The Social Influence of Technology to Support Physical Activity: A case study

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The Social Influence of Technology to Support Physical Activity: A case study

Full research paper

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Abstract
Despite the proven health benefits of physical activity, only 48% of adults in New Zealand are physically active. There are many factors influencing individuals to be active. One of them is social influence, i.e., the effects others have on an individual’s behaviour. Persuasive Technology is a relatively new research field, which explores how technology can influence the behaviour of its users. The purpose of this study is to investigate how technology can exert social influence to motivate and support physical activity. This paper presents a case study of a wellbeing initiative in a healthcare organization. The findings identify system requirements and social influence factors users perceive as essential in a system supporting the initiative. Four themes were identified as shaping the physical activity outcome of participants: personal attributes, organisation, technology features and persuasive technology aspects. The results demonstrate that the persuasive elements in the form of social comparison, feedback, information/advice and recognition motivate participants, but technology can be persuasive only in combination with the other factors. A model for the design of Persuasive Technologies is proposed for the design of a system to support the health initiative considered the case.

Keywords: persuasive technology, well-being, physical activity, social influence.
1 Introduction

Nearly half of the adult population worldwide are either overweight or obese. Obesity is linked to several diseases and is completely preventable. One significant contributing factor is physical inactivity. Physical inactivity is ranked 4th in the risk factors leading to death worldwide and the cost of it affects the health care and quality of life (World Health Organization, 2010). The positive effects of physical activity (PA) on health and wellbeing have been proven many times (Hardman & Stensel, 2009; Nieman, 2002;). Research has shown that social influence, the effect the behaviour of others has on an individual's behaviour, is a determinant for PA (Bauman et al., 2012; Chogahara, Cousins, & Wankel, 1998; Turner, 1991). One form of social influence is persuasion which is a deliberate attempt to change a person's judgement or action through communication (Jones & Simons, 2017). Cialdini (2007) has postulated six social influence principles that function as a rule of thumb for persuading individuals. The principles are reciprocity, consistency, scarcity, authority, social proof and liking (Cialdini, 2007). These principles can be used as guidance for the design of technology to support physical activity initiatives.

Persuasive technology (PT) is a term used for systems that are designed to motivate individuals to change their behaviour (Fogg, 1998). Persuasive Technology is a fast-growing research area with a wide range of applicable domains, and shows great promise in healthcare (Chatterjee & Price, 2009). One stream of research focuses on principles to design persuasive technology (Fogg, 2002; Oinas-Kukkonen & Harjumaa, 2009). Another area of research has identified factors for technology to be persuasive and influence an individual's behaviour. The most frequently used social influence elements in the research are social comparison, feedback on the activity level, and complimenting users for their achievements (Foster, Linehan, Kirman, Lawson, & James, 2010; Mohadis, Mohamad Ali, & Smeaton, 2016). There are also reported negative aspects of PT, and the persuasion applied. For example, not everyone likes to share their data (Fritz, Huang, Murphy, & Zimmermann, 2014). However, the majority of the research has focused on incorporating the existing design principles and taken a positivist approach to investigate the relationship between PT and PA. There is potential to explore the needs of users for support and motivation from technology.

The purpose of this study is to investigate how technology can exert social influence to change an individual’s behaviour to motivate and support physical activity among the participants of the Walking Challenge at the Christchurch Health. The study aims to explore the requirements of participants for motivation and support from technology in the context of the initiative and the organisational setting.

The remainder of this paper is structured as follows. In the next section the concepts of PA and social influence, as well as Persuasive Technology, will be introduced and related work discussed. Next, we present the research design and the methods of data collection and analysis. In section four, the results of the analysis of the data are presented followed by a discussion of the results in section five. The paper will finish with a conclusion of the research and its results.

2 Prior research

2.1 Persuasive technology

Studies have examined why some people are more active than others and have identified factors associated with personal characteristics and the external environment. Personal factors include self-efficacy and enjoyment of the activity (Bauman et al. 2002), values, norms and beliefs (Deliens, Deforche, De Bourdeaudhuij, & Clarys 2015) Social support from friends and family and peer pressure are social environment factors. Dishman, Sallis, & Orenstein (1985) found the most correlated influences coming from past activity, access to facilities, motivation, social reinforcements from staff and exercise partner, as well as family and peer influence. As personal factors are inherent to the individual and not are subject to influence, this research focuses on social influence factors.

In social psychology research, social influence is defined as the effect of others, individual or group, on an individual's behaviour (Turner, 1991). Social psychologists distinguish between various forms of social influence. One type of social influence that has been treated as distinct by researchers, is the science of persuasion (Fabrigar & Norris, 2012). In contrast to other forms of social influence, persuasion is a deliberate attempt to modify someone's judgements or actions through communication.
(Jones & Simons, 2017). This definition reveals the three core properties of persuasion: 1) the persuader makes a clear and open attempt to persuade; 2) communication is used to persuade and 3) receivers are called to make a decision. The receiver has the power to decide whether to respond positively or deny the attempt to influence them (Jones & Simons, 2017). Cialdini (2007) introduces six principles that influence the judgements and actions: reciprocity, consistency, scarcity, authority, social proof and liking.

The research area of Persuasive Technology (PT) is relatively new in the IS research field, and theories and concepts are still being refined (E. V. Wilson, Djamasbi, Strong, & Ruiz, 2017). Chatterjee & Price (2009) give an overview of the technologies, persuasion goals and domains where PT can be applied in healthcare. Persuasive Interactive technologies that are designed to change attitude and/or behavior. (Fogg, 1998; Oinas-Kukkonen & Harjumaa, 2009). An essential aspect of PT is the deliberate intent to change the attitudes and or behaviour without deception or coercion of the user (Fogg, 2002; Oinas-Kukkonen, 2013). Oinas-Kukkonen & Harjumaa (2009) emphasise the importance of requirements specification in software development for PT but do not consider the users in the process. The idea from Oinas-Kukkonen & Harjumaa (2009) is to derive the requirements (functional and non-functional) from a set of postulated design principles. The focus in the existing research is on the user design of the systems and eliciting user requirements through prototyping. The requirements are established from social psychology theories, e.g. social comparison, Theory of Planned Behaviour, or from PT development models and past empirical evaluations of persuasive systems. The studies follow the scheme of describing the implementation of PT which is then followed up with an evaluation of the user’s perceptions (Hamari, Koivisto, & Pakkanen, 2014).

2.2 Persuasive technology and social influence

In the past two decades, numerous applications have been developed in many different domains, targeting changes in user’s behaviours or attitudes. The health and exercise domain have seen the largest number of studies aiming to motivate and encourage users through social influences (Hamari et al., 2014). This section will review research on PTs used to influence physical activity (PA) and how they conform to Cialdini’s (2007) principles.

The principle of social proof states that people continuously compare their behaviours with the behaviours of others. Research in PA has shown that this principle can be applied through descriptive normative messages, i.e. messages about what others do. (Priebe & Spink, 2014). Foster et al. (2010) included a social comparison feature in their Facebook application called StepMatron. Through the application, users were able to see what others have done, a leader board, and were able to comment on others entries. The study results revealed a higher step count of nurses with access to the application features and more time spent interacting with the ranking interface. Other studies report on the positive effect of this principle on users (Consolvo et al., 2006; Fritz et al., 2014). But social comparison also has adverse effects. A few studies report that not all participants felt comfortable about the sharing features and public display of their achievements particularly when they did not perform well (Fritz et al., 2014; Mohadis et al., 2016).

The principle of reciprocity describes the need or the obligation of people to return favours or gifts that they receive from others. Hamari & Koivisto (2015) found that by receiving recognition from others through a comment feature in the application, users reciprocated that recognition. This influenced their attitude positively towards the system and resulted in continuous intention to use the system and to exercise. Foster et al. (2010) found that their participants used Facebook’s comment feature to engage in a competitive but playful manner to encourage each other.

Consolvo et al. (2006) developed Houston, software running on a phone, to track and share step count among friends. Houston had several persuasive elements, the one that helped participants most was committing to a goal and the feedback of their activity level. This resembles Cialdini’s (2007) principle of consistency which reflects the desire to be consistent with one’s actions, statements, and beliefs. Mohadis et al. (2016) found that self-monitoring was received positively by all participants. Participants with low activity levels found it especially helpful as it allows them to track their progress and gain confidence. Evidence for self-monitoring has also been found in PA intervention research, to influence self-efficacy positively (Michie, Abraham, Whittington, McAteer, & Gupta, 2009).

Wilson & Spink (2006) researched the social influences on older adults and PA. They found obedience as an influential factor. However, participants only complied with a request to be more active when the
request came from a healthcare professional. This finding supports the authority principle from Cialdini (2007) which states that people tend to follow the request of authorities. Mohadis et al. (2016) applied this principle in their system through the implementation of a virtual coach and displaying expert’s opinion of the benefits of PA. Dennison, Morrison, Conway, & Yardley (2013) found that apps developed by experts, i.e. when the user can see the person trying to persuade them has expertise in the field, increase the user’s compliance.

The principle of liking, which is influenced by factors such as similarity, cooperation and compliments, can influence an individual’s decisions. Guadagano & Cialdini (2005) found that in an online setting, this principle is not as effective as in face to face situations. In persuasive systems, liking is mostly interpreted as liking the system and its ease of use (Oinas-Kukkonen, 2013; Oinas-Kukkonen & Harjumaa, 2009). When examining liking through the factors of cooperation and compliments, several studies reported positive findings. Participants are motivated by the feedback they receive from the system, other users, and the ability to find similar participants to exercise with (Consolvo, McDonald, & Landay, 2009; Foster et al., 2010; Mohadis et al., 2016).

In conclusion, the review of the literature shows that technology, in specific PT, has the potential to support individuals to be physically active. The research on the benefits of PA on health is clear about the positive effects as well as on the importance of social influence to support individuals to be active. The reviewed articles have implemented a variety of existing persuasive design principles into system features that positively affected the behaviour of users. The dominant features implemented across the articles, are comparing to others, feedback on the activity level and complimenting users for their achievements. There are also reported negative aspects of PT, and the persuasion applied. These negative aspects have been identified by evaluating technology already in use. In the context of design, they provide lessons learned in how design features aimed at social influence and persuasion can have a negative impact. This shows that user’s need to be heard when developing a persuasive system and there is no “one size fits all” approach to PT and the context in which PT is applied matters.

There are two main streams of research related to persuasive technology and physical activity – research on design requirements and research on the influence of persuasion elements on activity outcomes. The design studies available in the literature, have focused on incorporating existing PT design principles or findings from previous research into prototypes. These prototypes were then evaluated with user studies to identify which principles have the greatest effect. The studies on social influence factors have mainly taken a positivist approach in examining the relationship between PT and PA. They have confirmed the associations between factors and the outcome but have not been able to include any other contextual factors. This study aims to explore the technology needs and requirements of participants in a particular wellbeing initiative and will consider how the technology elements interact with environmental contextual factors. It aims to identify the social influence principles required by potential users for the design of a prototype.

3 Research methodology

The main research objective of the study is to address the question how technology can exert social influence to support and motivate physical activity. To address this question in the context of a single organisational initiative the study explored the business and user requirements. Then the data was analysed to provide insights into the potential to incorporate the principles of social influence into the technology.

A qualitative design was chosen because this research aims to explore and investigate how technology can exert social influence according to user’s own experiences rather than to measure or explain that technology can exert social influence. Because of the many different determinants of PA and the various forms of social influence that can occur, both phenomena are highly subjective to personal experience. Qualitative research and its methods acknowledge the context in which a situation takes place, the fact that individuals may experience the same context differently, and seeks for a deeper understanding to why decisions were made (Myers, 2009; Creswell, 2009). The strategy of inquiry to find answers to the research questions is an exploratory case study. The chosen case for the research is the September Walking Challenge at the Christchurch Health (referred to hereafter as the Challenge) administered by the Māia Health Foundation.

The Challenge is an annual activity with an average number of participants of 400. The purpose of the Challenge is twofold: to raise funds for the children’s wards at Christchurch Hospital and the second is
to promote physical activity and wellbeing among staff. The Challenge runs for a few weeks, participants are given pedometers and then they submit the daily step count to the Challenge coordinator. The Challenge is currently administered by one person who communicates with participants and collects the activity data. At that level, the communication is at the beginning stating the rules, then at the end announcing the results. There are three units from the organisation involved and each has supported the initiative slightly differently. The foundation seeks to identify what technology can do to reduce the administrative workload and keep participants encouraged and motivated prior to the next Challenge.

A purposive sampling method was used to recruit the participants for the study with interviewees representing all units, different levels of involvement and prior physical activity. Interviews were conducted with 15 participants and the interviewing stage stopped when saturation of information was achieved. To preserve the privacy of participants, individual demographics have not been recorded. The participants of the study were between 28 years and 68 years and the majority were female. Semi-structured interviews were held with the participants asking participants what they would like to see in a system to support them during the initiative and how this can help. They were asked also about their experience during the previous challenges. In addition, documentation from the Māia Health Foundation about the Challenge was reviewed to triangulate data in particular to outcomes and business requirements. The documentation includes communication with the participants, internal communication and a project plan.

The collected data were analysed using an inductive approach in which broad themes were developed from the data and compared to the existing literature at the end (Creswell, 2009). The data from the interviews were first transcribed and then the data was coded using NVivo for Mac version 11.4.3. The codes generated were descriptive open codes used to summarise sentences or paragraphs. To avoid using the words of the participants ‘What?, Who?, How?, When?, Why?’ questions were used to uncover the meaning of the data as recommended by Myers (2009). The codes were then categorised into themes and compared to each other. The five most persistent themes were chosen for more in-depth analysis including interpretation of their meaning. The process was iterative as some of the earlier interviews were analysed before the next interview.

4 Findings

The participants talked about several requirements that are related to PT and the concept of persuasiveness. The four main categories that emerged in the interviews are social comparison, recognition, feedback and information/advice. Table 1 summarises the key themes identified in the interviews and this section discusses the themes in more detail.

The first persuasive element that is important to participants is social comparison. The participants want to know where they stand compared to other participants of the Challenge. This can be in the form of an individual goal to win the overall prize, to be better than your colleague, achieve a good result with your team and beat other departments.

The participants didn’t mind displaying the totals for teams publicly but felt differently about showing the totals of individuals publicly. Therefore, one way participants can imagine receiving the information is by sharing the number of participants in the Challenge and then where they are ranked or alternatively by creating log in names.

“[…] being able to go on and say you know there’s 1,000 people participating, and you are number 5 and you so far are number 500. So, you might walk a bit further to get yourself down to number 450 or something.” (P08; L211)

However, for the more ambitious participants, it is important to know the step count of the leader to adjust their efforts to compete for the overall win. Others said that just knowing the average of steps that was done across the Challenge would motivate them to do more and to be satisfied with knowing they are equal to, or above the average.

“[…] if I had the average of the September I might even go for 12. So, yea, in this way it might be enhancing.” (P01; L377)

Participants were also motivated to maintain their efforts or increase their step count by the recognition of others. Participants received recognition during or at the end of the Challenge through
various forms but reported unanimously that it made them feel good and motivated them. The common forms of recognition were from the praise of others, or from their devices for reaching targets. One office recognised the achievements through a leaderboard and highlighting everyone who did a certain number of steps in one day.

“...down the bottom it had another list of those who had achieved 10,000+ steps.” (P05; L101)

One participant reported having everyone in their office receiving a certificate at the end of the Challenge which she still keeps and proudly presented during the interview.

Table 1: Overview of themes: Persuasive Technology Aspects

<table>
<thead>
<tr>
<th>Theme</th>
<th>Categories</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Attributes</td>
<td>Qualities/ Traits, Values, Startup Motivation</td>
<td>Personal attributes of participants that shape their attitude towards the challenge and influence the outcomes.</td>
</tr>
<tr>
<td>Organisational Aspects</td>
<td>Office Champions, Process, Resource Allocation, Goals</td>
<td>The way participants experience the Challenge and their interaction with the Challenge, as well as the organisers limited resources and goals for the Challenge, influence the outcomes of participants.</td>
</tr>
<tr>
<td>Technology Other</td>
<td>Data Input, Interactiveness, Conversion to tangibles, Reliability, Usability, Privacy</td>
<td>Requirements participants expect or would like to have in a system to help them achieve their desired outcomes.</td>
</tr>
<tr>
<td>Persuasive Technology</td>
<td>Social Comparison, Feedback, Recognition, Information/ Advice</td>
<td>The social influence elements in form of persuasion that will motivate participants to be more active.</td>
</tr>
<tr>
<td>Outcomes</td>
<td>Expressed, Increased Activity, Lasting, Increased awareness</td>
<td>The reported outcomes from participants of the Challenge.</td>
</tr>
</tbody>
</table>

Participants were also motivated to maintain their efforts or increase their step count by the recognition of others. Participants reported unanimously that it made them feel good and motivated them. The common forms of recognition were from the praise of others, or from their devices for reaching targets. One office recognised the achievements through a leaderboard and highlighting everyone who did a certain number of steps in one day.

“...down the bottom it had another list of those who had achieved 10,000+ steps.” (P05; L101)

One participant reported having everyone in their office receiving a certificate at the end of the Challenge which she still keeps and proudly presented during the interview.

An important aspect for participants was to receive feedback during the Challenge. The feedback they would like to receive is in the form of information how they are doing compared to others, to monitor themselves if they achieve their target and how they improve compared to previous days or weeks. Participants want to monitor whether they are achieving the target they set themselves. Therefore, the participants used their devices, pedometer or smartwatch, to monitor themselves and make sure they are reaching their target. For some, the monitoring seems to become compulsive and one of the main
motivators to be active.

“I was very aware of it and it was like oh ok I’ve got more to do. You know I was competing with a little machine. That’s what it felt like…I haven’t done enough, I need to do some more!” (P07; L138)

While the participants can monitor themselves with their devices, they also want to reflect on their efforts and see how they are progressing compared to previous days or weeks. This helps them to be consistent and is motivating by reflecting on the past and seeing progress. The participants with smart devices had this feature and one participant said:

“[…] there is some enjoyment in it. Sort of almost, sort of type of reflective journal of your day when you look at it what you’ve done. […] it enhances, uhh, your reflection on being active and moving and enhances my willingness to move.” (P01; L494)

Another persuasive feature that came up in several interviews was that participants would like to receive information and advice that help them to be active. This can be in the form of suggestions of how to be more active or reminders to be active. Participants expressed their desire for such a feature as it would help them to prioritise being active. The participants want to be able to regulate the number of reminders received or opt out of them completely.

Participants know that they should be more active but some struggle to fit the activity in their day. Therefore, they are looking for suggestions of how they can change their behaviour or rearrange their day to do more walking.

4.1 Other technology features

Based on their repeated participation in the challenge, the interviewees had clear expectations of what they want from a potential system. The main categories that emerged in this theme are data input, interactivity, conversion to tangibles, reliability, usability and privacy. Data input including reminders to enter steps was reported as essential to support the motivating features discussed in the previous section. Interactivity ranged from interaction with others, converting the steps into other measures, setting goals, and more in-depth engagement with the data. Reliability referred to the reliability of the device which recorded the steps. Usability and ease of use were important to the participants. The participants don’t want a system that is too technical or time-consuming and it has to be simple with straightforward, easy steps otherwise it would frustrate them and put them off. The last requirement relates to privacy and sharing data. The concerns expressed were about how much data you want to share, what the data is being used for and having opt-in/out options to control what you want, and not want to share.

4.2 Outcomes

The outcomes of the Challenge on the participants can be categorised as perceived (verbal), tangible (increased activity), lasting and activity awareness. All participants showed a positive attitude towards the Challenge. The comments ranged from “it was good” to “I actually enjoyed it” and “I loved it”.

The Challenge had also significant tangible results for most of the participants in the form of behaviour change and increased activity. Participants reported to have done more steps than usual, started to park the car further away, doing others forms of exercise, taking steps instead of the lift or even began to walk from home to work.

“I started walking home from work, like some days where I hadn’t walked home ever before from here and I live, like 5k’s, yea probably about a 15-minute walk. But I never walked home before.” (P03; L56)

Also, some participants reported that they have carried on being more active and the Challenge was the initiator which gave them the push to be more active.

“[…] and I’m still keeping going with that now so that’s been a positive change for me yea it was enough of a push, a little push.” (P06; L91)

The other positive effect of the Challenge was for participants to increase their awareness of being active and how to fit it in their daily lives. This was reported by participants who had sedentary jobs and as a result of the Challenge reprioritised PA and thought about how they could do more walking.
4.3 **Personal Attributes**

The personal attributes of the participants emerged as one theme that influenced their experience and level of engagement with the Challenge. Three categories of attributes surfaced which are participants' startup motivation, the qualities/traits of a person, and their values.

The most common trait that motivated and drove the participants in the challenge was their competitiveness. Other exhibited traits were self-determination to reach their goals and the self-confidence to ignore others and focus on themselves.

The values that motivated participants were Physical Activity/their fitness, the cause of the challenge and the camaraderie created by pursuing a common goal.

“We thought this was a good challenge that we could all do, both individually as our own challenge but also collectively as a department. Which was a really good skill.” (P07; L18)

The last category is the start-up motivation of participants to take part in the Challenge which played a role in their level of engagement. Most of the participants wanted to get fitter or simply be more active while others signed up as a result of having other people in their office sign up.

4.4 **Organisational Aspects**

The organisation of the Challenge emerged as a theme and has four categories. The categories are Office Champion, Process, resource allocation and goals.

Some participants described an "Office Champion" in their office who took charge of the Challenge. The tasks Office Champions took on varied from collating and submitting the steps to giving feedback and encouragement. Participants were motivated by an Office Champion and perceived it as extremely positive. Many participants commented on the processes of the Challenge. The comments were mainly focused on the communication during the Challenge and the rules around it.

Participants perceived the initial communication as good and the sign-up process was easy without any barriers. However, once the Challenge was running the participants reported a lack of communication and dissatisfaction with the process. Participants also want general information regarding how many people have signed up, how much money was raised and information about the charity.

From the organisers' point of view resource allocation was a problem. With only one staff member responsible for adding up the scores the document review showed the organisers were aware of the potential bottlenecks. Therefore, going forward, a simple system can free up resources, support the Māia Foundation in their goal and by adding the persuasive elements, motivate participants to be more active.

5 **Discussion and conclusions**

The current study explored how technology can exert social influence to support and motivate physical activity in the context of the Challenge and its participants. The results of the study identified that to motivate and support participants through technology to be active, not only the social influence elements are important. They work together with other identified themes and this is how technology can have the maximum effects to motivate and support the users. The results of the study lead to the proposed theoretical model presented in Figure 1.

The model suggests how all the identified themes together may lead to the desired outcomes and how each theme plays its part. Through exploring the social influence factors prior to the design, the study gains insights into which principles motivate users and why. The social influence elements found in the study in the form of the persuasive factors are social comparison, feedback, recognition and information/advice. The factors and the participant's description of how they are motivating reflect Cialdini’s (2007) principles of social proof, commitment/consistency, authority and liking. This indicates that the principles are not only effective in face to face communication but also through computer-mediated communication. The findings have also identified how social influence elements may have a negative impact and suggest alternative forms of implementation. One example is social comparison. Participants stated that it can be demotivating, similar to the findings of Mohadis et al. (2016) and Fritz et al. (2014), but they still want it if it is in an acceptable form. The solution for participants is to
display the average or make it anonymous which none of the reviewed prior studies did. This might be because when evaluating a prototype participants can only comment on the existing features. When the participants report to receive it as negative the logical conclusion is that it can’t be supporting. However, the social comparison factor is important to participants and motivating which is shown by the fact that participants immediately think of a solution to the problem.

**Figure 1: Proposed Theoretical Model**

The liking principle is a bit more ambiguous in technology. The way the participants described the recognition to be motivating through compliments and praise from the system can be seen as liking, but at the same time, the other features that complement the system can lead to liking the whole system. Hamari & Koivisto (2015) found recognition to be supported by the reciprocity principle, and Foster et al. (2010) found reciprocity in social support. In the current study, neither way seems to be motivating for the participants. This can be because participants want recognition in the form of visible compliments from the system and receive social support from peers nearby (office, family).

Further, while the study focused on the social influence elements that technology can provide the results suggest that the other factors are important too. The results indicate that PT goes beyond the persuasive factors and can also motivate participants through other features. Interactiveness is another way to achieve a higher engagement of participants with the system and ultimately the Challenge. The conversion of the steps into other measures taps into the gamification context, and by playfully walking around New Zealand at their own pace it is another form of motivation for participants. The organisation in the form of Office Champions as discussed at the beginning of this section motivates participants as well as keeping participants focused on the good cause of the Challenge.

The proposed model as a result of this study illustrates how all themes influence the participants and the outcomes. The context in which the persuasive technology is used is important and for the persuasive elements to have the highest effect the complete system needs to support the users. To focus only on the persuasive elements would be a mistake and the desired results may not be achieved. The
Technology support for physical activity study found that through evaluating a prototype the design principles are assessed individually but in the current study it becomes evident that the factors overlap and influence each other.

Future research can test the proposed model in this study to confirm its validity. This study was conducted in the design stage of a system and future research can incorporate the identified themes to evaluate a proposed prototype. Once a system is created and implemented according to the findings of the current study for the Challenge, a quantitative study can measure the results and verify the proposed model. This would allow to not only validate requirements for positive aspects but can also ensure that no negative influence aspects have been included. The results need to be tested in a more generalizable setting of workplace physical activity initiatives.

The study has theoretical and practical implications. The main theoretical contribution of the research is that it contributed further to the body of knowledge of PT. Every persuasive system and its requirements are dependent on the context and the needs of the users. By exploring the needs of the users in a playful competition in an NZ setting, the study adds further to the body of knowledge of PT. The study also provides a deeper understanding of how technology, social influence and other factors work together in a persuasive system to achieve the desired outcomes. Although there are existing frameworks for the design of PT and studies evaluating these principles, few have used an explorative qualitative approach. This approach has elicited new insights on the interaction between PT features and how negative impacts can be prevented. The results indicate that a potential system for the PA employees initiative does not have to be expensive and complicated. A simple easy to use and reliable platform for participants to enter their step count, see where they stand compared to others, and monitor their performance as well as receive recognition for their efforts will motivate the participants to be active. From there, additional elicited requirements can be added in the future to make the system more interactive and keep users engaged. In addition, the results allow placing the focus during the design on the elements with the most significant effects, in contrast to wasting resources by adding numerous persuasive elements to a prototype that users don’t want or need.

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