Mobile fitness apps for promoting physical activity on Twitter: the #RunKeeper case

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Abstract
Running, walking and cycling are physical activities with a low entry threshold. Their health benefits are well documented. Yet, many people don't meet the minimum requirements of physical activity due to a wide variety of reasons. In this context, the emergence of new media can be partly identified as a cause of sedentary lifestyles. However, new media (tools) such as RunKeeper, Endomondo, Strava and Mapmyrun might also offer opportunities to encourage physical activity. Mobile fitness apps designed for smartphones experience an increasing popularity. They afford tracking and monitoring of activities as running, cycling and walking. More importantly, these activities can also be shared online on social network sites as Twitter and Facebook. In this paper we focus on the motivation of people for sharing their workouts with online peers. Results indicate that community identification, receiving positive feedback on activities and sharing information on activities are important predictors of a positive attitude towards sharing workouts, which leads to frequent sharing of those workouts.

Keywords
Mobile fitness apps, Twitter, RunKeeper, Physical activity, structural equation modeling

Introduction

Regular physical activity can reduce the probability of health issues such as obesity, type II diabetes and depression (Warburton, Nicol, & Bredin, 2006). That is why adults aged 18-65 years are advised a 30-minutes workout of moderate intensity 5 days a week (Haskell et al., 2007). Unfortunately, many adults do not meet these minimum requirements. In our research, we focus on the potential of Mobile Fitness Apps (MFAs) to promote physical activity among this group and create exercise adherence. After all, although computer use may be related to a more sedentary lifestyle (Ho & Lee, 2001), online social networking and MFAs may just provide a way of promoting physical activity as many smartphone applications enable people to track fitness workouts and share these with online peers. This sharing adds a new dimension to physical activity. In an experiment with step counters, Foster et al. (2010) found that daily step activity increased significantly in the condition in which sharing step counts on Facebook was enabled compared to the other experimental condition in which this sharing aspect was not enabled. Previous research has also indicated that social support is an important determinant of exercise adherence (Sherwood & Jeffery, 2000). Online peers could play a role equal to that of real life exercise partners (Consolvo, Everitt, Smith, & Landay, 2006).

“Just completed a … mi run/walk/ride…” is a frequently posted tweet on Twitter. Mobile fitness apps have seen a steady increase in users in recent years and they afford a new, connected way of sharing the results of workouts. This paper focuses on why people want to share their workouts with their online social networks and applies this question to RunKeeper, a widely used MFA, and the hashtag #RunKeeper on Twitter. The paper is structured in four sections. In the first section we set the scene by describing Twitter and defining Mobile Fitness Apps. Next, our hypotheses and research methodology is discussed. In the third section of this paper we describe the results of our research. The paper ends with a discussion of these results and with a reflection on the limitations of our research approach, pointing to a future research agenda.

Part 1: Twitter and mobile fitness apps

Mobile fitness apps and online fitness networks (a.o. RunKeeper, Endomondo, Strava, Mapmyrun) have recently seen a steady increase in users. These applications afford new, connected ways of sharing results of workouts and promoting physical activity. They use the built-in GPS capabilities of smartphones to track distance and speed of activities of the smartphone owner such as running sessions, bike rides and walks. The collected data can then be uploaded to online platforms that go along with the app. On these platforms, the user can a.o. monitor his progress, set goals and share activities with online peers. Twitter and Facebook users can also share the activity they completed with their Twitter followers or Facebook friends.

Twitter, founded in October 2006, is a micro blogging service (McFedries, 2007) originally developed for mobile phones, enabling users to send short text messages (tweets) to share with other users (Arceneaux & Schmitz Weiss, 2010). These tweets are limited to 140 characters. Initially an online application where users answered the simple question ‘What are you doing right now?’, Twitter evolved into a computer-mediated environment where users share information and form connections in real time (Chen, 2010). Twitter contains several typical social network elements, complying to Boyd and Ellison’s (2007) definition of a social network site (SNS). But Twitter also differs from the typical SNS as users do not need approval from others to be able to follow them and watch activities (Boyd, Golder, & Lotan, 2010), unless the Twitter account is explicitly protected (Kwak, Lee, Park, & Moon, 2010).

As the Twitter network structure is relatively flat and simple (e.g. tweets are either public and visible to all, or private and visible only to followers), Twitter users have developed mechanisms to cope with these limitations and to add structure and texture to their tweets, making these mechanisms or conventions de facto standard (Boyd, et al., 2010; Bruns, 2011), such as @mention, @reply, hashtag, short URL, direct message, retweet … For example, research by Boyd, Golder & Lotan (2010) showed that: 36% of tweets contained an "@ user", of which the vast majority are direct @replies to someone's tweet; 5% of tweets contains a hashtag, and 41% of these tweets also contain an URL; and 22% of the tweets just a contain an URL.

Twitter interactivity is especially challenging to make sense of because of the wide range of tools that are used to access Twitter (text message, smartphone, website, TweetDeck, …) and because Twitter functions as a backchannel of communication in a wide range of contexts.

Sharing information has been given a new dimension since the rise of social media and social network sites like Twitter. It has now become easy to share photos, feelings, statuses and information with an

online public. This public can consist of both friends or relatives that are well-known by the sender of the information which is commonly the case on social network sites such as Facebook. On the other hand, information is often shared with lesser known or unknown publics, such as followers on Twitter or by blogging.

Reasons for sharing content online has been a topic of a lot of research. Self-presentation theory (Goffman, 2002) is often cited as a theoretical framework to explain motivations for sharing content online. E.g. Kim et al (2012) state that the desire for online self-presentation is a key driver for purchasing virtual gifts online. Other research by Wang & Fesenmaier (2003) found that efficacy, instrumental goals, and expectancy have positive effects on level of contribution to online travel communities. According to Ekdale et al. (2010) extrinsic motivations are the main motivators for political blogging. Hsu et al. (2008) investigated the role of technology acceptance, knowledge sharing and social influences to explain peoples participation in blog usage. In their research, ease of use, enjoyment, altruism, reputation, community identification and attitude toward blogging were important predictors of participation in blogging activities.

In our research we will build on these insights and concepts and operationalize them to the context of mobile fitness apps and the sharing of workouts. We selected 6 potential motivators for sharing workouts: altruism, reputation building, community identification, social norms, getting feedback and information sharing.

Part 2: Methodology and hypotheses

Using a custom PHP-script that addressed the Twitter Application Program Interface (API), we collected a database of 4556 random tweets with the hashtag #RunKeeper tweeted in a period of two months on Twitter. In non-technical terms, the Twitter API serves as both a gatekeeper at the back door of the micro blogging platform and as a warehouse keeper who helps getting the right things if addressed in the appropriate language (Courtois & Mechant, 2012). Evidently, setting up such a system cannot be accomplished overnight, as it took a certain amount of documentation and programming effort. Next, the sample of people who posted a tweet with the hashtag RunKeeper, was used to create a subsample of 1,849 Twitter users who posted a tweet with the hashtag RunKeeper. Tweets reporting on walks, rides etc. and also retweets were excluded from the sample. A RunKeeper tweet has a standard part that mentions the distance of the run (e.g. “Just completed a 5 mi run with #RunKeeper”) and the location of the run in a short URL.

Although most APIs are used in social science research to retrieve metadata on media objects (e.g. tags, number of comments…) or on media subjects (e.g. number of posts), we used the Twitter API in a second research phase to recruit respondents for an online survey from this random subsample of 1,849 Twitter users. Using the Twitter REST API POST statuses/update-call, which updates the authenticating user's current status, also known as tweeting, we sent @messages to these 1,849 Twitter users, inviting them to navigate to a certain URL which contained an online survey. Simultaneously all the available metadata on these Twitter users was harvested using the Twitter REST API GET users/show-call and their Tweet-activity was followed daily using the Twitter REST API GET statuses/user_timeline-call. In this way, we could combine and supplement the self-reported subjective data (survey data) with the 'pure' objective data captured by means of a (new) measurement system (API data).

Our main research goal is to get insight into what drives people to share their workouts on social network sites. Taking the theory of planned behaviour (TPB) (Ajzen, 1991) as a starting point for our conceptual model, we measured the influence of altruism, reputation building, community identification, social norms, getting feedback and information sharing on the attitude towards tweeting workouts as well as this attitude's influence on actually tweeting workouts. The constructs were measured by asking respondents to indicate why they share their workouts online on a Likert scale (a five-point scale ranging from "totally disagree" to "totally agree"). Table 1 provides a description of the constructs. Workout sharing behavior was measured as the combined frequency of sharing workouts on Twitter and Facebook.

Table 1: constructs used in the model

Construct	Description	# of items	Example item
Altruism	Refers to the degree to which runners share their workouts online to motivate other people to take up running	2	*To motivate others to start running*
Reputation building	Refers to the degree to which runners share their workouts online to earn respect from their online peers in order to build a reputation	2	*To earn respect from others*
Community identification	Refers to the degree to which runners share their workouts online to find other people who have a shared interest in running activities	3	*To grow a bond with other runners who regularly share their runs*
Social norms	Refers to the degree to which runners share their workouts online because they believe this is approved by meaningful others	2	*Because people who are important to me think that I should*
Getting feedback	Refers to the degree to which runners share their workouts online because they receive positive reactions on their runs	2	*People complement me on the runs I share*
Information sharing	Refers to the degree to which runners share their workouts online to let other people know what they are doing	2	*To let others know what I'm up to*
Attitude	Refers to the degree to which runners have a positive attitude towards sharing their workouts with online peers	2	*I like sharing my runs on social network sites*

The following hypotheses were tested, resulting in the model presented in Figure 1:

- H1: Altruism has a positive effect on attitude towards tweeting workouts
- H2: Reputation building has a positive effect on attitude towards tweeting workouts
- H3: Community identification has a positive effect attitude towards tweeting workouts
- H4: Social norms has a positive effect on attitude towards tweeting workouts
- H5: Receiving feedback on workouts has a positive effect on attitude towards tweeting workouts
- H6: The need to share information on workouts has a positive effect on attitude towards tweeting workouts
- H7: Attitude towards tweeting workouts has a positive effect on workout tweeting

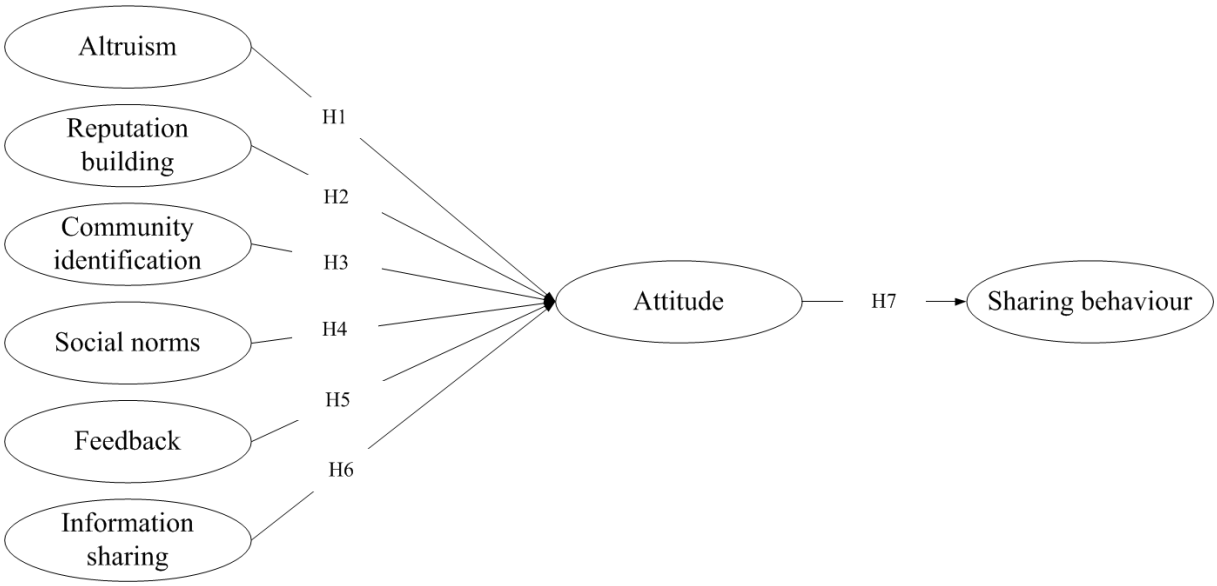

Figure 1: Conceptual model

Part 3: Results

Sample description

171 respondents participated in the survey, which corresponds to a response rate of 9%. 84% of our sample were male runners. The average age is 39 years (*M*=38.69, *SD*=8.56). They run 22.96km (*SD*=15.58) per week on average over 2.67 runs (*SD*=1.095) weekly, which equals to an average distance of 8.65km per run (*SD*=4.15). They are mostly recreational runners; 79.5% are not a member of a running team. To assess their motivations for running we used the Motivation of Marathoners Scale (Masters, Ogles, & Jolton, 1993). The scale distinguishes between 9 motivations for running a marathon, but is easily applicable to shorter distances as well. The motivations measured are general health orientation, weight concern, affiliation, recognition, competition, personal goal achievement, psychological coping, self-esteem and life meaning. Additionally the dimension "enjoyment" was measured. These motivations were measured using 5-point Likert scale items. Our respondents reported that their main motivations for running are general health orientation (*M*=4.37, *SD*=0.68), weight concern (*M*=3.86, *SD*=0.72), personal goal achievement (*M*=3.90, *SD*=0.75) and enjoyment (*M*=4.18, *SD*=0.68).

Data analysis

14% of the respondents rarely uses RunKeeper for capturing a run, 6.4% does this sometimes, 17% of them uses the application quite often and 62.6% captures every run with RunKeeper. But to what extent do our respondents share their captured runs with their online peers on social network sites? To measure this we asked respondents to indicate how often they share their workouts on Facebook, Twitter, Google+, RunKeeper or other sites on a 5-point scale ranging from "never" over "rarely", "regularly", "very often" to "every time". The workouts are mostly shared on Twitter (*M*=4.06, *SD*=1.11) and of course RunKeeper (*M*=4.10, *SD*=1.52) and to a lesser extent also on Facebook (*M*=3.54, *SD*=1.51). Google+ (*M*=1.06, *SD*=0.37) and other websites (*M*=1.29, *SD*=0.94) are rarely used to share workouts. The runners mainly want to reach family (75.4%), online followers (62.6%), other runners (53.2%) and their friends (49.1%).

Table 2: means per construct

	M	SD
Attitude	3.76	0.81
Altruism	3.26	1.04
Community identification	2.54	0.93
Reputation building	2.66	1.03
Social norms	2.54	0.93
Feedback	3.81	0.64
Sharing of information	3.53	0.49

To test the hypotheses, a structural equation model was computed (Figure 2). The model obtained a good fit (RMSEA= 0.048;TLI=0.946; CFI=0.962). Hypotheses 3, 5, 6 and 7 were confirmed. These results indicate that identifying and connecting with other runners through RunKeeper has a positive influence on attitude towards sharing workouts. Furthermore, receiving feedback on workouts positively influences attitude, as well as the need to share information on workouts. Last, a positive attitude towards sharing workouts has a positive influence on the actual tweeting of workouts. The independent variables in the model explain 54% of the variance in the attitude and 29% of the variance in tweeting behaviour.

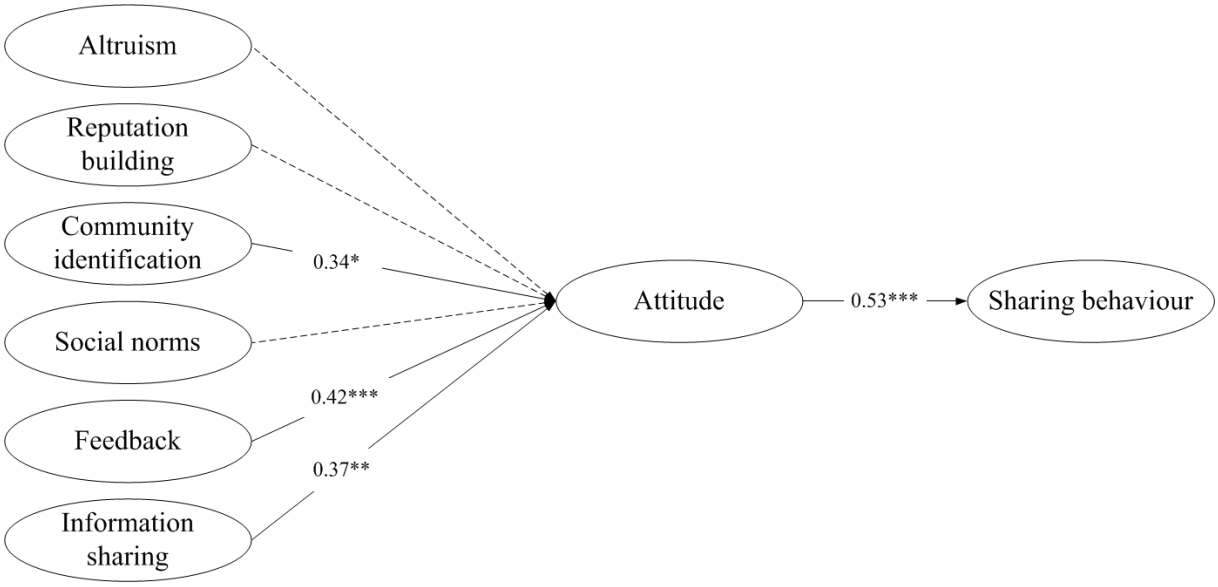

Figure 2: Results of the structural equation model

Part 4: Discussion

Results indicate that community identification, receiving feedback and sharing information positively influences attitude towards tweeting workouts, which in turn has a positive effect on actually tweeting workouts. Results also indicate that motivating others to start running, building a reputation of being a runner and the influence of peers, are not per se why people share their workouts on Twitter. The squared multiple correlations indicate that further research is needed into which factors besides community identification, feedback and sharing information play a role in the decision to tweet their workouts.

Our outlined method has some limitations and drawbacks that should be taken into account. Firstly, representativeness is likely to be an issue. Especially when tracking Twitter feeds, we are limited to those app users who are also a Twitter user. It may be possible that those users have a different running profile and motivations than those who are sharing their runs on Twitter. Secondly, Twitter feeds needed to be public in order for us to be able to capture the tweets.

Although APIs can help us to gain new or better insights into media audiences and content, they also have some pitfalls such as their lack of transparency (little to no insight in sampling and selection mechanism of the data made available), their commercial or corporate nature (see e.g. Karpf's Rule of Online Data (Karpf, 2012)) and the skills needed to interact APIs.

Future research can expand this model and include factors that provide a better picture of why people share their workouts and how this relates to exercise adherence. Our research focused on data of runners tweeting with #RunKeeper on Twitter, but obviously, this can be extended to all sorts of activities that are tracked by using mobile fitness apps, e.g. walking and cycling. Furthermore, tracking multiple activities performed by one person can give a better view on a person's activity level. Also, content analysis could result in a number of interesting findings on physical activity that could prove valuable in studying and promoting physical activity.

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