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Gamified Double-Edged Sword: Exploring the Different Social Comparison Motives of Mobile Fitness App Users

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ABSTRACT

Mobile fitness applications (a.k.a. “apps”) are widely used to manage personal health records. The success of fitness apps hinges on their ability in promoting users’ exercise activities. The gamified design element has been widely employed by fitness apps as an effective approach to motivate users to exercise more. However, the efficacy of different gamified elements in influencing users’ subsequent exercise behaviors is still under debate in both research and practice. In this research-in-progress paper, we anchor the social comparison mechanisms to accordingly design gamification elements and demonstrate the dual impact of gamification on users’ exercise behavior change. In addition, we argue that the improvement of users’ exercise performance hinges on the extent to which users’ dispositional approach avoidance temperament is aligned with user’ gamification-enabled social comparison motives. The theoretical inference will guide a future field experiment by testing the effect of gamification on the users’ exercise performance change.

Keywords

Fitness app, gamification, social comparison motives, upward comparison, downward comparison, person-technology fit

INTRODUCTION

In recent years, mobile fitness applications (aka fitness apps) have been widely adopted by individual users for the sake of personal health management (Chen and Lin 2018). Fitness apps can be used to import health related information and display the information on a user-friendly interface to guide users’ health behavior (Zhang, Dibia, Sodnomov and Lowry 2015). A recent report by Statista (2018) dictates there have been 29.80 million fitness app users and such number will reach 42.64 million in 2022 in United States.

It evidently suggests that the adoption of fitness apps can lead to a 30-40% increase in the amount of physical exercise (Stackpool, Porcari, Mikat, Gillette and Foster 2015). Fitness apps utilize gamification design features,

such as leaderboard and challenges, to promote competition and social comparison among users (Wu, Kankanhalli and Huang 2015). The majority of fitness apps allows users to establish friendship relationships with each other or join in certain online community to exercise together. The Display of the physical activity performance of friends or community members in a leaderboard enables individual users to compare their exercise performances with others. This arouses the social comparison motives of app users and motivate them to increase their exercise activities accordingly.

However, the findings from extant literatures regarding the role of leaderboard in influencing users’ behaviors are not coherent, which may results from the various contexts and research settings. For instance, Hwang, Ottenbacher, Green, Cannon-Diehl, Richardson, Bernstam and Thomas (2010) claims that users perform better in weight loss campaigns with the provision of leaderboard in fitness apps. However, Hanus and Fox (2015) argues that individual learning performance diminishes due to the use of leaderboard in an e-learning program. Despite the well-recognized fact that gamified design elements (e.g., leaderboard, challenges, points, levels and badges) can facilitate competition among users, little is known about the contingent factors how these gamified designs will lead to positive or negative outcomes for fitness app users (Wu et al. 2015).

This study aims at exploring the effect of gamified design (e.g. leaderboard) on fitness users’ exercise performance. We attempt to fill the preceding research gap (i.e., dual impact of gamification) by distinguishing the different social comparison strategies employed by fitness app users. This study suggests that using different leaderboard designs serve as different stimuli for users to formulate different social comparison strategies (e.g. upward, downward and lateral comparison) in a gamification-enabled competitive environment, which consequently exerts different impacts on their exercise performance. In addition, we argue that the alignment between user’s approach-avoidance temperament and the adopted social comparison motives can facilitate users’ exercise performance change.

Comparison Motives	Comparison Type	Contextualized Definitions in Fitness Apps
Self-improvement	Upward	Users' desire to improve their exercise performance, skills, and ranking status, to catch up with and surpass people who performs better at the current moment.
Self-assessment	Lateral	Users' desire to obtain accurate information concerning their exercise abilities.
Self-verification	Lateral	Users have the motives to seek out and interpret situations and adopt behavioral strategies that will confirm their existing self-conceptions.
Common bond	Lateral	Users' need to develop interpersonal relationship and interacting with others to reduce the sense of being isolated.
Self-enhancement	Downward	Users' motives to achieve and maintain a positive sense of self, by demonstrating relative competitive ability to others who perform poorly.
Altruism	Downward	Users' desire to help other users, in order to achieve a positive sense of self, and enhance the psychological well-beings of themselves.

Table 1. Social Comparison Motives of Fitness App Users (Helgeson and Mickelson 1995)

THEORETICAL BACKGROUND: SOCIAL COMPARISON THEORY (SCT)

Why Do People Make Social Comparisons

SCT, originally proposed by Festinger (1954), assumes that human beings have the basic need to evaluate their opinions and abilities. However, in reality, the needs for self-evaluation often cannot be fully satisfied through objective, nonsocial means. In such situations, people are motivated to compare themselves with other people to better understand and evaluate themselves, and such motives are defined as *social comparison motives*. The psychological process of social comparison widely exists among fitness app users. By using the fitness apps, users have the inner needs to make self-evaluation about their exercise performance by comparing with the others. Such inner needs can be attained if competitive gamified design features (e.g. leaderboard) are designed and implemented in the fitness apps.

With Whom People Make Social Comparisons

In SCT, people evaluate themselves by comparing themselves with other, and these comparison targets constitute a *comparative reference group* (Song 2015). SCT suggests that people adopt three different social comparison strategies with different comparative reference groups with the purposes of self-evaluation, including *upward comparisons* (i.e., compare themselves with better-off others), *downward comparisons* (i.e., compare themselves with worse-off others), and *lateral comparisons* (i.e., compare themselves with similarly perceived others).

For people who adopt different social comparison motives (i.e. upward, lateral, and downward comparisons), their motivation structure is inferred to be significantly different. Notably, self-assessment, self-verification, and common bonds represent the major motives for people who make lateral comparisons; self-improvement is the

major motive for people to make upward comparison; whereas self-enhancement and altruism are the most common motives hold by people who make downward comparison (Helgeson and Mickelson 1995). Table 1 summarizes the details of these social comparison motives.

RESEARCH MODEL AND HYPOTHESES DEVELOPMENT

In this paper, we propose a research model to understand how gamification-enabled social comparison influences the exercise performance of fitness app users, as shown in Figure 1.

Gamification Facilitates Social Comparison Motives

Gamification is defined as “the use of game design elements in non-game contexts” (Cugelman 2013, p.2). Gamified design elements not only increase users' hedonic motivations by using IT artifacts (Lowry, Gaskin, Twyman, Hammer and Roberts 2013), but also create a competitive environment to facilitates users' involvement in the primary tasks. Gamification creates a “real-time, competitive environment” in which individuals can compete with each other in dealing with the primary tasks (Robson, Plangger, Kietzmann, McCarthy and Pitt 2016, p. 32). As depicted previously, there are two key ways to arouse social comparison motives of IS users by using gamified design features (Treiblmaier, Putz and Lowry 2018), namely the competition to conquer and competition for proving their capability with high ranking. In the context of fitness apps, prior literatures found that gamification can effectively stimulates the social comparisons (upward, lateral, and downward mechanisms) among users with the design of leaderboard and challenges (Hanus and Fox 2015).

According to SCT, the formation of one's comparative reference groups in certain social comparison is not only determined by one's personal traits but also the

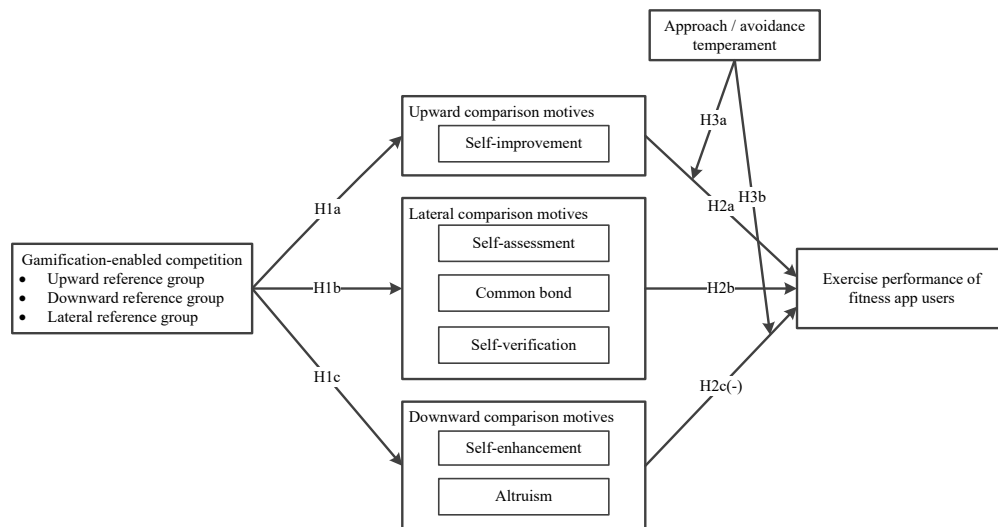


Figure 1. The Research Model

environmental cues and feedbacks. In this study, we provide three kinds of leaderboard designs that emphasize different reference groups in competition. As shown in Figure 2 (a preview of our self-developed prototype), the three leaderboards, in order, emphasize upward reference groups (people who perform better), lateral reference groups (people who have similar background), and downward reference groups (people who perform worse). More details about the manipulation will be explained in the methodology section. We argue that by inducing different reference groups in gamification enabled competition, fitness app users are expected to develop distinguishing social comparison motives.

H1a: Gamified design elements emphasizing upward reference groups will lead to an increase in users' upward comparison motives (self-improvement).

H1b: Gamified design elements emphasizing lateral reference groups will lead to an increase in users' lateral comparison motives (self-assessment, common bond, and self-verification).

H1c: Gamified design elements emphasizing downward reference groups will lead to an increase in users' downward comparison motives (self-enhancement and altruism).

The Impact of Social Comparison Motives on Subsequent Exercise Performance

Different social comparison strategies and motives can lead to different behavioral outcomes. According to extant literature, in most cases, social comparisons result in better performance (Suls, Marco and Tobin 1991; Buunk, Gibbons and Buunk 2013) with the exception of 1) individuals generate the feeling of dissatisfaction toward themselves, 2) and their self-efficacy to improve their current status and performance is relatively low (Jones 2001; Tylka and Sabik 2010).

Gibbons, Lane, Gerrard, Reis-Bergan, Lautrup, Pexa and Blanton (2002) investigated the influence of *preferred comparison level* on subsequent performance. They found that social comparison with well-performing people (i.e. a higher preferred comparison level) conduced to subsequent performance. According to the findings by Ybema, Buunk and Heesink (1996), upward comparison facilitates users to adopt problem-focused coping and adaptive coping strategies. To catch up with the competition at better-off or similar situations, individuals are motivated to spend more effort on improving their skills and performances (Buunk 1994). Conversely, downward comparison is detrimental to individual subsequent performance because it is a maladaptive and emotion-focused coping strategy for individuals who seek for mood improvement and psychological well-being (Taylor, Kulik, Badr, Smith, Basen-Engquist, Penedo and Gritz 2007).

To this end, for users who compare themselves with superior others, they will further adopt effort-based coping strategies to exercise more in order to get a higher ranking and meet the needs for self-improvement. By contrast, fitness app users who compare themselves with inferior others immediately can obtain better short-term psychological well-being but will be less motivated to adaptively exercise more in later stages. Thus, we hypothesize:

H2a: Upward comparison motives (i.e., self-improvement) will lead to an increase in subsequent exercise performance of fitness app users.

H2b: Lateral comparison motives (i.e., self-assessment, self-verification, and common bond) will lead to an increase in subsequent exercise performance of fitness app users.

H2c: Downward comparison motives (i.e., self-enhancement and altruism) will lead to a decrease in subsequent exercise performance of fitness app users.

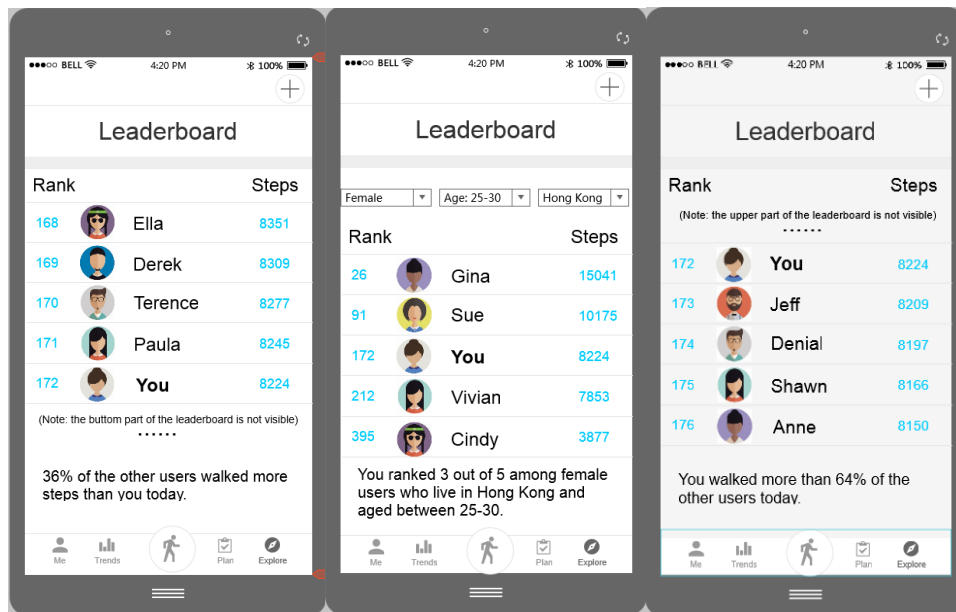


Figure 2. Leaderboards emphasizing upward, lateral, and downward comparison

The moderation role of approach avoidance temperament

Finally, from a person-technology fit perspective, this study suggests that fitness app should use personalized gamification designs to encourage users with different dispositions (i.e. approach avoidance temperament) to adopt different social comparison strategies. Specifically, we argue that approach avoidance temperament moderates the influence of upward and downward comparison motives.

Approach avoidance temperament represents the degree to which people are dispositionally sensitive to positive and negative stimuli. People with stronger approach temperament tend to be more reactive to positive stimuli (i.e. success and rewards). They spontaneously have “perceptual vigilance for, affective reactivity to, and a behavioral predisposition toward such stimuli” (Elliot and Thrash 2002, p. 805). Hence, in the gamified competition, they tend to find something difficult to challenge to get high intrinsic and extrinsic rewards, which motivates them to achieve better performance. The person-technology fit is achieved when approach-oriented people adopt upward social comparison strategies and motives (Elliot 1999). On the contrary, people with stronger avoidance temperament are more sensitive to negative stimuli (failures and punishments). They are afraid of encountering failures in doing certain tasks or doing worse than others. The person-technology fit is achieved when avoidance-oriented people adopts downward comparison strategies and motives. In this study, we propose that it is beneficial to users’ exercise performance when individual’s approach avoidance temperament and their social comparison motives have a good fit:

H3a: The positive influence of upward comparison motives (i.e., self-improvement) on subsequent exercise performance will be stronger for approach-oriented users.

H3b: The negative influence of downward comparison motives (i.e., self-enhancement and altruism) on subsequent exercise performance will be weaker for avoidance-oriented users.

METHODOLOGY

By designing and developing a self-developed fitness app, a single-factor field experiment will be conducted to test our research model and hypotheses. We will recruit college students who live in the same campus as our participants to control the potentially unobservable confounding issues. Upon registration, students will be randomly assigned to four groups: one control group with no gamification features, and three treatment groups who will later see different designs of leaderboards. Participants are required to use our mobile app for 8 weeks, during which the intervention will be implemented without advanced notification. In this regard, we can observe users’ fitness behavior change before and after the provision of treatment as well as the trend of change.

We will exploit different designs of leaderboard to set different comparative reference groups for users. Users in the treatment group 1 will see a leaderboard that only lists other users who walk more steps with an indication like “XX% users walks more than you”; users in the treatment group 2 can use filters to find users with similar characteristics to construct a leaderboard; users in treatment group 3 can only find a leaderboard displaying users who walk less steps with an indication of “you walk more steps than XX% users”.

CONCLUSION

It has been observed that more and more fitness app developers incorporate gamified designs to facilitate users' competition but with less coherent consequences. Gamification, as a double-edged sword, may increase or diminish users' exercise performance. We explain this dual impact of gamification results from the users' different social comparison motives when using gamified fitness apps. This may further lead to different behavioral outcomes. In addition, we conclude that fitness apps should provide personalized solutions to make sure a good fit between the gamification design and users' dispositional approach avoidance temperament.

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