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# PERSUASIVE TECHNOLOGY FOR SMARTPHONE FITNESS APPS

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## Abstract

*Increased popularity of smartphones has great potential to assist individuals in making healthy changes to their behaviour. Obesity and sedentary lifestyles are fast becoming a healthcare concern in modern societies. This study takes an important step in designing persuasive fitness applications (or apps) that can enhance the physical activity behaviour of individuals. We conceptualize that persuasive technology design principles embedded in social cognitive theory constructs will lead to the design of successful fitness apps. The conceptual model will be tested by analysing the design principles in existing mobile fitness apps. The theoretical and practical implications are discussed.*

*Keywords: Persuasive Technology, Fitness apps, Design Principles, Smartphone apps.*

# 1 INTRODUCTION

Smartphone market has experienced a remarkable growth in the recent past. Smartphones today are in-built with sophisticated technology, such that they are ubiquitous, versatile, and always readily accessible. The ubiquitous nature of smartphones allows them to intervene at the right time and place. The versatility of the smartphones is achieved through third party software applications that run on smartphones (popularly known as mobile apps or apps). Thus, smartphone apps are being used for various activities (such as social networking, checking email, managing finances etc.) beyond just making calls. As of February 2013 there are around 1.7 million apps available in the major app stores and thousands of apps are being downloaded every day (Mobilewalla, 2013). During the period from December 2011 to December 2012 the average time spent on smartphones grew by 35% from 94 minutes to 127 minutes (Flurry, 2013). Therefore, the use of smartphone apps should have great potential to promote healthy changes in behaviour. Health related software applications (i.e. health and fitness apps) that run on smartphones (such as *RunKeeper*, *MyFitnessPal* and *Nike+ Running*) are built-in with GPS (Global Positioning System), social networking capabilities (e.g. sharing on Facebook and Twitter), and sophisticated sensor technologies that provide details of physiological data (such as calories burnt, heart rate, blood glucose level and blood pressure) would improve the effectiveness and cost of health interventions. Despite the popularity and potential of health and fitness apps to assist individuals in leading a healthy lifestyle, research related to the design of such apps is limited.

As of February 2013, there are 39,849 health and fitness apps available for users to download from major app stores (Mobilewalla, 2013) but, their retention rate is only 38% (Flurry, 2013). Healthcare professionals suggest that practicing healthy behaviours regularly ensure enhanced health and wellbeing (Pate *et al.*, 1995). However, the current frequency of health and fitness app usage is very low (i.e. used only 2-3 days in a week) and the relative time spent with health and fitness apps is comparatively very less (i.e. Games 39%, Social networking 24% and Health and Fitness 3%) (Flurry, 2013). This indicates that healthcare apps usage is not at its fullest strength in enhancing the wellness of people. Therefore, there is a high need to develop healthcare apps that ensure consistent and sustained usage among people. Persuasive healthcare apps have great potential in assisting individuals to lead a healthy lifestyle. In the absence of physical activity obesity and sedentary lifestyle are fast becoming a healthcare concern in modern societies, therefore this study aims to analyse the healthcare apps that belong to 'fitness' category. More specifically, our research question is "How can persuasive technology help in the design of successful fitness apps that would encourage people with greater physical activity behaviour?" Successful fitness apps generally have desirable features that would be well received among users and enable them to engage in effective fitness activities.

Drawing from the social cognitive theory (SCT) (Bandura, 1986) and persuasive technology (Fogg, 2003), this study offers design principles that can be leveraged by app designers in designing successful fitness apps with influential design features. The findings of this study would demonstrate the flexibility of SCT components, being able to deliver through modern smartphone technology.

This paper is structured as follows: The immediately following section provides details of the design principles and hypothesis. Subsequent sections describe the proposed methodology and discussion.

## 2 DESIGN OF SYSTEM FEATURES

Given the hyper-competitive nature of fitness app market, designing successful fitness apps is a challenge. Existing research on mobile based physical activity interventions have used 'user centred design', in which the design requirements are derived from users (Consolvo *et al.*, 2006; Ahtinen, 2009). However, fitness intervention research suggests that following the theory based recommendations and guidelines would ensure the success of the intervention (Rovniak *et al.*, 2005). Since, success of fitness apps depends on motivating and persuading individuals to be physically active, in this study we utilized social cognitive theory(SCT) (Bandura, 1986) and persuasive technology (Fogg, 2003) to guide the design of effective fitness apps.

SCT (Bandura, 1986), suggests that individual behaviour is determined by triadic, dynamic and reciprocal interaction among cognitive, personal factors, and environmental influences. According to the theory, self-efficacy, outcome expectations, socio-structural factors, and self-regulatory mechanisms predict the individual behaviour (Bandura, 1986). Thus, successful fitness interventions should be able to provide environmental stimuli, promote cognitive processes (self-efficacy, outcome expectations, and goals) and hence increase the physical activity behaviour. In order to effectively implement these social and cognitive motivational strategies in fitness apps, design principles were derived from persuasive technology (Fogg, 2003).

Persuasive technology is an “interactive technique that is designed to change the attitudes or behaviours or both”(Fogg, 2003). The framework developed by Fogg (2003) provides means for understanding the persuasive technology design. In this study, we have adopted and modified persuasive technology design principles to support mobile app technology. The conceptual model is shown in Figure 1

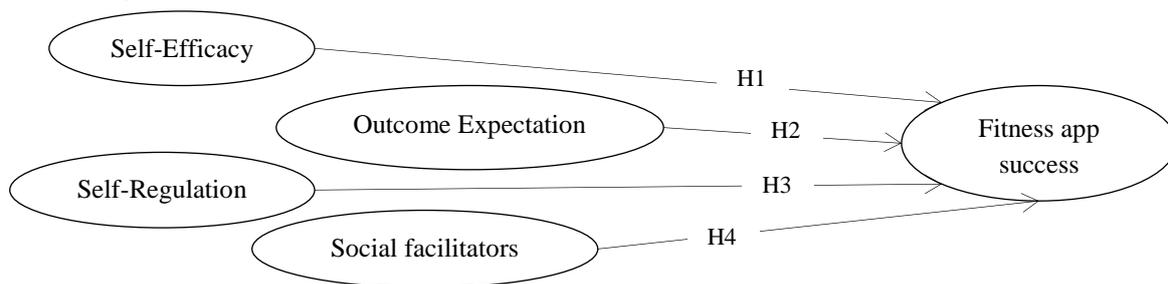


Figure 1. Conceptual Model

**Fitness app success** refers to heavily used, greatly valued and highly recommended fitness apps that fulfil the fitness needs of users. Previous studies on consumer goods have emphasized that user word of mouth (WOM) such as product rating volume (Dellarocas *et al.*, 2010), rating valence (Li & Hitt, 2010) and review sentiments (Asur & Huberman, 2010) are important determinants of product success. Therefore, fitness apps with influential design features that enable users to achieve their fitness goals would be highly valued by its users and hence become more popular and successful among users (with high rating volume, rating valence and positive review sentiments).

## 2.1 Self-Efficacy

Self-Efficacy refers to “people’s judgement of their ability to organize and accomplish necessary courses of action to attain the desired types of performances”(Bandura, 1986). Fitness apps with design features that enhance the exercise self-efficacy of individuals would enable them to increase their exercise performance. Persuasive design principles such as reduction and tunnelling technologies can be used to effectively enhance the self-efficacy of individuals in performing physical activities.

**Reduction in fitness apps** refers to a “design that reduces the extraneous effort that the user expends” while performing physical activity (Fogg, 2003). Reducing or simplifying a complex behaviour into few simple tasks, would enhance self-efficacy of individuals by enabling them to easily accomplish the desired exercise performance (Fogg, 2003). Therefore, users may prefer fitness apps that require less extraneous effort from user’s side. For example, an app that automatically does everything related to exercise (i.e. scheduling, planning, tracking/journaling activities, calculating the calories burnt, measure activity progress, etc.) with just ‘one-click’ would enhance a person’s self-efficacy to perform the exercise effectively. Fitness apps such as *Hundred Pushups* or *Fitness Buddy* have many readymade unique exercises and workout routines that reduce the extraneous effort from the user’s side and make exercise easily accomplishable everyone.

**Tunnelling in fitness apps** refers to “guided persuasion” (Fogg, 2003), “a design that guides the user throughout exercise by a systematic step-by-step process in order to accomplish the physical activity task”. For example, users may prefer fitness apps with personal trainers who instruct them throughout the workout. Thus, tunnelling design principle enhances the self-efficacy of users by making the exercise process easy to follow. Fitness apps such as *Workout Trainer* and *Gym Training, Yoga for*

*Stress Management for iPad* enhance the exercise self-efficacy of users by guiding them with step-by-step video, audio and photo instructions.

Therefore, persuasive technology features that enhance the self-efficacy of individuals will help them greatly in improving their exercise performance and enable them to easily achieve their fitness goals. Hence, such apps would be highly valued, become popular and successful among people. Thus, we hypothesize that

*H1: Existence of features that enhance the exercise self-efficacy of users will positively affect the fitness app success.*

## **2.2 Outcome expectation**

Outcome expectation refers to “an individual’s belief that a given behaviour will lead to the expected outcome” (Bandura, 1977; Bandura, 1986). Various expectancy maximizing theories such as Vroom’s expectancy valence theory (Vroom, 1964) emphasise that anticipation of outcome may affect behaviour. Although it appears that self-efficacy (i.e. “can I do this?”) and outcome expectation (i.e. “what will happen if I do this?”) are similar, Bandura (1986) argues that these two forms of belief have different and unique potent to affect behaviour. According to SCT (Bandura, 1977; Bandura, 1986) outcome expectations of a behaviour generally depends on individual’s self-efficacy beliefs and subsequently outcome expectations guide behaviour. Persuasive design principles such as simulation, conditioning and suggestion technologies enable people to have favourable positive outcome expectations.

***Simulation in fitness apps*** refers to the design that artificially imitates real-world entities in order to encourage individual’s exercise behaviour. Compelling simulated experience can help people to explore cause and effect relationships (Fogg, 2003) towards exercise. Health and fitness interventions heavily use simulated environments to motivate people to do exercise. For example, ‘Virku’ (Mokka *et al.*, 2003) a virtual environment based research application that enriches the exercise experience, by requiring vigorous bicycling effort from user in order to navigate in the virtual environment. Since simulations help users to explore and experiment various exercise activities in a safe, non-threatening environment, and demonstrates the cause and effect immediately, it enables people to have favourable outcome expectations about exercise. Moreover, simulated environments allow users to rehearse or practice target exercise behaviour, therefore it would facilitate user to have favourable outcome expectation, when the user has perform exercise in real world. Further, simulations help users understand the details of performing the exercises. For example, fitness app such as *VirtuaGym* provides demonstrations with 3D animation effects, which helps users to rehearse exercises and have positive expectations about exercises.

***Conditioning in fitness apps*** refers to “the design that uses principles of operand conditioning” to change physical activity behaviours, (Fogg, 2003). Operand conditioning uses reinforcements to increase the re-occurrences of behaviours or shape behaviours (Skinner, 1969). Moreover, SCT points out that both positive and negative reinforcements can act as an initial method of structuring valued outcomes expectancies in people (Bandura, 1986). Early mobile based research applications such as Huston (Consolvo *et al.*, 2006) and Mobile lifestyle coach (Gasser *et al.*, 2006) reinforce physical activity behaviour by simple rewards like ‘\*’ next to step counts and ‘smiley’ faces upon goal attainment. Providing these simple rewards has resulted in consistent usage of the application and increased physical activity behaviour among users. These reinforcements assist users in formulating greater outcome expectations in future exercise activities. Moreover, immediacy of reinforcements (i.e. positive reinforcement immediately following target behaviour) has also been effective in enhancing behaviour (Skinner, 1969). Fitness apps such as *Run Tracker Pro* and *Digifit* provide real time feedback to users, which can shape future physical activity outcome expectations.

***Suggestion in fitness apps*** refers to “the design that allows intervening at the right time”(Fogg, 2003). Due to the interactive and ubiquitous nature of smartphones, it is easy to intervene and offer suggestions at the opportune moments. This would increase the potential to persuade and enable users to have positive outcome expectation about the physical activity behaviour. Modern fitness apps are built-in with GPS and sensing technologies that can predispose users to be active in their day-to-day

activities with point of decision prompts (Kahn et al., 2002; Intille, 2004). For example fitness apps can suggest users to use staircase rather than using elevators or suggest user to get down one bus stop before and walk until home. These features might facilitate users to think that simple things like climbing the stairs can help them to burn the excess calories consumed by the burger last night. Hence, such positive outcome expectations can persuade them to be physically active. Likewise apps can provide tips, strategies, suggestion and informational content related to fitness. Commercial application such as *Fitness Tips* provides tips referenced from reliable sources such as US department Health and Human Services, which can help users in formulating positive outcome expectations on being physically active. Moreover, reminders about user's previous fitness achievements and their present and future fitness goals, exercise routines and schedules can also improve individual's outcome expectations about being physically active (Bandura, 1977; Oinas-Kukkonen & Harjumaa, 2009). Fitness apps such as *Exercise Reminder HD*, *Workout Trainer*, and *JEFIT PRO Workout* remind users about their previous fitness achievement and current exercise goals and schedules, and enhance user's outcome expectation about exercise.

Therefore, persuasive technology features that enable users to formulate positive favourable physical activity outcome expectations would enable them to improve their exercise performance. Hence, such apps would help users in achieving their fitness goals. Therefore, such apps will be highly valued and very much recommended by users (i.e. apps become popular and successful). Thus, we hypothesize

*H2: Existence of features that promote positive outcome expectation about physical activity, in users will positively affect the fitness app success.*

### **2.3 Self-regulation/goals-setting**

Self-regulation refers to the “standards that people set on themselves for behaviours and responding to their own actions self-evaluatively.” (Bandura, 1986). According to SCT individuals with higher self-efficacy and more favourable outcome expectations are more likely to implement effective self-regulatory strategies in adopting and maintaining enhanced physical activity behaviours (Bandura, 1986). Individuals who monitor their own physical activity behaviour can use appropriate goals to motivate and guide their behaviour in enhancing physical activity performance. Persuasive design principles such as self-monitoring, and tailoring technologies enables users to formulate effective self-regulation strategies or optimal goals that can fulfil their fitness needs.

***Self-Monitoring in fitness apps*** refers the “design that allows the user to track his or her own performance or status”(Fogg, 2003). Contemporary fitness apps are built-in with heart rate monitors and calorie meters that can provide users with detailed information about their current fitness performance and enable them to formulate their optimal fitness goals accordingly. The promising results from primitive research applications such as Wellness Diary (Mattila *et al.*, 2008), PmEB (Lee *et al.*, 2006; Tsai *et al.*, 2007) and BALANCE (Denning *et al.*, 2009) indicate that self-monitoring or self-observation is crucial for healthy behavioural change. These primitive applications have used pedometer (e.g. Wellness Diary(Mattila *et al.*, 2008) ) or calorie calculator ((e.g. PmEB(Lee *et al.*, 2006) , BALANCE (Denning *et al.*, 2009)) to infer the activities of users. However, contemporary fitness apps are built-in with GPS and accelerometers that enable tracking all types of physical activities. For example popular fitness apps such as *RunKeeper*, and *Endomondo* use GPS and sensors to track various activity statistics (such as pace, time, distance, and physiological data - heart rate) which aids users to understand their capacity and set their fitness goals accordingly to perform physical activity more effectively.

***Tailoring in fitness apps*** refers to “persuasion through customization” (Fogg, 2003) i.e. “providing users with the information (e.g. physical, physiological, behavioural) exclusively relevant to them”. Tailored information that considers individual's needs, interests, mood, emotions and contexts would enable users to pay more attention and process the information more carefully (Petty *et al.*, 1981), hence it would help them in formulating goals that are more appropriate for them. Therefore, fitness apps that enable individuals to set their personal goals, and direct their physical activity behaviours towards the achievement of their own established goals (Zeidner *et al.*, 2000) would be well received by users. Fitness apps such as *Ab Workout*, *Infinity Pushups*, *Xercise* and *Pocket Trainer* provide

tailored training program based on user's fitness level and goals. Hence, these apps would help people to formulate their exercise behaviours in the way they choose.

Therefore, persuasive technology features that enable self-regulation (i.e. setting their personal fitness goal, steering individual's physical activity behaviour towards the achievement of their own fitness goal, self-monitoring their physical activity behaviour and evaluating their behaviour against fitness goals) would enhance the physical activity performance of individuals. Hence, such app would be well received and highly valued by its users. Thus, we hypothesize that

*H3: Existence of features that enable effective physical activity related self-regulatory mechanism in users will positively affect the fitness app success.*

## **2.4 Social facilitators**

Social facilitators refer to socio structural factors that enable individuals to enhance their physical activity behaviour. Interactions or connections with members of social network can encourage user's physical activity behaviour. The social networking capability of mobile apps provides various avenues to persuade individuals' exercising behaviour through social influence (Consolvo *et al.*, 2006). Many psychologist theories including theory of reasoned action (Fishbein & Ajzen, 1975) , impression management theory (Goffman, 2002) and many other studies (Turner, 1991) also emphasize that social facilitations such as being observed by others, normative belief, pressures to conform could have a greater impact on an individual's behaviour. However, the surveillance technology can raise issues of privacy. Therefore while implementing such design principles the designers should give the user an option to choose for being observed by others. Social facilitation techniques such as normative influence, social comparison, competition, co-operation, and social recognition can enhance the physical activity behaviour of fitness app users.

***Normative influence in fitness apps*** refers to “the design that allows pressures to conform” such that people tend to change their attitudes or behaviours in order to meet the expectations of other people” (such as family members, friends)(Fishbein & Ajzen, 1975; Goffman, 2002). Due to sedentary lifestyle, people find it difficult to include physical activities into their lifestyle. Therefore, mobile apps that promote physical activity through social networking sites, (e.g. *RunKeeper*, *Edomondo*, *Fanvibe*, *Nike+ Running*) can motivate individuals to adopt, improve exercising behaviours (e.g. An individual might think that since most of his/her friends are using a fitness app, he/she should also use that app, in order to conform with his/her group of friends). Prior studies have emphasized that normative influence can have a greater impact on individual behaviour (Deutsch & Gerard, 1955; Lou *et al.*, 2000; Liang & Xue, 2010).

Moreover, many fitness apps have fan pages, in which users share their success stories. Individuals who observe that people similar to them have succeeded, (i.e. the app has helped them in reducing weight or helped them to win marathon, etc.) would be more enthusiastic about using the fitness app for physical activity. Moreover, SCT (Bandura, 1986) and Self-efficacy theory (Bandura, 1977) also emphasize about this power of modelling and vicarious learning. Many commercial apps like *Edomondo*, *Nike+ GPS*, and *RunKeeper* have fan pages in social networks sites (i.e Facebook, Twitter), which enable users to share their experiences and success stories. When individuals observe the success behaviours of others who are similar to themselves in terms of age, ethnicity, or any other attribute (Suls *et al.*, 2002), they tend to have greater motivation (Bandura, 1977; 1989) in doing exercise.

***Social Comparison in fitness apps*** refers to “the design that facilitates benchmarking individual's fitness performance with that of others, and hence provides an opportunity for greater motivation in target behaviours”. As hypothesized by social comparison theory (Festinger, 1954) people look out for others' behaviours in order to formulate their own behaviour. Many fitness apps allow users to compare their own physical activity performance with their friends' performance. For example, mobile fitness apps such as *Nike + Training* and *RunKeeper* enable users to share (i.e instantly post workout performance and accomplishments in social networking site) and compare their performance with friends. Likewise fitness app *Lose It* facilities updating and comparing achieved weight loss with friends. Moreover, apps such as *Strava Cycling*, *runens running is social (GPS)* also use the same

strategy to motivate the users. Thus, the social comparison feature facilitates greater motivation for physical activity. Therefore, this built-in social comparison feature of mobile apps could be highly effective in enhancing physical activity performance.

**Competition in fitness apps** refers to “the design that motivate enhanced physical activity performance by leveraging human’s natural drive to compete” (Fogg, 2003). Positive results from many early research applications such as Mobile fitness coach (Gasser *et al.*, 2006), Houston (Consolvo *et al.*, 2006), and Fish ‘n’ Steps (Lin *et al.*, 2006) emphasize that incorporating competition is a useful feature in persuasive fitness apps to encourage physical activity behaviour. Gamification apps such as *Fit Friendly* and *Fitocracy* inspire friendly fitness competitions and challenges among buddies through fun games. However, few studies report that competition can hurt feelings of some users (Consolvo *et al.*, 2006; Lin *et al.*, 2006), thus indicating the need to have competition as an optional element that users can choose to omit.

**Co-operation in fitness apps** refers to “the design that motivates users to adopt physical activity behaviour by leveraging an individual’s natural drive to co-operate”(Fogg, 2003). Fitness apps such as *MapMyRide* facilitate cooperation among its user groups and communities. These groups allow users in the near vicinity/location (using GPS) to get-together and perform cycling in groups, offer tips etc. These types activities stir the human beings natural drive to co-operate and thus motivate users to adopt and enhance healthy physical activity behaviours.

**Social Recognition in fitness apps** refers to “the design that offers acknowledgment for an individual or group, with an aim of increasing the likelihood of that person or group would enhance their physical activity behaviours”(Fogg, 2003). Mobile fitness apps that allow recognition of individual’s or group’s physical activity achievements would motivate them to do more achievements. Mobile fitness app *fitocracy* acknowledge users with ‘badges’ for successfully completing fitness milestones. Further, publishing the names of the people who have achieved fitness milestones in app’s fan page can also motivate others to aim for such greater performance, in order to be recognized in public.

Therefore, social facilitation features in fitness apps that makes connection and interactions among members of social network, and satisfy the human beings’ innate psychological need for relatedness (Deci & Ryan, 2000) can enhance the individual physical activity behaviour and help them to fulfil their fitness goals. Hence, an app with such features would be much popular and successful among users. Thus we hypothesize that

*H4: Existence of social facilitation feature will positively affect the fitness app success.*

### 3 METHODOLOGY

The data for this study will be collected from Mobilewalla (Datta *et al.*, 2012), an independent app rating agency, which collects, analyses and presents, mobile app related data from four native app stores Apple iTunes, Google Play, Blackberry native store and Windows store. Mobile apps in the ‘fitness’ category will be chosen for this study. App related data such as app name, app description, app rating count (i.e. rating volume), app rating score (i.e. rating valence/star rating) and app reviews will be collected for this study.

#### 3.1 Operationalization

The dependent variable ‘fitness app success’ will be measured using the number of active users who are using the app (i.e. app rating count/rating volume)(Dellarocas *et al.*, 2010), worthiness of the app or the referral value (i.e. app rating score/rating valence)(Li & Hitt, 2010) and user’s favourable feeling towards the app (i.e. review sentiments)(Asur & Huberman, 2010). Each app will be a unit of analysis.

The independent variables such as self-efficacy, outcome expectation, self-regulation and social facilitation will be measured by the existence of these features in the contemporary commercial fitness apps. First of all, set of items for each of the persuasive technology design features discussed above will be derived based on prior literature(Fogg, 2002). The items will be reviewed by experts for

appropriateness and ambiguity. Sorting procedure will be carried out to verify the convergent and discriminant validity of the constructs (Moore & Benbasat, 1991). Cohen's Kappa (Cohen, 1960), inter-judge raw agreement and hit ratio will be assessed (Moore & Benbasat, 1991). Once the items are finalized, each fitness app will be assessed for presence of the given item features. The inter-coder-reliabilities will be assessed. The sum of features in each category will be calculated. Number of features in each category will be normalized in order to account for difference in number of features in each category. In addition to study variables, control variables such as price, version count, age, and type of physical activity (i.e. running, bicycling, strength training, yoga) promoted by the app will be included in the research model. Operationalization of constructs is given in Table 1.

Construct	Items
1 Fitness app success	Rating Volume, Rating Valence, Review sentiments
2 Self Efficacy	Reduction, Tunnelling
3 Outcome Expectation	Simulation, Conditioning, Suggestion
4 Self-Regulation	Self-Monitoring, Tailoring
5 Social Facilitation	Normative influence, Social Comparison, Competition, Cooperation, Social Recognition

Table 1. Operationalization of Constructs

### 3.2 Data Analysis

The model will be tested using Partial Least Squares (PLS), a structural equation modelling technique (SEM), since this is an early attempt of developing a theoretical model (Chin *et al.*, 2003). All the study variables will be treated as reflective constructs, and hence will be assessed by content validity, convergent validity and discriminant validity using items loading, Cronbach's alpha and average variance extracted (AVE) (Chin, 1998; Hair *et al.*, 1998).

## 4 DISCUSSION

Increasing physical activity in the general population has an important role in the prevention of obesity and associated health problems. Thus motivated, this study aims at designing successful persuasive mobile fitness apps that leverage the social, cognitive, psychological processes and persuasive design to induce physical activity behaviour among individuals. The findings of this study would have important practical and theoretical contributions. Practically, the findings of this study can guide the mobile app developers in designing successful persuasive fitness apps that can enhance the physical activity behaviour of smartphone users. Theoretically, the findings of this study would demonstrate that social cognitive theory can be effectively used in the design of successful fitness apps and the crucial elements SCT can be delivered through modern technologies such as smartphones. This shows the flexibility of the SCT to support different modes such as smartphones.

Moreover, the most of the design principles discussed in this study can be utilized by healthcare apps in general. For example, the persuasive design principles for developing the sense of self-efficacy, promoting individual's positive expectations of behaviour change, modifying self-regulatory skills and social facilitation features can effectively help in cessation of smoking, consuming healthy diet and treatment for alcohol. This demonstrates the generalizability of our model to support the design of health apps in general. However, the precise descriptions provided in this paper are specifically demonstrated for fitness apps. Further, this study has used rating volume, rating valence, and review sentiments to measure fitness app success. Although these items do not always indicate actual behaviour of consumers, prior studies have used them as indicators of increased sales and profit (Dellarocas *et al.*, 2007; Ghose & Ipeirotis, 2011).

Considering the increasing prevalence of obesity and overweight in the population, studies of this nature can be useful in changing the everyday lifestyle of smartphone users by persuading them to be physically active. We believe such investigations have rich potential to broaden the research in behavioural science and design science paradigms and hope other scholars will follow the suit.

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