

ShuttleKickers: Exploring Social Persuasions to Encourage Physical Activities

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In the HCI domain, many researches have been carried out on how to apply Persuasive Technology (PT) to stimulate a more active lifestyle. Regarding collectivist cultures, social influence has been considered as one of the most impactful factors among others in PT. Within one societal context, however, different individuals may need different motivational mechanisms based on social persuasion. In this paper, we designed the prototype ShuttleKickers embedding different social persuasive mechanisms to stimulate more physical activities in China. Subsequently, we conducted the field-test of our prototype with sportive groups and sedentary groups, identified by Transtheoretical Model, which results in a set of implications on how to apply social persuasions for active behaviours for these two different groups respectively.

Social persuasion; persuasive technology; physical activity; transtheoretical model; exploratory study

1. INTRODUCTION

During the last decades, chronic diseases, such as type 2 diabetes, have become increasingly urgent global issues. Sedentary lifestyles have been recognised as one of the main causes of some chronic diseases. Thus motivating people to move towards an active lifestyle is considered as a crucial solution when preventing the increase of such diseases (Roberts & Barnard 2005).

In HCI, research has shown that Persuasive Technology (PT) offers strong advantages over other means of persuasion (Fogg 2002). For example, it was acknowledged that computer-mediated systems could facilitate social activities to support people to affect each other's behaviour and attitude. Consequently, there have been growing efforts on investigating how to design product- or computer-mediated persuasion to leverage social influence in order to encourage behaviour change.

Particularly in the collectivist cultures such as China, it is very common to apply social persuasion as an influential PT in stimulating certain behaviour change. Although most of the cultural-related PT researches accommodate social persuasion in "one-size-fits-all" solution, it is too complex to ignore other factors within the same culture when motivating a certain behaviour change for specific groups (Orji & Mandryk 2014). According to Green, the absent considerations of variations within the same culture could result in the overgeneralization of the findings (Green 2005). While existing

examples have been worked on personalizing PTs by comparing national cultural difference to develop cultural-related persuasive strategies (Khaled et al. 2009; Orji & Mandryk 2014), by tailoring persuasive principles according to distinct user types (Orji et al. 2013), and by using persuasive profiles to adapt the ways of persuasions (Kaptein et al. 2015), we approach our context based on the Transtheoretical Model (TTM) (Prochaska & Velicer 1997) to investigate on how to tailor social-related PTs for differently motivated individuals in China to encourage physical active behaviours.

Four important points can be identified from earlier works. First, instead of an independent event, behaviour change moves through a series of stages from precontemplation to contemplation, to preparation, to action, and eventually to maintenance stage, as defined by Transtheoretical Model (TTM) (Prochaska & Velicer 1997). Second, in the case of physical activity (PA) promotion, the first three stages (i.e. precontemplation, contemplation, and preparation stage) are often used to treat people who are living at a sedentary or irregular active level on daily basis, while the action and maintenance stage are used to treat people who are living regularly physical active (Woods et al. 2002). Third, as the critical processes to support TTM, social factors are interweaved with behaviour change. Fourth, people at different stages hold different opinions and behave differently towards the same intervention (McConaughy et al. 1983).

Based on the previous considerations, we aim to explore the following question more explicitly: In the societal context of China, how to effectively motivate sedentary and sportive people to engage in physical activity using social-related PTs?

Specifically, our current investigations followed technology probes (Hutchinson et al. 2003) approach, where we developed and field-tested a novel technology, ShuttleKickers, to explore our research question. We designed ShuttleKickers to facilitate a co-located social exertion game that was inspired by the traditional Chinese sport of shuttlecock-kick. Through the field test with both physical active and inactive people, we aim at obtaining a set of insights to identify the most relevant social-related PTs for these two distinct groups of people respectively.

This paper is structured as following. Section 2 describes key theories upon which our design strategies are based. In Section 3, we propose our design strategy, which is followed by the design of our prototype. Section 4 explains the design of the experiment, followed by the discussion on our results in Section 5. In Section 6, we discuss the design implications on social persuasions for different motivational groups respectively. Section 7 discusses the scope, limitations, and delimitations of this exploratory study. Conclusion is given in the end.

2. THEORETICAL BACKGROUND

2.1 Social Persuasions in PT

Social influence occurs when a person's emotion, opinion and behaviour are influenced by others (Cialdini & Goldstein 2004). Six decades ago, Deutsch & Gerard (1955) distinguished two types of conformity motivation, namely informational influence and normative influence. With the first one they argued that information from others could serve as a source to accurately interpret reality and behaviour, while in the latter they argued human being's natural drive of obtaining approval from others.

Based on the theoretical basis, in his earlier explorations, Fogg (2002) has recognized the importance of social influence in PT from four social psychological theories, including social facilitation, social comparison, conformity, and social learning theory. Since then, subsequent discussions have been stretched over years. In Persuasive Systems Design (PSD), Oinas-Kukkonen and Harjumaa (2009) highlighted social support as one of the four categories (primary task, dialogue, system credibility, and social support) that persuasive principles could be grouped under. The social support category was primarily adopted from Fogg's four considerations and was extended

into seven critical principles of social persuasion, consisting social learning, social comparison, normative Influence, social facilitation, cooperation, competition, and recognition.

2.2 Personalizing Persuasions

In the HCI community, it is acknowledged that the widespread use of PTs is not efficient for everyone. By means of personalization, persuasive designers are primarily aiming to shape the persuasions to cater to individual's particular tastes.

Khaled et al. (2009) examined how the cultural dimension of collectivism – individualism, identified by Hofstede et al. (1991), can influence persuasive strategies for smoking cessations, and in return they designed persuasive games targeting for collectivist cultural groups. Similarly, by setting up a large-scale survey among individualist cultures and collectivist cultures, Orji and Mandryk (2014) developed cultural-relevant PT strategies for healthy eating behaviour. Their work not only compared the differences between cultures, but also explored the variations within one culture, such as gender and age. Later, Orji et al. (2013) introduced BrainHex (blog.brainhex.com) model to personalize the persuasive game for different types of gamer to motivate healthy diet. Furthermore, Kaptein et al. (2015) coined the use of explicit and implicit user profiling to content-wise adapt the persuasive systems for individuals.

2.3 TTM for Motivating PA

Another promising perspective to approach this topic is to correlate PTs to motivational theories, where the stages of TTM have been largely exemplified in relevant studies over years. He et al. (2010) classified PTs that support sustainable energy use according to the different stages of TTM. Lin et al. (2006) found some design backfired among participants at different TTM stages. Our research also took TTM as the basis to specifically discuss on how to differentiate social-related PTs to encourage active lifestyle in China by probing the insights from people in distinct TTM stages.

Motivation, as “an inquiry into the why of behaviour” (Miller et al. 1988), serves to activate or energize behaviour change. As one of the most widely recognized behavioural theories dedicated on motivation, TTM (Prochaska & Velicer 1997) describes intentional behaviour change as a series of stages through which an individual progresses from unaware of the problem to intentionally modify the behaviour. TTM has been successfully applied in varieties of designs to motivate healthy behaviours including promoting active lifestyle. In this topic, the stages progress as follows:

Precontemplation. Individual has no intention to make change to exercise regularly in foreseeable future;

Contemplation. Individual has seriously considered changing to take regular exercise in daily life, but has not committed to taking action;

Preparation. Individual intends take an action to start exercising lifestyle in the immediate future (usually measured as the next month), and has unsuccessfully taken action in the past year;

Action. Individual has performed regular exercise consistently for less than six months;

Maintenance and Relapse. Individual has consistently performed regular exercise for six or more months.

3. PROTOTYPE DESIGN

3.1 Construct Group-Based Strategies

In this research, we exclusively select social facilitation, cooperation, and competition principle from PSD, as described in (Torning & Oinas-Kukkonen 2009), as the basis to formulate the persuasive strategies to support the design of the prototype. Due to the collectivist nature of Chinese people (Hofstede et al. 1991), evidence shows that social behaviour is determined heavily by group expectations rather than personal goals (Triandis 1989). Therefore, all these principles are adjusted to group-based strategies. Details of design principles involved in the strategies are organized as follows:

- **Social facilitation:** The design provides means for getting people to participate group exercise together.
- **Intragroup cooperation:** The design provides means for cooperative exercise to achieve a group goal.
- **Intergroup competition:** The design provides means for competing the scores of group exercise with other groups.

3.2 Design Probe: ShuttleKickers

Based on the selected PT strategies, we developed ShuttleKickers, a social exertion that derived from a traditional Chinese sport of shuttlecock-kick. As is depicted in Figure 1, ShuttleKickers includes a physical object for collective play and an app indicator for co-located activity initiation in the office surrounding. Shuttlecock-kick is an activity very similar to the game of hacky sack and has a long history of at least 1000 years in China. The form of ShuttleKickers basically imitated the tradition, a cork with colourful feathers attached above. The only evolution of ShuttleKickers was embedding an Arduino platform, called LightBlue Bean ®

(punchthrough.com/platform), which embedded with accelerometer in order to record the score of the game and with the Bluetooth connection to convert the recorded data into the app.



Figure 1: Overview of the prototype: the interactive prototype, and the platform that keeps track of progress

We based our prototype on the traditional shuttlecock-kick, because it is a unisex activity that promises a variety of physical benefits. Research has suggested that with the use of different body parts, including feet, knees, hips, and torso to interact with shuttlecock, people can develop and enhance their coordination, timing, balance, perseverance, and agility (Bian et al. 2009).

During our initial design phase, we applied the social design strategies into the design of ShuttleKickers. In the following, we will elaborate the implementation of each principle.

3.2.1 Facilitating collective exercise

The traditional shuttlecock-kick game can be performed either individually or with partner(s). In this study, however, we intended to concentrate on the activity as a collective exercise so as to understand the influence of social persuasion in the office surroundings in China. Therefore, we incorporated the social facilitation principle to get people playing the physical game together in the same location. For this purpose, the app indicator was designed according to the following mechanisms. At the beginning, the prototype only allows participants to sign up as a team including 2 to 6 players (Figure 2(a)). During the registration, participants would also be required to log their nickname, gender, and age into the system (Figure 2(b)).



(a) First of all, the app requests for general information of the team (name/number of players)



(b) Then, the app requests for detail information of each player (player name/ age/ gender)

Figure 2: Screenshots of team registration flow

3.2.2 cooperation and competition

To explore the influence of social persuasion, the prototype also incorporates cooperation and competition principles to enable socially physical performance. As is shown in Figure 3, the system could automatically generate weekly assignments for the team. Moreover, once a team was created, it would be linked with other teams by overall scores and printed on the ranking board on the main interface. When new points gained, the ranking board would be adjusted immediately.

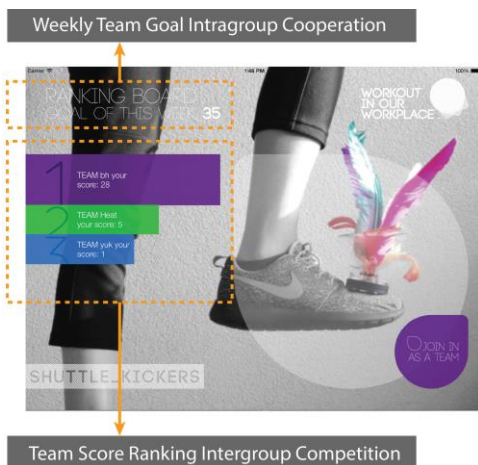


Figure 3: Screenshots of weekly goal and ranking board on the main interface

3.2.3 System interaction

We designed our system to provide real-time feedback through auditory and visual display: As is shown in Figure 4, During the use, our prototype would help users to track their scores and visualize the points on the interface; Meanwhile a corresponding feedback sound (traditional Chinese music) would also be given as a reward from the system; Once users failed, the recording, visual feedback, and auditory feedback would freeze. Simultaneously, a praise message such as “congratulations!” and an animation would be presented on the interface.

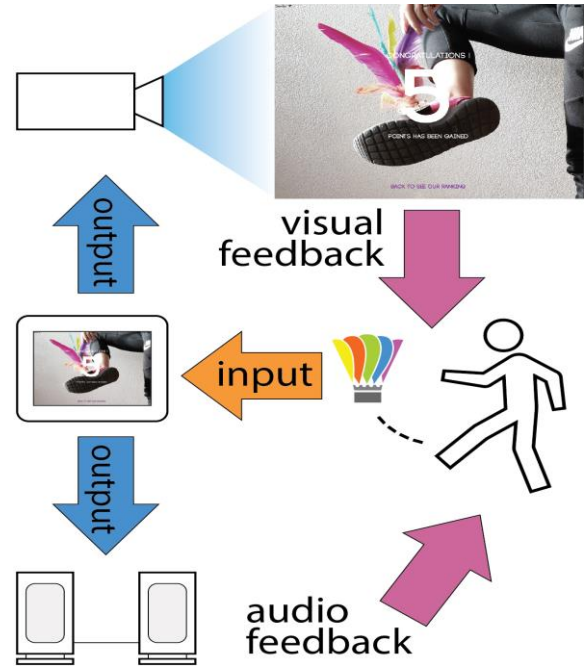


Figure 4: Structure of the system interaction

4. EXPERIMENT

In this section we will discuss the set up of a field study with the earlier discussed prototype.

The participants were recruited on Yuquan campus of Zhejiang University in China. We recruited participants using flyers, word of mouth and personal contacts using the following criteria:

- Participants should be teachers or students in the university in order to confirm they conduct their daily activities mostly in office environments to ensure background homogenous of the participants.
- As mentioned before, TTM-Based measures were used here to screen through the participants to distinguish sedentary people (precontemplation, contemplation, or preparation stage) and sportive people (action or maintenance stage).

- Through a short interview, we confirmed all the participants were familiar with shuttlecock-kick game. We also asked them for a small test before the test to more or less understand their abilities on shuttlecock-kick.

We finally recruited two teams (G1: P1, P2; G2: P3, P4, P5) of physically active participants (n=5; gender: 5 males; age: M=29.8, SD=11.23) as well as two teams (G3: P6, P7, P8, P9; G4: P10, P11, P12, P13) of participants (n=8; gender: 4 males and 4 females; age: M=32.1, SD=6.42) who were living in sedentary lifestyles. We asked for a small pre-test to ensure their physical abilities of shuttlecock-kick. The details of each participant are shown in Table 1.

Table 1: Information of participants, we calculate the initial ability according to the numbers they can juggle within one time.

	Age	Gender	TTM stage	Ability
P1	44	Male	Maintenance	10-15
P2	40	Male	Maintenance	10-15
P3	22	Male	Maintenance	>=15
P4	21	Male	Maintenance	>=30
P5	22	Male	Maintenance	<2
P6	42	Female	Precontemplation	<2
P7	34	Male	Preparation	2-3
P8	38	Male	Preparation	2-3
P9	37	Male	Preparation	>=5
P10	25	Male	Preparation	2-3
P12	27	Female	Preparation	2-3
P12	27	Female	Preparation	2-3
P13	27	Female	Precontemplation	<2

Before the test, all the participants signed the consent form and allowed us to publish their information related to this study for academic purpose. We gave everyone a small Dutch souvenir (e.g., the ceramic model of Dutch windmill, stroopwafle, etc.) as reward after test. However, we did not mentioned about the incentives on beforehand.

As is depicted in Figure 5, the test was conducted in public spaces near the office environments on the campus (e.g., corridor, vacant office, etc.). Projector and speaker were also used to present the visual and auditory feedback from the app. The evaluations were conducted with different groups separately. After each test, we invited the group for an interview session, where they were asked to discuss their experience and preference on PTs we involved in our prototype. Upon the agreement of the participants, we collected data in three ways, including:

- The number of participants, duration and scores of the test of shuttlecock for each group recorded by the app.

- Video-recorded data of the game progress and observational data from researchers' interpretation. The protocol for observation oriented from our design strategies.
- Audio-recorded data from the interview. These data were transcribed later for analysis. Same as observation, the protocol for interview also oriented from design strategies.

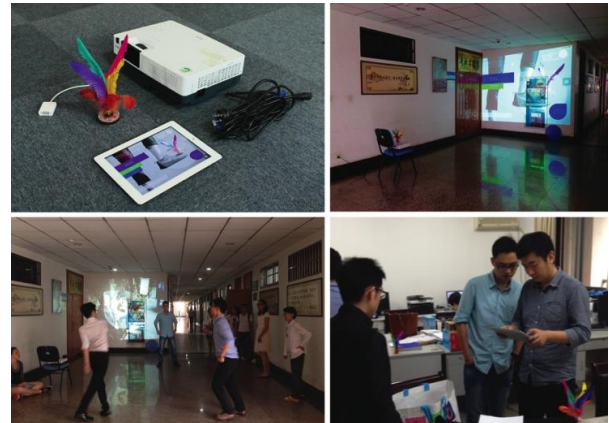


Figure 5. Field-test details, clockwise from top left: Overview of test facilities; The test setup; Introduction; Field-testing.

5. RESULTS

From the app-recorded data (see Table 2), we observed that the exercise duration of the four groups were basically at a similar level. Although every team was suggested to play for 10 minutes and could cease at any moment in time if necessary, all of them had kept the activity for more than 10 minutes. This finding suggests that the participants had considerably immersed themselves into the activity. On the other hands, we found that although the participants in sportive groups were fewer than that of the sedentary groups, the final scores of sportive groups were higher than sedentary groups. Furthermore, between sportive groups, the group that has fewer participants even created higher scores than another group. This implies, at least for sportive groups, the team efficiency could be negatively influenced by numbers of participants. This may because of the confusion who to take the next one.

Table 2: App-recorded data of four groups

	G1	G2	G3	G4
Number of Participants	2	3	4	4
Duration (minutes)	12	12	12	13
Scores	558	540	339	337
Average Scores	279	180	85	84

Apart from the app-recorded data, due to the explorative nature of our study, we highlight our

qualitative data from observations and interviews as key findings of this paper. In the following, we present the reflections on our design strategies with use of representative quotes to describe the participants' perspectives in their own words. As discussed before, we aimed to verify whether TTM stages could differentiate social persuasion. Therefore, in each category we organize our findings into sportive groups and sedentary groups separately.

5.1 Social Facilitation

5.1.1 Sportive groups

We observed that most of the participants were highly involved in the activity during the test. They also thought that shuttlecock-kick game is a sort of collective exercise. However, P5, the participant who was sportive but lack of ability in playing shuttlecock was an exception. He acted as an outsider of the activity and passively contributed to the team performance. He gave us the following explanations on this behaviour:

"To achieve better scores, we applied the strategy that better people work harder. That means at first they put efforts to gain more points. When they felt tired, I do them a favour to kick the shuttlecock. When we considered this as a game, it would be more interesting if we just pass the shuttlecock one by one." (P5)

This suggested that among people at higher TTM stages, their ability on certain PA behaviour could influence their motivation of participation. Especially when comparing to the activity they are good at, they tended to choose their old habits:

"I won't suggest to organize this activity, rather, I prefer to organize activity like table tennis and swimming, which I accustomed to do." (P1)

"We will not join in this activity in the spare time, because we have to play basketball together." (P5)

Consistent with TTM, their answers suggested that people at high motivational stages are already confident in their regular PA routine and are less tempted to accept any new process of change.

5.1.2 Sedentary groups

We observed that participants in both groups were very proactive in engaging in the activity initially. When asked whether want to join such kind of collective sports, their first reactions also positively supported their behaviours. There was one exception of P13 during the test with G4, who seemed to be very passive in the game at the end of the test. Her reasons were:

"At first I did not aware of my ability (on shuttlecock-kick), but in the last a few minutes I

found that I still not very good, so I wanted to give up." (P13)

This suggested that when facilitating a collective exercise among sedentary people, it should be noticed that lack of abilities in certain PA could eventually contribute to a relapse of the behaviour. To response, P6 mentioned:

"Initially I like to spend sometime on practicing my own skill on shuttlecock myself, and after technically ready, I will play the shuttlecock with my friends." (P6)

This implied that appropriate improvement on personal ability is desirable among sedentary people before participating in the collective activity. Moreover, positive feedback on individual performance could also be motivational, as P13 also said:

"It must be encouraging for pre-seniors when playing (shuttlecock) with friends and receive applause from them." (P13)

Moreover, they also expressed concerns that timing and location would affect the trigger of behaviour. They mentioned:

"No matter how interesting this activity would be, I will not do it in my office when there are other people around. This behaviour will disturb others, and I suggest to design a new room specific for this activity to help people get relax." (P12)

"Time is decisive to this activity, I think it would be wise to consider about the time in the afternoon." (P8)

5.2 Intragroup Cooperation

5.2.1 Sportive groups

There was very little evidence indicating that players in both groups conformed to cooperate with each other. More concisely, participants in G1 always attempted to juggle the shuttlecock as many as possible before sending to others. This individualist phenomenon was even more obvious with G2. In the test, they did not pass the shuttlecock to others until they got tired. Their explanations of this behaviour were:

"If we two persons juggle (the shuttlecock) respectively, we could make better scores than this time." (P1)

"Unlike basketball, shuttlecock kick is not a match requires team spirit. It mostly based on personal performance. Just now, we considered it as a competition with other teams. When we consider this as a team game, it would be more interesting if we keep on passing the shuttlecock to each other." (P5)

This suggested that the behaviours of the sportive people are very much driven by individual abilities and performance; however, if there is a clearly defined collective goal, their behaviours can be driven by the collective goal rather than personal preference.

5.2.2 Sedentary groups

The situation seemed to be different when testing with the sedentary groups. From the test we observed that every participant tried to deliver the shuttlecock appropriately to others. This suggests that they gave the priority to cooperate with each other, which could reflect their natural drive to consider the activity at a group level. In their own words,

“I have to say teamwork outweigh personal ability during the game.” (P8)

This implied that participants strongly prefer cooperation to achieve a group goal. In the test with G4, they changed the rule of the cooperation: people have to say their own name before receiving the shuttle. They explained this strategy as follows:

“This approach is meant to resolve the problem when everyone want to kick (the shuttlecock) in the same time. The player who wants to take the shuttlecock has to say his/her own name in advance, so that we will work in a good order. And this strategy is derived from volleyball training.” (P12)

This result informed us that sedentary people could have interests to optimize social interaction and team cooperation based on their own experience from other activities.

5.3 Intergroup Competition

5.3.1 Sportive groups

From the test with two groups, we could not find anything evident to show their concerns on the final scores. When talking about join in a tournament of shuttlecock, we received similar comments from both groups:

“I don't want to participate any competitions of shuttlecock-kick, unless there has attractive prize.” (P2)

“Without incentives, we don't have motivation to involve in such kind of competition.” (P4)

Their views pointed out that explicit rewards for sportive people could encourage the engagement of competition, which is conform to the reinforcement management process in TTM. Interestingly, they attributed their lack of communication in the test to their sense of competition.

“This sport requires attention, I don't want pay too much attention on communicating in the game, otherwise we can just stand there to have a chat.” (P2)

“We will communicate about the strategy in basketball match. But communication has nothing to do with the activity.” (P3)

This observation, again, suggested that when highly motivated people decides to engage in any forms of collective competition, they may take it seriously and adjust strategies according to the different requirement of physical activities.

5.3.2 Sedentary groups

Same as sportive groups, participants did not show strong awareness of competition during the test. When being asked with similar questions as the previous groups, they offered us more insightful answers:

“I want to beat other teams, also sometimes want to challenge myself. Just want to become better.” (P12)

This implied that sedentary people would not only evaluate their effect on others, but also keen on re-evaluating self-image in their progress. More in depth, we realized that the negative consequence at a team level could also demotivate their passion on the activity. As what P7 said,

“If we perform too bad and the ranking is not good any more, then we may not mind which place we will be.” (P7)

Moreover, we particularly observed that G2 celebrated their high team score during the test, which, in contrast, means a positive result could be motivational.

5.4 System Interaction

5.4.1 Sportive groups

Although most of the participants comprehended the meaning of visual and auditory feedbacks correctly, their remarks on our design were indifferent. They gave us some suggestions on improving our interaction design:

“It will be more attractive if you can visualize our performance as animations on the screen.” (P1)

“I noticed the traditional music according to our performance. But I prefer disco music, which the rhythm could drive us to play harder.” (P2)

As we have argued, these highly motivated people are already confident in their current status. Therefore motivation-based interventions may not be so effective compared to systems that aim at stimulating high performance.

5.4.2 Sedentary groups

In the interview, participants appreciated the facts that they could see their scores on the screen. However, we learned that the congratulatory message was too subtle to be recognized, as P10 said,

“We just noticed the scores on the screen, yet the rest of the information wasn’t attractive to us.” (P10)

Moreover, it has to be committed that audio feedback seemed more popular than visual. They mentioned that:

“I like the traditional music that enables us to kick the shuttlecock with the rhythm.” (P9)

“The companionship of music had encouraged us to carry on.” (P11)

However, they also revealed the other side of the coin, as what P12 recalled:

“When we failed and the music stopped, then we felt a bit depressed.” (P12)

In other words, adding praise principle using audio feedback and lower the threshold of receiving rewarding message should be considered at the collective level.

6. DESIGN IMPLICATIONS

According to McConnaughy et al. (1983), individuals show differential patterns of engagement in each of the TTM stages. In our case, we have also found distinct feedbacks on our PT design strategies between sedentary and sportive people. Our initial results suggest that the general use of one single social PT strategy may not be sufficient for different individuals in the collectivist context. In the remainder, we elaborate further the preliminary implications obtained from this study. Each category below is originated from at least one of the PT strategies used in the design of our prototype. We firstly discuss the differences according to our prior analysis and then provide design implications (DI) for two user groups respectively, as representatives for stages of TTM.

6.1 Performance: Solitary Task vs. Cooperation

While all the groups participated in the shuttlecock-kick game as a collective activity, they demonstrated a consistent difference in the patterns of their team performance. In the collectivist environment, those active people tended to divide the mission into small tasks for individual players to accomplish. Under this circumstance, when they perceived the task beyond their capability, they would attempt to marginalize

themselves to support a better team performance. As a result, better-performed people will have more chance to play than the less performed people. This observation could also be affected by the fact of the high score of Power Distance in China (Hofstede et al. 1991). Moreover, we also observed that the sportive people were more inclined to understand their role of playing in the collective exercise. At this point, the following implication could be derived:

DI for sportive people: *Ensure sportive people could find the right positions in the collective PA to contribute to the team performance (see Figure 6).*



Figure 6. The prototype interface enables users to choose their expertise in the basketball game.

On the other side, the study revealed that the sedentary participants showed more interest on cooperation. However, when the physical skills are not equivalent among players, the comparison both within group and between groups could be discouraging for further playing. As for collectivist cultures such as China, people may prefer activities that preserve ‘face’ to those that may ‘lose face’ (Markus & Kitayama 1991). Therefore, the PT design should allocate sedentary people with similar skills into one team to avoid ‘losing face’ on individual performance:

DI for sedentary people: *Pre-evaluate sedentary people’s ability to certain PA and accordingly help them to find co-operators and competitors at a similar level (see Figure 7).*

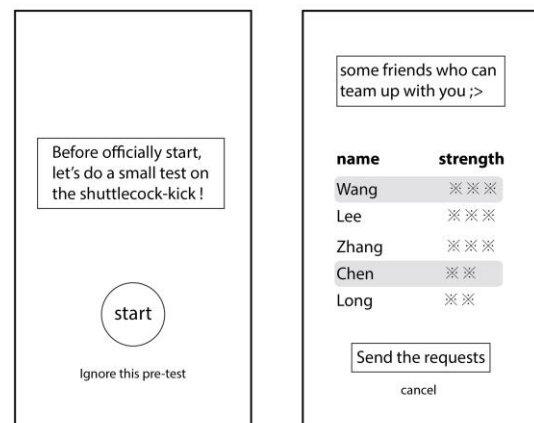


Figure 7. Left: the prototype interface to ask users for pre-test; Right: the prototype interface to recommend teammates to users according to their physical abilities.

6.2 Ambiance: Serious Sport vs. Casual Game

During the test, team communication between two user groups was also significantly different. On the one hand, the active participants were very much immersed into the activity and did not chat with each other so often. Whereby one easily recognisable character has been identified: they were goal-oriented. As showed in the post-interviews in the experiment, we understand that they did not treat PA as any types of leisure activity. Therefore, the design of social persuasions for this user group should really define the purpose very well on why they should join in the collective PA:

DI for sportive people: Assign sportive people a clear collective goal for the team performance (see Figure 8).

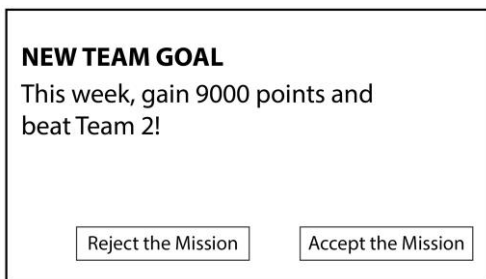


Figure 8. The prototype interface to assign a new team task for users.

In contrast, we observed that participants from inactive groups did not enjoy the PA as a serious competition, particularly when they were not doing well in the PA. This observation conformed to the previous study that the competitive aspects could bring negative influence to sedentary people (Lin et al. 2006). Therefore, instead of making the goal of collective PA so obvious to sedentary people, designers should put more efforts on hiding the 'real aim' of the intervention to distract their attentions on the activity.

DI for sedentary people: Trigger the communication between sedentary people during the PA to create a casual atmosphere. For example, Mueller et al. (2010) developed the prototype of *Jogging the Distance*, which utilized mobile phone and handsets to support conversations between joggers in different locations.

6.3 Stimulus: Reward vs. Praise

As noted previously, when talking about the competition mechanisms in the collective PA, sportive people emphasized the impactful role of incentives as a trigger to attract them to take part in the match. In this way, we would suggest designers to take extrinsic stimulus into account when

designing the system to motivate active people to take a new PA behaviour.

DI for sportive people: Provide rewards to sportive users to maintain their interests on the collective PA behaviour, see the example from real product in Nike+ Training App (goo.gl/9kWN4y).

Among sedentary people, we observed that social normative influence (Deutsch & Gerard 1955) could act as a facilitator to encourage participation of a certain PA. However, the overemphasis of social pressure could also discourage them to carry on a certain PA, if there are any negative feedbacks on their PA abilities. Therefore, when designing the PA motivational system for this user group, designers should consider including PT principles to maintain their confidence and motivation on continuing certain behaviour. As is shown in Figure 9, this could be achieved from both the social and system perspectives:

DI for sedentary people: Allow sedentary people to recognize and be recognized by others to encourage their social participation of the PA.

DI for sedentary people: Provide positive feedback to sedentary people on their every small improvement to reinforce their PA performance.

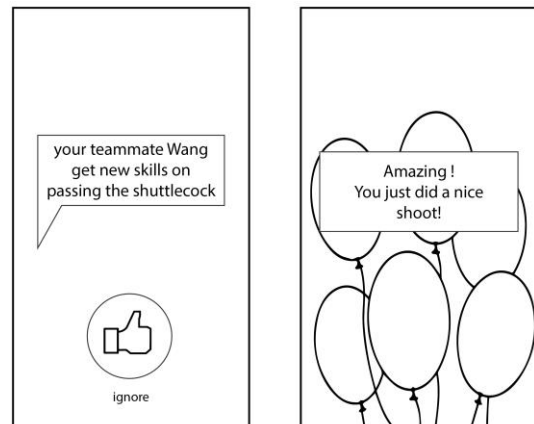


Figure 9. Left: the prototype interface to give away praise to friends; Right: the prototype interface to give praise from the system.

6.4 Target: Old Habits vs. New Behaviours

During the test, for those non-sedentary participants, they tended to insist on existing PA other than any new activities. In this case, when designing social persuasions for this group of people, it would be more viable to adjust the principles according to their current habits than to look for any other new activities to make behaviour change.

DI for sportive people: Suggest sportive people to participate in collective activity according to their existing PA behaviours.

Regarding another user group, from the earlier results, we learned that only focusing on the collective activity in the social context would limit the effect of social persuasions. Besides, to eliminate the effect of their inadequacy of physical ability, we would suggest providing explicit individual training, apart from the collective exercise, so as to prolong the behaviour change.

DI for sedentary people: *Provide self-training programs for sedentary people to support long-term behaviour change, see the real life example from Jawbone UP 4 (jawbone.com/).*

7 SCOPE, LIMITATIONS, AND DELIMITATIONS

The scope of this study was to customize collectivist persuasions in the sociocultural context of China for sportive and sedentary people, identified by TTM. For this purpose, we conducted the pilot study of ShuttleKickers, a prototype that implemented various social-related PT strategies, with two specific groups of participants. In the following, we elaborate on the limitations arose from our study and how we delimited our work.

First, the exploratory study makes it difficult to generalize the findings to a wider population of users. Due to the explorative nature of this study, we want to initially focus on a smaller selection of representative groups to gain qualitative understanding of the potential opportunities to inform what might be salient issues for future research and design practice (Klasnja et al. 2011). Second, results from the tests are do not cover the effectiveness of our design for long-term behaviour change. However, the central contribution of our study is to obtain insights on how and why the social-related PTs works or does not work in order to enlighten our future design for different user groups. We do believe that apart from the prolonged study, the short-term study is more straightforward to achieve our goal at this very early stage (Klasnja et al. 2011). Third, we have also realized that it is necessary to take the target users' real lifestyle into consideration when applying PT strategies. This conforms to the earlier critique on TTM by Littell & Girvin (2002), Therefore, next to discussions of PT strategies from a TTM perspective, more research needs to be done to support the tailoring of social persuasion towards different individuals within one sociocultural context.

8 CONCLUSIONS

In this paper, we presented our insights into how to explore a combination of various social persuasions for users in different stages of the TTM, in this case, sedentary and sportive user groups in China. In order to achieve the goal, we

firstly designed our prototype ShuttleKickers based on the constructs of group-based social persuasions; and then conducted a field research with those two different groups of participants. Based on the results from our study, we summarized our work with several design implications for different user groups for collectivist culture to use. On the one hand, our study implied that the collectivist PT strategies should ensure sportive people the roles fit for their skills in the collective PA; should assign them explicit goals for team performance; should provide them rewards; and should suggest them the collective activity based on their existing PA behaviours. Regarding sedentary people, on the other hand, we found that the social-related PTs should allocate them with similar skills into one team; should provide the ambiance for communication; should provide the positive feedback on their performance; and should offer self-training program to support long-term playing. Concluding, we look forward to our insights and methodology here to be verified and applied by further studies. We also believe our work can contribute to a larger HCI practice in the topic of health and wellbeing.

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