting how different motivation and social variables may influence the three m-health applications differently. In contrast to most current m-health applications, it appears that most runners are interested in sharing if it is relevant to a small goal (with a buddy) or if it is a milestone (to a wider audience). None of the major running apps on the market today address this social effect. These challenges highlight a primary issue for designers of m-health applications: understanding users' activities-in-social contexts. Furthermore, applications that facilitate long-term health behavior change can be assisted by the motivating potential

of mobile apps. Participants appreciated the structured approach in using their application while running, and felt that these features would increase their motivation. Skepticism toward the design of gamification elements (in the form of rewards or game-like elements) was expressed by participants of the Runno app, with the concern that too much time would be wasted playing instead of running. This points to gamification taking an ambient role in the usage experience, a strategy that the Nike+ app employs.

Notwithstanding that many of the participants were already somewhat familiar with mobile applications for fitness -which may have facilitated the adoption of the app and learning the skills - the patterns observed reflect near as close to reality usage patterns, as the participants were the direct target groups of the apps. Future studies can extend this scope to include users from other countries and conduct cross-cultural comparisons as well with different mobile platforms (e.g. Android). A comparison between developed and developing countries will improve the generalizability of this research. Future studies can consider measuring the diffusion of m-health usage activities across time, and investigate whether motivation (and perhaps demographic) variables change at various stages of m-health fitness and self-tracking activities. Attention to design and users for long-term positive behavior change should form part of a longitudinal study to increase rigour of the results and as part of a larger research initiative. Lastly, additional adoption factors such as self efficacy, security as well as the desire of an individual to engage in physical activity because of external rewards [24, 19] have not been included in this study and these issues can be the focus of future research.

Our findings provide a good starting point for continuing research on motivation and social feature support for fitness applications. Given the short-term behavior change reported by participants using the three applications, it appears that users are motivated to use fitness apps but for social UX to improve their experience, will require thinking about the social elements beyond social media and more in line with the social habits and sensitivities of user behavior.

Acknowledgements. Special thanks to all users who participated in this study. This research was not reviewed by an Institutional Review Board and has not received financial support from any other source.

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